F. M. LA CAVE Sculp.

——— *Search more deeply for the Cause;*
And study Nature well, and Nature's Laws. —
Dryden

A

SUPPLEMENT

TO THE

New and Universal

DICTIONARY

OF

ARTS AND SCIENCES.

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M.DCC.LIV.

GEORGE R.

GEORGE the Second, by the Grace of God, King of *Great-Britain*, *France*, and *Ireland*, Defender of the Faith, *&c.* To all to whom theſe Preſents ſhall come, Greeting: Whereas our Truſty and Well-beloved *John Hinton*, of our City of *London*, Bookſeller, hath by his Petition humbly repreſented to Us, That he hath been at very great Labour and Expence in purchaſing Books, and employing Mr. *John Barrow* to compile and write a Work, entitled, *A New and Univerſal Dictionary of Arts and Sciences, containing, Not only an Explanation of the various Terms made Uſe of in the following Arts and Sciences, but alſo, whatever elſe is requiſite to render theſe Branches of Literature themſelves, Eaſy and Familiar to the meaneſt Capacities,* viz. Agriculture, Algebra, Anatomy, Architecture, Arithmetic, Aſtronomy, Botany, Catoptrics, Chemiſtry, Chronology, Commerce, Conics, Coſmography, Dialling, Dioptrics, Ethics, Fluxions, Fortification, Gardening, Gauging, Geography, Geometry, Grammar, Gunnery, Handicrafts, Heraldry, Horſemanſhip, Huſbandry, Hydraulics, Hydrography, Hydroſtatics, Law, Levelling, Logic, Maritime and Military Affairs, Mathematics, Mechanics, Merchandize, Metaphyſics, Meteorology, Muſic, Navigation, Optics, Painting, Perſpective, Pharmacy, Philoſophy, Phyſic, Pneumatics, Rhetoric, Sculpture, Series, Statics, Statuary, Surgery, Surveying, Trigonometry, *&c.* With an Introductory Preface, tracing the Progreſs of Literature from the earlieſt Ages, and enumerating the various Improvements made therein at different Periods of Time; the whole being a complete Body of Arts and Sciences, as they are at preſent cultivated; illuſtrated with a great Number of Copper-Plates: In Two Volumes, in Folio: One Volume of which is already Publiſhed, and the other now Printing from the Manuſcripts of the ſaid *John Barrow*. Which Work the Petitioner apprehends will be of the greateſt Uſe and Benefit, by facilitating the Study of the Arts and Sciences. And being deſirous of enjoying the Profit and Benefit that may ariſe from Printing and Vending the ſame, without any other Perſon interfering in his juſt Property: He has therefore moſt humbly prayed Us, to grant him Our Royal Licence and Protection, for the ſole Printing, Publiſhing, and Vending the ſaid Work, in the ſame Manner as has been done in Caſes of the like Nature: We being willing to give all due Encouragement to this Undertaking, are graciouſly pleaſed to condeſcend to his Requeſt; and We do by theſe Preſents, ſo far as may be agreeable with the Statute in that Behalf made and provided, grant unto him the ſaid *John Hinton*, his Executors, Adminiſtrators, and Aſſigns, Our Licence for the ſole Printing, Publiſhing, and Vending of the ſaid Work, for the Term of Fourteen Years, to be computed from the Date hereof; ſtrictly forbidding all our Subjects, within our Kingdoms, or Dominions, to reprint, or abridge the ſame, either in the like, or in any other Size or Manner whatſoever; or to import, buy, vend, utter, or diſtribute, any Copies thereof reprinted beyond the Seas, during the aforeſaid Term of Fourteen Years, without the Conſent or Approbation of the ſaid *John Hinton*, his Executors, Adminiſtrators, and Aſſigns, under his or their Hands and Seals, firſt had and obtained, as they will anſwer the contrary at their Peril: Whereof the Commiſſioners, and other Officers of our Cuſtoms, the Maſter, Wardens, and Company of Stationers are to take Notice, that due Obedience may be rendered to Our Pleaſure herein declared.

Given at our Court at St. James's, *the Third Day of* December, 1753, *in the Twenty-Seventh Year of Our Reign.*

By His Majeſty's Command,

HOLDERNESSE.

PREFACE.

HAVING, in our preface to the Dictionary traced the progress of the Arts and Sciences from the earliest ages, we shall here endeavour to shew how these various branches of human knowledge form one regular system; for it is obvious upon reflection, that they have a certain connection with, and mutually assist each other; and, consequently, all form one general concatenation. But, if we find it no easy task to reduce any single Art, or Science, to a few rules or general principles, we shall find it equally difficult, at least, to reduce the various branches of human knowledge into a general system. In order, however, to see how far this may be effected, we shall previously enquire into the origin, generation, or production of human knowledge; its causes, signs, and the formation of ideas.

Human knowledge, in general, may be divided into direct and reflex. The former is what we receive directly by the senses without any exertion of the will; and flows to the mind spontaneously, and without obstruction. The latter is an acquisition of the mind attained by its operations upon the direct, in uniting, separating, arranging, or combining.

As we are indebted to the senses for all our direct knowledge, our ideas are all, consequently, derived from our sensations. This was a principle with the earliest philosophers; and, because of its antiquity, long held as an axiom among the ancient schoolmen; who would indeed have as warmly defended substantial forms, and occult qualities. Upon the revival of philosophy this truth, standing among a number of absurd opinions, was overlooked, and prescribed indiscriminately with them; nothing being more dangerous to truth, than its keeping company with error. The seducing doctrine of innate ideas, recommended the more strongly perhaps by its novelty, was adopted, and long prevailed over this axiom of the schoolmen; nor is it yet destitute of defenders; so difficult is it for truth to regain her seat, when once dethroned by prejudice or sophistry.

Nothing is more certain than the existence of our sensations; and, to prove that they alone are the foundations of all our knowledge, it will be sufficient for us to shew, that they possibly may be so; for, in sound philosophy, deductions, having facts and acknowledged truths for their bases, are preferable to what rests only on mere hypotheses, however ingenious.

The first thing taught us by our sensations is our own existence, which cannot be distinguished from them; and, consequently, our primary reflections revert back upon ourselves, or that thinking principle that constitutes our nature, and differs in nothing from ourselves.

The second thing taught us by our sensations is the existence of external objects, and among the rest, that of our bodies, which are, in a certain sense, external to us, even before we distinguish the separate nature of the thinking principle within us.

These innumerable external objects have upon us so strong, constant, and attractive an effect, that our ideas of reflection have no sooner called us into ourselves, than those of sensation, which entirely surround us, force us outwards; and detain us from that pensive solitude, in which we should otherwise continue.

The multiplicity of these sensations, the concurring agreement of their evidence, the degrees we observe in them, the involuntary affections they excite in us, compared with the voluntary controul we have over our ideas of reflection, which operate only upon our sensations; all this, we find, produces in us an irresistible impulse to acknowledge the real existence of external objects, and to regard them as the cause of our sensations. This impulse has by many philosophers been looked upon as the effect of the supreme Being, and the most convincing argument of an external world.

But, as we are ignorant of any relation between a single sensation and the object thus supposed to occasion it, we cannot reason from the one to the other: nor could any thing but a kind of instinct, more evident than reasoning itself, oblige us to draw so remote a conclusion. But this instinct is so strong, that, could it for a moment subsist, and all external objects be annihilated, their reproduction could add nothing to its strength. We may therefore surely conclude, that our sensations actually have the external cause supposed; since even the effect of that very cause would be the same with that we really experience.

Our own bodies, belonging more immediately to us than any other external objects, affect us most. We are no sooner sensible that our body exists, than we are convinced of the care requisite to guard it from surrounding dangers. It is not only exposed to a thousand wants, but so extremely sensible of the action of other bodies, that it would soon be destroyed, did not we exert our utmost attention to preserve it. All external bodies, indeed, do not produce disagreeable sensations; the action of some is attended with pleasure: but the condition of human nature is such, that we have a quicker sense of pain than of pleasure; and, therefore, the latter seldom compensates for the former.

Certain philosophers, indeed, maintained, that pain was no evil, and suppressed their cries in the midst of torments: others placed supreme happiness in voluptuousness, but avoided it for fear of its consequences. All of them however would have shewn themselves better acquainted with human nature, had they restrained the sovereign happiness of this life to exemption from pain; and allowed, that we can approach this happiness, only in proportion to our care and circumspection.

Reflections like these infallibly arise in the breast of every person, who has not imbibed the prejudices of wrong education or perverted study. They follow as consequences of the first impressions we receive from objects, and may be placed among those first emotions of the soul, which are so valuable to the truly wise, and so deserving of observation; though neglected, or rejected, by vulgar philosophers, whose principles they almost universally contradict.

As we are under a necessity of preserving our bodies from pain and destruction, we must examine what external objects may prove useful or hurtful to us, in order to secure the one, and avoid the other: but we no sooner begin to consider these objects than we discover among them numerous beings like ourselves, their form exactly resembling ours; and, having, in all appearance, the same perceptions, we justly conclude they labour under the same wants, have the same appetites, and the same desire of gratifying them; and, consequently, that we might, by uniting ourselves with others of our species, in discovering what things in nature to tend to our preservation, or detriment, reap very great advantages. The communication of ideas is the principle and support of this union, which necessarily requires the invention of signs: and upon this principle was society formed, and language introduced.

And surely the pleasure and advantage flowing from this communication, either by imparting our ideas to others, or by adding those of others to our own, should oblige us to an intimate union in society, and induce us to exert all our powers to render it as mutually useful as possible.

But as each member of society is chiefly sollicitous to procure his own personal advantage, and as an equal desire to do the same is implanted in others; all of us cannot possibly receive an equal share, though we have all undoubtedly an equal right: and hence a right, so justly founded, is presently invaded by that barbarous one of inequality, or the law of force; a law that reduces human nature almost to a level with the brutes, and is extremely difficult not to abuse. The strength nature has generously given to some, doubtless to be imployed for the support and protection of the weaker of our species, becomes the means of oppression: but the weak, in proportion to the violence of this oppression, the less patiently endure it: being persuaded that it is founded on no reasonable motive. And from hence flow our ideas of injustice, and of moral good and evil; the principle of which philosophers have so long endeavoured to discover; whereas it is truly the voice of nature, extending even to savages. This is the law of nature implanted in every human breast, and the true origin of the earliest laws formed by mankind. Nay, this sole voice of nature, unassisted by human laws, is often sufficient either to prevent oppression, or, at least, to confine it within certain bounds. Thus the vices of our own species produce in us the reflex knowledge of our opposite virtues.

Having acquired the idea of just and unjust, and the consequent moral nature of actions, we are led to examine, what that acting principle within us is, which wills and conceives. We easily discover, without a long research into the nature of our own bodies, and the idea we have of them, that they are very different from this principle, because the properties found in bodies are entirely different from the faculty of willing and thinking; consequently, we are composed of two principles, different in their nature; but so united, that the motions of the one are connected with the affections of the other, which we are absolutely unable either to suspend or alter: and this connection renders them reciprocally subordinate to each other.

This subordination so independent of us, added to the reflections continually flowing from the nature of these two principles, and their imperfections, raises us to a contemplation of an omnipotent intelligent being, to whom we are indebted for our existence and preservation, and who, consequently, demands our adoration: our internal sentiments, therefore, are sufficient to demonstrate the existence of an omnipotent Being; were we even deprived of the universal consent of others, and of all mankind. And thus our pure intellectual notions of virtue and vice, the principle and necessity of laws, the spiritual nature of our souls, the existence of God, and our duty towards him; in short, all the truths we have an absolute occasion for, naturally flow from our first ideas of reflection upon those of sensation.

But notwithstanding these first truths are of the greatest consequence, with regard to the more noble part of us, our soul; the body, to which that part is united, soon diverts our attention from them, to provide for its numerous wants. Its preservation obliges us either to prevent the dangers that threaten it, or to remove the evils it suffers. We have only two methods of performing this; the first is our own particular discoveries; and the second, those of others, which we acquire by intercourse. And from hence agriculture, medicine, and all those arts absolutely necessary, or the primitive arts of man, together with all the rest, though apparently very remote, derived their origin.

Men, in the earliest ages, either by mutually assisting each other with information, or by joint endeavours, seem soon to have discovered some particulars to which they might apply themselves. Eager in the pursuit of useful knowledge, they did not long amuse themselves with idle speculations, but examined the different objects of nature, and, discovering their most obvious and striking properties, applied them together.

This first application produced a more latent one, relating to man's necessities; consisting principally in examining more minutely some less single properties, in the alteration and decomposition of bodies, and the uses naturally flowing from thence.

But in whatever method the first of our species, and their successors, proceeded, instigated by an object so interesting as their own preservation; their experience and observation of this immense universe must have produced difficulties too great for their utmost efforts to surmount. But, having now accustomed their minds to meditation, and being desirous of drawing advantage from it, their only resource must be the discovery of some merely curious properties of bodies. And, indeed, were it possible for an immense number of agreeable facts to supply the place of a single useful truth, the study of nature would be abundantly sufficient; for, if it does not afford us necessaries, it at least furnishes us with a profusion of pleasures; and supplies, though very imperfectly, the place of what is truly essential, by a kind of barren superfluity.

Pleasure holds one of the first places in the order of our wants, and the objects of our passions; and curiosity is a want to the pensive mind, especially when animated by the flattering hopes of acquiring entire satisfaction. Hence, we owe numerous discoveries, whose only merit consists in pleasing, to an unhappy impotence of acquiring such as would be attended with real utility. But there is another motive to works of curiosity; we mean, a pretence of advantage. When we are convinced, that something real and advantageous has resulted from enquiries, where at first we had not the least reason to suspect it, it inspires us with hope that all curious enquiries may, in the end, prove useful: and shews the origin, cause, and progress of that vast science, called, in general, physics, or the study of nature, comprehending so many different parts; agriculture and medicine, which principally gave it birth, are now only branches of it; and, though the most ancient and most essential, have only been esteemed, in proportion as they happened to be more or less obscured by others.

In this study of nature, partly prosecuted from necessity, and partly for amusement, we are sufficiently convinced that bodies have numerous properties; but generally so united in the same subject, that, in order to study thoroughly each of them, we are obliged to consider them separately. And, by this operation of the mind, we soon discover properties apparently belonging to all bodies; as motion, rest, and the communication of motion: sources of the principal changes we observe in nature. Upon examining these properties by the senses, especially the last, we soon discover another property, whereon they depend, namely, impenetrability; or that kind of force, by which each body excludes all others from the space it occupies.

Impenetrability is the principal property by which we distinguish bodies from the parts of indefinite space, wherein we suppose them placed; at least, we are obliged by our senses to judge thus of them: and, if our senses in this particular deceive us, it is so metaphysical an error, that our existence and preservation have nothing thence to fear; our common manner of conceiving obliging us constantly, in spite of ourselves, to return to this notion. We are induced by every object that surrounds us to look upon space, as the real, or at least the supposed place of bodies: and it is, actually, by the means of the parts of space, considered as penetrable and immoveable, that we acquire the justest idea of motion we can possibly obtain: and are consequently obliged to distinguish, mentally at least, two kinds of extension; the one impenetrable, and the other constituting the place of bodies. Thus, though we include impenetrability in the idea we form of the parts of matter, yet, being a relative property, the idea of which we only acquire by examining two bodies together, we soon accustom ourselves to consider it as distinguished from extension; which we can mentally abstract from body.

In this new consideration we regard bodies only as figured and extended parts of space: which is the most general and abstract light they can be considered in: for extent, wherein we distinguish no figured parts, resembles only an obscure picture, whose several parts escape our notice; because we can distinguish nothing. Colour and figure, properties constantly, though differently, residing in bodies, help us to distinguish body from space. Indeed, one of these properties is sufficient for the purpose; and, in that case, figure is generally preferred to colour.

Hence, we are enabled to fix the properties of simple figured extension, which constitutes the object of geometry, which, the more easily to attain its end, considers extension as first limited by one, then by two, and lastly by three dimensions. These three dimensions constitute the essence of all bodies in the universe. Also, by the successive operations and abstractions of mind, we divest matter of almost all its sensible properties, in order to examine only its idea. This enquiry cannot fail of leading to discoveries of the greatest utility; especially, as it is here unnecessary to regard the impenetrability of bodies: for example, when we contemplate their motion, we need only consider them as figured and moveable parts of space, and distant from one another.

The examination of figured extension presenting a great number of possible combinations, it is necessary to invent a method of rendering these combinations easy. And as they principally consist in the calculation, and proportion, of the different parts which we imagine constitute geometrical figures; this enquiry leads us immediately to arithmetic, or the science of numbers. This art consists in finding a short and facile method of expressing a single relation, resulting from the comparison of several others. The different ways of comparing these relations give us the different rules of arithmetic.

By attentively considering these rules, we cannot help observing certain principles, or general properties, of relations; and, by expressing these relations in a general manner, we discover different possible combinations. The results of these combinations, being reduced to one general form, are in effect no more than arithmetical calculations indicated and expressed in the most concise manner, consistent with their generality. The art or science of representing these relations is what we term algebra. And though, properly speaking, it is impossible to perform any calculation, but by numbers; nor measure any magnitude but by extension (for without space we could not exactly measure time) we arrive, by constantly generalising our ideas, at that principal branch of the mathematics, and all the natural sciences, called the science of magnitude in general; being the foundation of all the possible discoveries relating to quantity; that is, whatever is susceptible of being increased or diminished.

This science is the ultimate end possible to be attained by the contemplation of the properties of matter; it being impossible to go farther, without entirely quitting the material universe. But such is the progress of the mind in its enquiries, that after having generalised its perceptions, so as to be unable to analyse them farther, it returns back by the same steps, recomposes its perceptions anew, and gradually forms ideas of such beings as are the immediate and direct objects of our sensations. These being immediately relative to our wants, we are under an absolute necessity of studying them; mathematical abstractions greatly facilitate this study, and by this application only prove useful in life.

Having now, as it were, exhausted the properties of figured extension by our geometrical speculations, we again restore to it impenetrability; which constitutes physical body, and is the last sensible property we divested it of by our abstractions. This new consideration is attended with another, the action of bodies upon each other; for bodies only act by means of impenetrability; whence we derive the laws of equilibrium and motion; the object of mechanics. And hence we extend our enquiries to the motion of bodies, propelled even by unknown powers, or moving causes; provided the law, regulating these causes, is either known or supposed.

Returning thus to the corporeal world, we immediately perceive the use of geometry and mechanics, in deriving, from the properties of bodies, the most sublime and interesting truths; and from whence, nearly, all those sciences, termed physico-mathematical, are derived. At the head of these sciences we justly place astronomy; a study, next to that of ourselves, the most worthy of cultivation, on account of the magnificent scene it presents to our view. Joining observation with calculation, and illustrating the one by the other, astronomy determines, to a surprising degree of exactness, the distances and most complicated motions of the celestial bodies; and even assigns the forces themselves, by which these motions are either produced or altered. So that this science may be justly regarded as a sublime and certain application of geometry and mechanics united; and its progress as an incontestable monument of the advantageous efforts of human sagacity.

The use of mathematical knowledge is no less considerable in examining the terrestrial bodies that surround us. All the properties observable in these bodies have certain relations to one another, more or less sensible to us: The knowledge, or discovery, of these relations is almost the only object we can arrive at; and, consequently, the only one we should propose to ourselves. The knowledge of nature can never be obtained from vague and arbitrary hypotheses: it must be acquired by considering phænomena, comparing them together, and reducing, as much as possible, many of them to one single cause, which should be regarded as a principle. In fact, the more we diminish the number of principles in a science, the more we increase their extent; for, the object of a science being necessarily determined, the principles applied to that object become so much the more pregnant, in proportion as they are rendered fewer, or more general. This reduction, which facilitates the discovery of principles, constitutes genuine theory; and should not be mistaken for the spirit of building systems; which is often a very different thing.

But this reduction becomes more or less difficult, in proportion as the object considered proves more or less abstruse, or extensive; and, accordingly, we are more or less intitled to require it of those who apply themselves to the study of nature. The magnet, for example, is a subject that has been greatly laboured; and surprising discoveries are already made in it; as its properties of attracting iron, and communicating the same virtue thereto; its turning to the north, with a variation subject to rules, and affording as surprising a phænomenon, as a more exact direction; and, in fine, its dip to the horizon, in an angle greater or less, according to the part of the earth it is placed upon. These are particular properties, probably depending upon some one general principle, or cause, hitherto unknown. And it is surely an enquiry worthy of philosophers to reduce, if possible, all these properties to one, by shewing the principle that connects them. But this discovery, however serviceable it might be to natural philosophy, is, we fear, not easy to make. We may say the same of many other phænomena, whose connection, perhaps, belongs to the general system of the universe.

The only method to be followed in such labdrious, necessary, and useful researches, is, to collect as many facts as possible; dispose them in a natural order; and reduce them under a certain number of principal facts, of which the lesser should appear as so many consequences. If at any time we presume to rise higher, it should be with a circumspection becoming so feeble an understanding as ours.

Such is the plan to be followed in this vast part of physics, generally called experimental philosophy. It differs from the physico-mathematical sciences, in being, properly, no more than a rational collection of experiments and observations; whereas the physico-mathematical sciences, by applying calculation to experience, sometimes, even from a single observation, draw numerous consequences, approaching, with certainty, to geometrical truths. Thus from one experiment upon the reflection of light, the whole science of catoptrics, or doctrine of mirrours, was produced; and, from another on the refraction of light, the theory of the rainbow, the doctrine of colours, and all dioptrics. From observing the pressure of fluids, we derive the laws of their equipollency and motion. In fine, from the single experiment of the acceleration of falling bodies, was derived their falling on inclined planes, and the whole doctrine of pendulums.

It must however be acknowledged, that some mathematicians have misapplied algebra to physics. Instead of proper experiments to ground calculation upon, they sometimes use hypotheses, commodious for their purpose, though often different from what is actually found in nature. Algebraists have been fond of reducing all to calculation, not excepting the healing art itself. That complicated engine, the human body, has been treated by algebraical physicians, as a simple machine, easy to analyse. For our own parts, either more cautious or more kind, we look upon the greatest part of such calculations, and vague suppositions, as the sport of fancy, to which nature is not in the least obliged to submit; and conclude, that the only true method of philosophising consists either in the application of mathematical calculation to experiments; or in simple observation, conducted by proper methods, and sometimes assisted by conjectures for further enquiry; scrupulously avoiding all arbitrary hypotheses.

From what has been said, we may observe that there are two limits, within which all our certain knowledge of nature appears to be confined; the one is, what we at first laid down, the idea of ourselves; which leads us to that of an almighty being, and our principal duties. The other is, that part of mathematics, which has for its object the general properties of body; we mean, extent and magnitude. Between these two limits, is an immense interval, wherein the supreme intelligence seems willing to exercise human curiosity, by the numerous clouds interspersed, and certain tracts of light breaking out here and there, as if to allure us. The universe may be compared to books written with sublime obscurity; where the author, sometimes levelling himself to the capacity of his readers, seems to persuade them they nearly understand the whole. Happy for us, who enter this labyrinth, if we do not mistake the path; for, if we should, the light, designed to conduct, will mislead us farther.

As the small acquisition of certain knowledge we can boast of, is incapable of conducting us beyond the two limits above-mentioned, it is far from being sufficient to supply our numerous wants. The study of human nature, so necessary, and so much recommended by Socrates, is an impenetrable mystery to man, who has only reason to direct him. The greatest genius, reflecting upon this important subject, seldom rises higher than to know less than the rest of mankind. And the same may be said of our present and future existence; the essence of that being to whom we owe them both; and of the kind of worship he requires of us.

A revealed religion is therefore absolutely necessary, to instruct us in essential points, and serve as a supplement to natural knowledge, by teaching us things otherwise impossible to be discovered. Revelation however has confined itself to what is absolutely necessary for us to know; the rest remains, and, perhaps, for ever will remain, concealed. A few truths to believe, a few precepts to practise, make the substance of revealed religion; but, by means of the light it has communicated to the world, we are more confirmed in many interesting points, than any of the sects of mere philosophers.

With regard to the mathematical sciences, which constitute the second limit of our knowledge, their nature and number should not deceive us. It is principally to the simplicity of their object, that they are indebted for their certainty. And, as the objects of the several branches of these sciences are not equally simple, demonstration, which is founded on self-evident principles, does not equally belong to them all. Many of them are founded on principles merely physical; that is, on experiments, or simple hypotheses; and, consequently, have only experimental or hypothetical certainty. Properly speaking, only those branches which treat of magnitude, and the general properties of extension, as algebra, geometry, and mechanics, can be called demonstrative. The light, acquired by the mind from these sciences, has a certain kind of gradation; and their principles become clearer, in proportion as their object is considered in a more abstract and general manner. Geometry is more simple and abstract than mechanics; and algebra more simple and abstract than either. This is no paradox to those who have philosophically studied these sciences; the abstractest notions, which the generality look upon as most confused, commonly afford the clearest light: our ideas become obscure, in proportion to the number of sensible properties we examine in an object. Impenetrability, joined to the idea of extension, seems like adding one mystery to another; the nature of motion is an ænigma to philosophers; the metaphysical principle of the laws of percussion is as little known: in a word, the more we compare our idea of matter with its properties, the more that idea becomes obscure, and seems to elude the utmost efforts of human perspicacity.

From what has been said it evidently follows, that all the mathematical sciences are not equally capable of giving satisfaction to the mind: let us next examine without prejudice, how far these sciences may be reduced. At first view, they appear extremely numerous, or almost inexhaustible; but, when ranged in order, and brought into a philosophical list, their number falls greatly short of expectation. There are numerous mathematical truths, of which little use, or application, is made. This, indeed, is no argument against them, considered in themselves; but even most of the axioms which geometry plumes itself with, what are they but expressions of the same simple idea, under two different signs, or words? Do we derive any more real knowledge from saying that two and two make four, than we should from saying that two and two make two and two? The ideas of a whole and a part, greater and less, are they, properly speaking, any more than the same individual simple idea; as we cannot have the one without the other's presenting itself at the same time? Certain philosophers observe, that many errors are owing to the abuse of words; and perhaps axioms are also owing to this abuse. We do not however absolutely condemn their use, but only propose to observe its limitation; which consists in rendering simple ideas more familiar by habit, and fitter for the different purposes to which they may be applied. The same, with proper restrictions, may be said of mathematical theorems; for, when they are considered without prejudice, they may be reduced to a few primitive truths. If we examine a train of geometrical propositions, so deduced the one from the other, that every contiguous two are linked together; we shall find, that they are all no more than the first proposition successively disguised, in passing from one consequence to the next; the original proposition not being in the least multiplied by this concatenation, but only appearing under different forms: as if successively expressed in a language, gradually changing by time, and employing a different phraseology, according to the different stages it passes through; whilst each stage remains discoverable by comparing it with that immediately preceding, but not so well by comparing it with one more remote one; though all the stages depend upon each other, and design to convey the same ideas. We may therefore consider the concatenation of a series of geometrical truths, as so many different translations of the same proposition, and often of the same hypothesis. Such translations, indeed, are often of the greatest use, as they enable us to make different applications of the theorem they express: and these applications are more or less valuable, in proportion to their importance and extent. But as the real merit of such mathematical translation originally resides in the proposition translated, how greatly are we indebted to those inventors, who, discovered any one of these fundamental truths, the source, or original from whence numerous others flow, as they have, by that means truly enriched, and greatly enlarged, the Science of Geometry. The same may be observed also of those physical truths, and properties of bodies, which form a concatenation; for all these properties, well ranged together, afford us only one simple truth. If numerous others appear to us detached, or separate, so as to form different truths, this melancholy advantage arises from the weakness of human understanding; our abundance here flowing only from our indigence. Electrical bodies, for example, wherein so many extraordinary, and apparently independent properties have been discovered, are perhaps, in one sense, the bodies we least understand; though we may think we know them the best. The virtue they acquire, by friction, of attracting lighter bodies, and of producing violent commotions in animals, appear at present two different things; but, could we discover their primary cause, we should be convinced of their unity. The universe itself, were it possible for us to reduce it to a single point of view, would be no more than a single pregnant fact, or immense verity.

We have yet mentioned only those Sciences which owe their origin to our wants; but these are not the only sort we are obliged to cultivate: there are others relative to these, which men have therefore studied at the same time with them. Both kinds might, indeed, have been described together; but we thought it more proper, and, at the same time, more suitable to the philosophical method of this discourse, first to consider it

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without interruption, the general study men employ on bodies, and with which they originally commenced; though others were soon joined with it. These studies seem to have been pursued in the following order.

The advantages they found upon enlarging the sphere of their ideas, whether by the efforts of their own genius, or the assistance of others, must have pointed out to them the great utility of reducing the means of acquiring and communicating knowledge to an Art, which, being invented, was termed logic. It teaches us to range our ideas in the most natural order; to form them into a close concatenation, decompose such as comprehend too many simple ones, examine them on all sides, and, in fine, to communicate them to others in the most intelligible and perspicuous manner. In this consists the Science of reasoning, which may be justly called the key of knowledge, though it did not come first in order of discovery. The Art of reasoning is the free gift of nature to men of genius; and the books which treat of logic prove, in general, only of use to those who might reason well without their assistance.

The valuable Art of forming our ideas into a concatenation, and consequently of facilitating the transition from one to the other, furnishes us with a method of reducing nearly to an equality the abilities of every individual. For in fact, all our knowledge reduces itself primitively to sensations, which in all men are nearly the same; and the Art of combining and connecting our direct ideas is no more than arranging the same ideas in a series, more or less exact; whence they become more or less sensible to others. A man who readily combines his ideas, differs but little from another who combines them slowly; as he who judges of a picture at sight, differs but little from him who requires to be made successively sensible of all its parts: both, at the first glance, have the same sensations; but, as they do not sink so deep in the second, there is a necessity for him to dwell longer upon each, to render them strong and distinct. By this means, the reflex ideas of the former become as easy to the latter as the direct ones. And, perhaps, it would be difficult to find an Art or Science, that, by means of a well-adapted logic, may not be taught to persons of slow understanding; because there are few Arts, or Sciences, whose precepts, or rules, may not be reduced to simple notions, and disposed in so connected an order, that the chain need never be broken. But, in proportion as the mind is more or less slow in its operations, this connected order will become more or less necessary; and the advantage of a great genius is that of having less occasion for it, or rather of being able to form it in a rapid and almost imperceptible manner.

The Science of communicating our ideas is not confined to the method of arranging them in a proper order; it also teaches how to express each idea in the most exact and perspicuous manner, and consequently to perfect and ascertain the signs destined to convey them: this also the human species have, by degrees, endeavoured to perform. Those languages which had their origin at the same time with society, were, doubtless, at first only a confused collection of signs; and, consequently, natural bodies, as being objects of our senses, were first represented by names. And, as languages, at their first origin, were adapted only to the most pressing occasions, they were certainly very imperfect, confined, and subject to very few certain principles: and, therefore, the Arts and Sciences, of absolute necessity, might have made a great progress, before men attempted to form any rules for style or diction. The difficulty and imperfection attending the communication of ideas, during this want of rules, and scarcity of words, must have obliged every man to improve his knowledge, by his own resolute labour, without greatly depending on others for assistance. Too facile a communication of knowledge may doubtless sometimes benumb the faculties of the mind, or prevent the exertion of its force.

But, as a facile method of exchanging ideas by mutual commerce was attended by incontestable advantages, it is no wonder men should endeavour to render this exchange still more easy. In order to this, they began to reduce signs to words, which are marks or symbols, always ready at hand. The order of the generation of words, therefore, followed the order of the operations of the mind: after individuals, sensible qualities came next to be named, which, without having any existence of their own, except in individuals, belong in common to a great number; and hence, by degrees, men came to use certain abstract terms; some serving to connect ideas together, others to denote the general properties of bodies, and others to express mere mental notions. All these abstract terms, which children are so long in learning, doubtless required much time to discover. But, at length, the use of words being reduced to rule, grammar was formed; which we may consider as a branch of logic. Grammar, assisted by a subtle and refined metaphysics, determines the shades or degrees of our ideas; teaches us to distinguish these shades by different marks; affords rules for the more commodious use of such marks; and, by means of philosophical sagacity, in tracing the origin of things, often discovers the reasons of that apparently odd choice, which prefers one sign to another, and leaves as little as possible to that national caprice, called custom.

Men, at the same time that they communicate their ideas, endeavour also to communicate their passions. This is performed by means of eloquence. This speaks to the sentiments of the heart, as logic and grammar speak to the understanding, and can silence reason itself; and, perhaps, the great effects, which a single orator sometimes produces upon a whole people, are the most glaring instance of the superiority of one man over another. And here it is very surprising, that men should ever have thought of supplying the want of this prodigious talent by rules; can genius be reduced to precept? He who first pretended that orators were owing to Art, was either no orator himself, or very ungrateful to nature, which alone has the power of making an orator. There are but two books to be studied by orators; men are the first, and the greatest masters of the Art the second.

We are not contented to live with our cotemporaries alone. The mind of man, drawn by curiosity and self-love, eagerly endeavours to embrace, at once, the past, the present, and the future times. We desire to live both with our successors and predecessors. Hence the origin and intention of history, which unites us with past ages, by representing their vices, virtues, knowledge, and errors; and transmitting our own to posterity. It is by history we learn to esteem men only for their good actions, and not for the seducing pomp that surrounds them. Sovereigns, who are often unhappily excluded from truth on all sides, may here previously pass sentence upon themselves: for history is a tremendous, uncorrupt tribunal, which judges their resembling predecessors just as it will do them.

Chronology and geography are two appendages, or supporters of history: the one fixing the inhabitants of the earth, in point of time; and the other assigning their place upon our globe: they both derive great advantages from the history of the earth and the heavens; that is, from historical facts and celestial observations; and may therefore, in the language of the poets, be stiled, the daughters of astronomy and history.

One principal advantage resulting from the study of empires, and their revolutions, is to examine how mankind, separated, as it were, into numerous large families, formed different societies; how these societies gave birth to different kinds of government; and how each people endeavoured to distinguish themselves from the rest, both by laws, and particular signs, as the means of more easily communicating their thoughts: whence arose that great diversity of languages and laws, which, to our misfortune, is become a principal object of study. Hence, also, we see the origin of civil policy, as a particular and superior kind of morality; it being often difficult, without straining, to accommodate the principles of common moral duty to civil policy, which, entering into the principal motives of government, aims at discovering what may tend to preserve, weaken, or destroy a state. This study is perhaps the most difficult of any; for it requires not only a deep knowledge of mankind, in general, and of the people to be governed, in particular; but alſo a great compaſs, and variety of abilities: eſpecially if the politician would remember that the law of nature, being prior to all particular conventions, is the firſt law of the people; and that his being a ſtateſman does not exclude his being a man.

Theſe are the principal branches of that portion of human knowledge, which conſiſts either in the ideas we receive directly by the ſenſes, or in the combination or compariſon thereof: which combination is, in general, called philoſophy. Theſe branches ſubdivide themſelves into ſuch a prodigious number of others, that the enumeration of them rather belongs to the work itſelf than the preface.

We began with conſidering the firſt operation of reflection, which conſiſts in collecting and uniting our direct notions, and have mentioned the different Sciences reſulting from thence. The notions, formed by the combination of our primitive ideas, are not however the only ſort of which the mind is capable. There is another kind of reflex knowledge, which we ſhall now conſider. It conſiſts in the ideas we form to ourſelves, by imagining and comparing things, as they reſemble the objects of our direct ideas. This is what we term the imitation of nature, ſo well known, and ſo much recommended, by the ancients. As the direct ideas which ſtrike us with the moſt vigour are thoſe we remember beſt; ſo we the more earneſtly endeavour to reproduce them in ourſelves, by an imitation of their objects. Agreeable objects indeed ſtrike us ſtronger when real, than when barely repreſented; but this defect is, in ſome manner, ſupplied by the pleaſure we receive from their imitation. On the other hand, thoſe real objects which excite melancholy or diſtreſsful ſentiments, their imitation becomes more agreeable than the objects themſelves, by placing us at ſuch a juſt diſtance, that we receive the pleaſure of the emotion, without the diſorder. And in this imitation of all kinds of objects, capable of raiſing lively or agreeable ſentiments in us, conſiſts, in general, the imitation of beautiful nature; upon which ſo many authors have wrote, without being preciſe: perhaps becauſe it requires exquiſite ſentiments to determine what beautiful nature is; or becauſe the limits that diſtinguiſh what is arbitrary from what is juſt, are not hitherto properly aſcertained; and therefore leave ſome liberty to opinion.

At the head of the Arts of imitation painting and ſculpture are placed, as being thoſe wherein imitation comes neareſt to the objects they repreſent, and ſpeaking the moſt directly to the ſenſes. To theſe we may add that Art, which owes its origin to neceſſity, and its perfection to luxury; we mean architecture, as having riſen by degrees from cottages to palaces; and being, to a philoſophical eye, no more than an embelliſhed diſguiſe of one of our greateſt wants. The imitation of beautiful nature is here leſs ſtriking, and more confined, than in painting or ſculpture; which indifferently and with reſtriction expreſs all the parts of beautiful nature, by repreſenting her as ſhe is, either uniform, or with variety: whereas architecture is conſtrained, in diſpoſing and uniting the different materials it employs, to imitate that ſymmetry, which nature obſerving, more or leſs viſibly, in the ſtructure of each individual, produces ſo fine a contraſt with the beautiful variety of the whole.

Poetry, which occupies the next place to painting and ſculpture, employs, in its imitations, words ſo diſpoſed as to make agreeable harmony to the ear; but ſpeaks rather to the imagination than to the ſenſes; and thus preſents, after a ſtrong and lively manner, all the objects in the univerſe; and appears rather to create than paint, by the glow, motion, and life it gives to each.

The laſt among the Arts of imitation is muſic, which at once ſpeaks both to the imagination and the ſenſes. It is not becauſe its reſemblance is leſs perfect than theirs, with regard to the objects it would repreſent, that it is the laſt in the ſeries, but becauſe it has been confined to fewer images. Nor ſhould this perhaps be attributed ſo much to its nature, as to the want of invention and contrivance in moſt of its profeſſors.

And here we conclude our enumeration of the principal branches of human knowledge. If we conſider them all together, and ſearch for the general views that ſerve to diſtinguiſh them, we ſhall find, that ſome of theſe branches are entirely practical, and have the execution of ſome deſign for their end: that others are merely ſpeculative, or confine themſelves to the examination of their object, or the bare contemplation of its properties; and that a third ſort, from the ſpeculation of its ſubject, derives a practical uſe in theory and practice that principally diſtinguiſh Sciences from Arts; and accordingly one or other of theſe terms is applied to moſt branches of knowledge; but it muſt be confeſſed, that our ideas are, in this caſe, not hitherto ſufficiently preciſe. We are often at a loſs in naming ſuch branches of knowledge where ſpeculation is joined with practice; and it is frequently diſputed in the ſchools, whether logic be an Art or a Science: the queſtion might eaſily be ſolved, by ſaying it is both the one and the other. If words could be brought to a clear and preciſe ſignification, much time would be ſaved, and many diſputes avoided.

The term Art may, in general, be given to any branch of knowledge, capable of being reduced to determinate invariable rules, independent of caprice or opinion; and, in this ſenſe, ſeveral Sciences, conſidered in their practical uſe, may be termed Arts. There are rules for the operations of the mind, and others for thoſe of the body, the operations whereof, being confined to external ſubjects, require no more than the aſſiſtance of the hand to perform them. Hence proceeds the diſtinction between the liberal and mechanic Arts, and the preference given to the former, though very unjuſtly, in many reſpects. The mechanic Arts, depending upon manual operation, and confined to a certain beaten track, are aſſigned over to thoſe perſons whom prejudice has placed in an inferior claſs. Indigence, rather than taſte and genius, compelling them to this occupation, became, in time, a cauſe of contempt: ſo detrimental is it to thoſe it attends: whilſt the free operations of the mind were left to others, who thought themſelves greater favourites of nature. But the advantage of the liberal over the mechanic Arts, from employing the operations of the mind, and from the difficulty of excelling therein, is ſufficiently compenſated by the greater utility generally reſulting from the latter. This very utility reduces them to mere mechanical operations, in order to facilitate their practice among a greater number of men. Thus ſociety may have a juſt regard for its enlightening geniuſes, without debaſing the hands that ſerve it. The diſcovery of the mariner's compaſs is not leſs ſerviceable to mankind, than an explanation of the properties of the needle would be to philoſophy. In fine, if we divide the ſeveral branches of knowledge according to the grounds of diſtinction above-mentioned, how many of thoſe, termed Sciences, will be reduced to mechanic Arts? And what is the difference between a head furniſhed with a chaos of uſeleſs unconnected facts, and the inſtinct of an artiſan, diſplayed in mechanical execution?

The contempt thrown upon mechanic Arts has alſo, in ſome degree, been extended to their inventors. The names of theſe benefactors to mankind are rarely heard of; whilſt the great deſtroyers of our ſpecies, called conquerors, are univerſally known. Yet we find, among artiſans, many extraordinary proofs of ſagacity, genius, aſſiduity, and invention. Moſt Arts, indeed, are diſcovered by degrees; and ages have been employed in bringing ſome of them to perfection. And may not the ſame be ſaid of the Sciences? How many diſcoveries, which have immortaliſed their authors, were begun and continued by the labour of preceding ages, and ſome of them brought ſo near perfection, that little more than a ſingle addition was requiſite? Should not the inventors of the ſpring, the chain, and repeating parts of a watch, be equally eſteemed with thoſe who have ſucceſſively ſtudied to perfect algebra? But, though the gradual improvement of Arts ſhould be granted as a ſufficient reaſon for not ranking theſe artiſts in the claſs of inventors, yet there are certain machines ſo complicated, and all their parts ſo much depending upon one another, that it is difficult to conceive they ſhould have been invented by different perſons; and ſhould not ſuch extraordinary inventors, inſtead of having their names buried in oblivion, obtain a place among the few diſcoverers who ſtrike out new paths of Science?

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Among the liberal Arts reduced to principles, those that make the imitation of nature their end, are called fine Arts, or Arts of elegance, and have principally agreeableness for their object. But this is not the only particular that distinguishes them from the more necessary, or more useful liberal Arts, as grammar, logic, and morality. The latter have their fixed and determinate rules, capable of being transmitted from one man to another: whereas the practice of the Arts of elegance principally consists in invention, and derives its laws from genius. The rules laid down, with respect to these Arts, properly regard their mechanical part; and therefore, like telescopes, assist only those who have eyes.

From what has been said it follows, that the different ways, in which our mind operates upon objects, and the different uses it derives from thence, are the first means of distinguishing, in general, our different kinds of knowledge from each other; and that the whole of it relates to our wants, either of necessity, convenience, amusement, real use, or caprice. The more remote our wants are, or the more difficult to supply; the more slow is the progress of our knowledge. What improvement would the Art of physic have made, to the discredit of the speculative Sciences, were it founded on as certain principles as those of geometry? There are also other characters or differences, besides those we have enumerated, taken from the manner wherein our knowledge affects us, or the different judgments we form of our ideas. These judgments are denoted by the words evidence, demonstration, probability, sentiment, and taste.

Evidence belongs properly to those ideas, between which the mind immediately perceives a connection; and demonstration to those where the connection does not appear, without the assistance of intermediate ideas; or when the propositions are not found to have an identical agreement with the same self-evident principle, but by means of a chain of reasoning; and hence a proposition may appear different to different persons, according to the nature of their minds; for it may be self-evident to the one, and only demonstrative to the other. But, taking the term in a different sense, we might say that the former is the result of the mere operations of the mind, employed in metaphysical and mathematical speculations; and that the latter regards physical objects, our knowledge whereof flows from the constant and invariable relation of our senses. Probability principally relates to historical facts, and, in general, to all events, whether past, present, or future, which we usually ascribe to accident, for want of knowing the causes from whence they flow. But, though the history of present and past transactions rests solely upon testimony, yet it often produces as strong a persuasion in us as axioms. Sentiment is of two kinds; the one relates to moral truths, and is called conscience; which is a consequence of the law of nature, and of the ideas we have of good and evil; whence it might be called the evidence of the heart: for, though it differs greatly from the evidence of the understanding, which regards speculative truths, yet it equally affects us. The other kind of sentiment is restrained to the imitation of beautiful nature, and what is called the beauties of expression. This catches, with transport, all sublime and striking beauties; discovers, with elegance, such as lie concealed; and rejects all false appearances and pretensions. It often condemns at once, without assigning the motives; which, to render intelligible to others, would require much time to explain. To this kind of sentiment we owe what is called taste and genius; which only differ, as genius is creative, and taste judicial sentiment.

After this enumeration of the different parts of our knowledge, and the characters by which they are distinguished, it remains that we form them into a kind of genealogical tree, or systematical table of human knowledge, which may represent them all at one view, so as to shew their origin, relation, and mutual connection. The use of such a contrivance is evident; but the execution is attended with difficulties. The philosophical history of the origin of our ideas, given above, will, indeed, help us herein; though it would be absurd and impracticable severely to follow the series of that history, in forming our plan. A general system of Arts and Sciences is a kind of labyrinth, which the mind enters, without well knowing which path to take. Pressed by its own wants, and those of the body, to which it is united, it fixes on the first objects that present themselves; proceeds as far as it can in understanding them; but soon meets with difficulties to stop its progress; and, either in hope or despair of conquering them, strikes into a new track; returns afterwards by the way it went; but no sooner surmounts the first difficulties, than it is opposed by others; and, passing rapidly from one object to another, makes upon each a series of different attempts, which the very generation of its ideas necessarily interrupts. This disorder, however philosophical in the mind, is sufficient to disfigure, or even annihilate entirely any systematical plan of the Arts and Sciences.

Besides, we have already shewn, in that part of the preceding discourse relating to logic, the greatest part of those Sciences which include the principles of others, and therefore ought to have the first place in the philosophical order, must not have the same in the genealogical order of our ideas, because they were not first invented. The truth is, the primitive study of the human species must have been that of individuals; the particular obvious properties of these were first examined, and then, by the abstraction of the mind, their general properties; which formed metaphysics and geometry. Primitive signs were long in use, before mankind so far improved the method of using them, as to form it into a Science. A long series of operations on the objects of their ideas was necessary, before men could form, by reflection, rules for such operations.

In fine, the system of human knowledge is composed of different branches, many of which unite in one point. And as it is impossible, by beginning from the same point, to trace all the different branches; the choice of every man must be determined by the natural turn of his own mind: and, consequently, very few can pursue numerous branches to any advantage. Many, at first, applied themselves, in concert, to the study of nature, in order to supply their most pressing wants; but those parts of knowledge, not absolutely necessary, were divided, and each individual pursuing that which best suited his own genius, a number of them were almost equally improved at once. But, though several of the sciences were thus cultivated at the same time together, yet, in giving the historical order of the progress of the mind, they must necessarily be considered as successive.

It is not the same, with regard to the systematical order of our knowledge. This consists in contracting the whole of it into the smallest space possible, and placing the reader on an eminence above this vast labyrinth, so that he may at once take a view of all the principal arts and sciences; discover, by a single glance, the objects of each, and the operations to be performed upon these objects; distinguish the general branches of human knowledge, the points which separate or unite them, and, at the same time, perceive the secret paths that join them. Such a system would resemble a map of the world, on which the principal countries, their situation, and mutual relation, together with the direct roads that lead from one to the other, are delineated: though these roads are frequently interrupted, and so obstructed, that none but the respective inhabitants, or experienced travellers, can know them: nor is it possible for them to be delineated, except on the particular maps of each country. The different articles of our Dictionary and Supplement make such particular maps; and the philosophical tree, or systematical view annexed to this discourse, forms the general map of the world.

But as, in general maps of the globe, objects are placed nearer or more remote, and appear differently, according to the point wherein the eye is supposed to be placed; so the form of our philosophical tree will vary, according to the point from which we view the universe of literature. We may therefore consider the different systems of human knowledge, as general maps of different projections: and each system may have some advantage peculiar to itself over the rest. It is natural to think that every man would willingly place in the center of the whole his own favourite science; as the first men, being persuaded that the universe was made for them, placed this earthly globe in the center of it. And many of these pretensions, impartially considered in a philosophical light, might be justified by solid reasons.

Among all the various kinds of systematical plans of knowledge, that should doubtless be preferred, which takes in the most connections and relations between the sciences. But who can flatter themselves with having been fortunate enough to find it? Nature, as we have already observed, and which we cannot repeat too often, is wholly composed of individuals; which are the primitive objects of our sensations, and direct perceptions. We truly remark, in these individuals, certain common properties, by means whereof we compare them; and certain dissimilar properties, by which we distinguish them; and, by assigning abstract names to these properties, we are enabled to distribute objects under different classes. But as an object, which, on account of some properties, should be ranged in one class, has others which equally intitle it to another; it follows that all general divisions must needs be arbitrary. The most natural arrangement would be to make things succeed each other in gradual shades, or scarce discernible transitions; which at once might serve to separate and unite them: but the scanty number of the things we know, will not permit us to discern these shades. The universe resembles an immense ocean, where we see islands of different sizes above the surface, but cannot discern their connection with the continent.

A systematical plan of human science might be formed, by dividing it either into natural and revealed, or into useful and agreeable, or into speculative and practical, or into evident, certain, probable, and sensible; or into the knowledge of things, and the knowledge of signs; and so in infinitum: but we have chosen such a division as appeared, at the same time, most suitable both to the systematical and genealogical order of human knowledge. We principally owe this division to the immortal Sir Francis Bacon. But we are too sensible how arbitrary all divisions of the arts and sciences must ever be, to imagine ours the best or only system.

The objects which employ our minds, are either spiritual or material; and we are employed about them, either by direct or reflex ideas. Our stock of direct knowledge consists of a merely passive or mechanical collection of things treasured up in the memory. We have already observed that reflection is of two kinds, and either reasons upon the objects of our direct ideas or imitates them. Hence, there are three different methods, whereby the mind operates on the subject of its thoughts; which are memory, reason, properly so called, and imagination. We do not mean by imagination the mere faculty of recollecting sensible objects; this is no more than memory, which, were it not for the use of signs, must be in continual exercise; but we use the word in a higher and more explicit sense, to signify that faculty of the human mind which creates objects by imitation.

These three faculties form the three general divisions of our system, and the three general objects of human knowledge, viz. history, which relates to memory; philosophy, which is the product of reason; and the polite arts, which owe their origin to imagination. We place reason before imagination, because that order is more conformable to the natural progress of the operations of the mind; imitation is a creative faculty, but the mind, before it attempts creating, reasons upon what it sees and knows. Another motive for placing reason before imagination is, that reason and memory unite, to a certain degree, in forming the imagination. The mind creates, or imagines objects, only resembling those it already knows by direct ideas and sensations: The more it departs from these objects, the more strange and disagreeable objects it forms. Hence, in the imitation of nature, even invention is subject to certain laws; and these laws chiefly constitute the philosophical part of the polite arts; though, at present, it is but little known, as being only the work of genius, which rather delights in creating than discerning.

In short, if we examine the progress of our rational faculty, in its successive operations, we shall find it plainly precedes imagination; because the ultimate operations which reasoning performs upon objects, lead, in some sort, to imagination. For these ultimate operations consist in the formation of general notions, which, separated from their subject by abstraction, are no longer the immediate objects of our senses. And hence metaphysics and geometry, of all the sciences that derive their origin from reason, are those where imagination has the greatest share. The imagination of a geometrician who discovers, is as active as that of a poet who invents; though they operate differently on their respective objects. The former simplifies and analyses, whilst, the latter composes and adorns. These different operations also belong to different kinds of geniuses; whence, possibly, the talents of a great geometrician, and of a great poet, are impossible to be united. But, whether the one excludes the other, or not, they have doubtless no right to despise each other, as is too often the consequence. And, perhaps, among all the great geniuses of antiquity, Archimedes best deserves to be ranked with Homer.

The general distribution of subjects, into spiritual and material, forms the subdivision of the three general branches of our knowledge. History and philosophy equally regard both, whilst imagination wholly operates upon the plan of material objects: whence we have another reason for placing it last in the order of our faculties. At the head of spiritual beings is God; who holds the first place by his nature, and the necessity we have of knowing him. Next to this supreme being, come created spirits; the knowledge of whose existence we derive from revelation. In the next place comes man, composed of two principles, a soul, which is spiritual, and a body, which is material; and, lastly, comes this immense universe, which we call the corporeal world or nature.

History, as it relates to the supreme being, includes revelation and tradition; and is therefore divided into two parts, sacred and ecclesiastical. The history of man hath human actions and human knowledge for its object; and therefore is either civil or literary; treating of powerful nations and great geniuses; potentates and men of letters; conquerors and philosophers. Lastly, the history of nature is the history of the numerous productions we behold; and forms almost as many branches as there are different productions in nature; but among the rest is justly placed, with distinction, a history of arts; which is no other than a detail of the different purposes to which men have applied the productions of nature, either to satisfy their wants, or their curiosity.

Having considered the principal object of memory, we shall next proceed to that faculty of man which reflects and reasons.

Both spiritual and material beings, which are the objects of this faculty, having certain general properties, such as existence, possibility, and duration; the examination of these properties immediately forms that branch of philosophy, from which all the rest borrow some part of their principles; and is called ontology, the science of being, or general metaphysics. From ontology, in general, we descend to all the different particular beings; and the divisions, afforded by this science, of particular beings, form themselves on the same plan with the divisions of history.

Our knowledge of God, known by the name of theology, divides itself into two branches, natural and revealed. Natural theology, or the knowledge we have of God, by reason alone, is very confined; but revealed theology derives a more perfect knowledge of him from scripture. Man also owes his knowledge of created spirits to revelation.

The first part of the science of man, is that of the soul; consisting in the speculative knowledge of the soul itself, and of its operations. The speculative knowledge of the soul participates both of natural and revealed theology; and is a branch of metaphysics, called pneumatology. The speculative knowledge of the soul's operations is subdivided into two branches, as its object is either the discovery of truth, or the practice of virtue. The discovery of truth, which is the end of logic, constitutes the art of conveying truth to others: and hence the use we make of logic is partly for our own sakes, and partly for the sake of others. The rules of morality do not chiefly regard man in a solitary state, but suppose him necessarily linked with others in society.

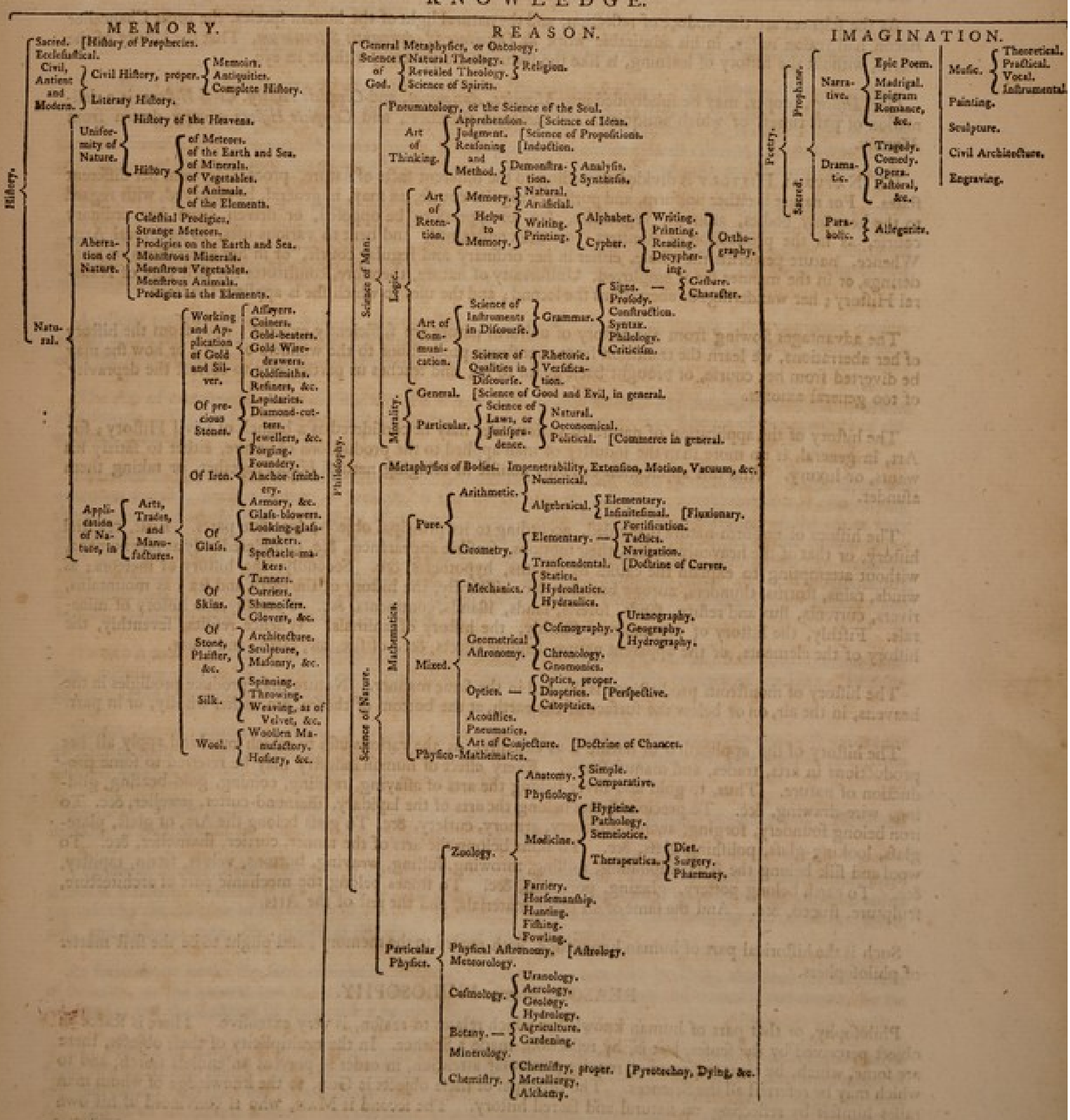
The science of nature is the knowledge of bodies, and their general properties; such as impenetrability, mobility, and extension, which are the first to be studied in natural philosophy. These general properties, being considered abstractedly, open an immense field for speculation; and, when considered materially, they become the objects of mensuration. Pure speculation belongs to general physics, or the metaphysics of body; and mensuration is the object of mathematics, the divisions and applications of which are almost infinite.

These two Sciences lead to particular physics, or natural philosophy, which considers bodies as they are in themselves, and has individuals for its object. Among these the human body is that whose properties we are principally concerned to know; and next after this come such as are necessary to our preservation: whence proceed anatomy, agriculture, medicine, and their different branches. In short, all the natural bodies, subject to our examination, furnish the other numerous branches of natural philosophy.

Painting, sculpture, architecture, poetry, and music, with their several branches, form the third general division, which refers to the imagination, and are all comprehended under the title of polite Arts. They might also be included under the general name of painting; because all the polite Arts are reducible to painting, and differ only in regard to the means they employ. Or, indeed, they might all be referred to poetry, taken, in its natural signification, for invention or creation.

In order farther to elucidate this systematical plan of the Arts and Sciences, we have added the following general view of the several branches of human knowledge.

A SYSTEMATICAL VIEW *of* HUMAN KNOWLEDGE.



Explanation of the preceding Syſtematical View of Human Knowledge.

Phyſical objects act upon the ſenſes; and their impreſſions excite perceptions in the mind. O theſe perceptions the mind employs itſelf three different ways, according to its three principal faculties, memory, reaſon, and imagination. The mind either takes a pure and ſimple review of its perceptions by memory; or it examines, compares, and digeſts them by reaſon; or elſe attempts to imitate or counterfeit them by imagination. And hence ariſes a proper general diſtribution of human knowledge into *Hiſtory*, which relates to memory; *Philoſophy*, which is produced from reaſon; and *Poetry*, which flows from the imagination.

MEMORY, whence proceeds HISTORY.

HISTORY relates facts; and theſe facts either regard God, man, or nature. The facts regarding God belong to ſacred Hiſtory: the facts regarding man belong to civil Hiſtory; and the facts regarding nature belong to natural Hiſtory.

HISTORY. I. SACRED. II. CIVIL. III. NATURAL.

I. SACRED HISTORY is divided into religious, or eccleſiaſtical, and the Hiſtory of prophecies, where the recital precedes the event.

II. CIVIL HISTORY is a branch of univerſal Hiſtory, to whoſe truſt are committed the examples of antiquity, the revolutions of things, the foundations of civil prudence, and the names and reputations of men. This is divided, according to its objects, into what is properly called *Civil Hiſtory*, and *Literary Hiſtory*.

As the ſciences are the produce of reflection, and the natural light of the human ſpecies, the great Chancellor Bacon had reaſon to ſay, in his admirable work *de Dignitate & Augmentis Scientiarum*, That the hiſtory of the world, without the hiſtory of learning, is like the ſtatue of Polypheme, without its eye.

Civil Hiſtory, proper, may be ſubdivided into *Memoirs*, *Antiquities*, and *Complete Hiſtory*. *Civil Hiſtory*, is a deliniation of paſt times, of which antiquities are damaged ſketches; and *Complete Hiſtory* a copy drawn from *Memoirs*.

III. NATURAL HISTORY is divided according to the different facts of nature, proceeding from her different ſtates. For nature is either uniform, and purſues a regular courſe, as may, in general, be obſerved, with regard to the heavenly bodies, animals, vegetables, &c. or appears to be oppoſed, or driven from her ordinary courſe, as in the production of monſters; or elſe conſtrained, and bent to various uſes, as in ſeveral Arts. Whence, nature performs the whole, either in her ordinary and regular courſe, or in her aberrations or wanderings, or in the manner ſhe is employed. Uniformity of nature, therefore, conſtitutes the firſt part of Natural Hiſtory; her wanderings or aberrations the ſecond; and the uſes to which ſhe is applied, the third.

The advantages flowing from the hiſtory of uniform nature are ſufficiently evident; and, from the hiſtory of her aberrations, we learn the tranſition from monſtrous productions to the wonders of Art; or how ſhe may be diverted from her courſe, or brought back again to it; and teaches us particularly to correct the depravity of too general axioms.

The hiſtory of the application of nature to various uſes may be conſidered as a branch of Civil Hiſtory; for Art, in general, is no more than the induſtry of man applied to the productions of nature, either to ſatisfy his wants, or luxury. And this application can only conſiſt in bringing natural bodies together, or taking them aſunder.

The hiſtory of uniform nature is divided, according to its principal objects, into five parts. Firſt, celeſtial hiſtory, or that of the heavenly bodies, their motions, ſenſible appearances, &c. conſidered only as phænomena, without attempting to explain the cauſes by ſyſtems, hypotheſes, &c. Secondly, the hiſtory of meteors; as winds, rains, ſtorms, thunders, auroræ boreales, &c. Thirdly, the hiſtory of the earth and ſea; as mountains, rivers, currents, flux and reflux, ſands, foreſts, lands, iſlands, continents, &c. Fourthly, the hiſtory of minerals. Fifthly, the hiſtory of vegetables. Sixthly, the hiſtory of animals. Whence reſults, ſeventhly, the hiſtory of the elements, or the apparent nature, ſenſible effects, &c. of fire, air, earth, and water.

The hiſtory of monſtrous productions is divided in the ſame manner. Nature may produce prodigies in the heavens, in the air, on or below the ſurface of the earth, at the bottom of the ſea, &c. either wholly, or in part.

The hiſtory of the application of nature is as extenſive as the various uſes to which mankind apply all her productions in arts, trades, and manufactures. Every effect of human induſtry may be referred to ſome production of nature. Thus, to gold and ſilver belong the arts of aſſaying, refining, coining, gold-beating, gilding, wire-drawing, &c. To precious ſtones belong the arts of the lapidary, diamond-cutter, jeweller, &c. To iron belong foundery, forging, anchor-ſmithery, armory, cutlery, &c. To glaſs belong the Art, of glaſs, plate-glaſs, looking-glaſs, poliſhing-glaſs, &c. To ſkins belong the arts of the tanner, currier, ſhamoiſer, &c. To wool and ſilk belong the Arts of ſpinning, milling, throwing, fulling, weaving, buttons, velvet, ſattin, tapiſtry, &c. To earth belong pottery, glazing, porcelain, &c. To ſtones belong the mechanic part of architecture, ſculpture, ſtucco, &c. And the ſame of all other materials, and the reſt of the Arts.

Such is the hiſtorical part of human knowledge, with regard to the memory; and ought to be the firſt matter of philoſophers.

REASON, whence PHILOSOPHY.

Philoſophy, or that part of human knowledge which relates to reaſon, is very extenſive. There is ſcarce an object perceived by the ſenſes, but is, by reflection, made a Science. In the multiplicity of theſe objects, there are ſome, which, by their importance, require particular attention, in order to prevent an endleſs ſearch, and to which may be referred all the Sciences. The principal of theſe objects is GOD, to the knowledge of whom man raiſes himſelf by reflecting on natural and ſacred hiſtory. The ſecond is MAN, who is convinced of his own exiſtence

existence by his conscience, or internal perception. And the third is NATURE, the history whereof we are taught by our external senses. GOD, MAN, and NATURE, will therefore furnish us with a general distribution of *Philosophy*, or *Science* (which are synonymous terms) into *the Science of God*, *the Science of Man*, and *the Science of Nature*.

PHILOSOPHY, or SCIENCE. } I. SCIENCE of GOD. II. SCIENCE of MAN. III. SCIENCE of NATURE.

I. The natural progress of the mind is to rise from individuals to species, from species to genera, from lower genera to higher, and at every step to form a Science; or, at least, to add a new branch to a Science already formed. Thus, our idea of an infinite, uncreated intelligence, recounted in nature, and revealed in sacred history; and that of a created, finite intelligence, as we find in man, lead us to the idea of a finite, created intelligence without body, whence we derive our general notion of spirit. And as the general properties of both spiritual and corporeal things are existence, possibility, duration, substance, attribute, &c. the examination of these properties produces ontology, or the Science of beings in general. And, by inverting the order, we have first the Science of ontology, and next the Science of spirit, or pneumatology, commonly called particular metaphysics; which Science is divided into the Science of God, or natural theology, which he has been pleased to rectify and sanctify by revelation; whence proceeds religion, or theology proper. Hence flows the doctrine of good and evil spirits, or angels and dæmons; whence divination, and that chimerical Art, called necromancy. Hence also proceeds the Science of the soul; which is divided into the Science of the rational soul, which thinks; and the Science of the sensitive soul, which is confined to sensations.

II. *The* SCIENCE *of Man.* The distribution of the Science of man is derived from his faculties, which are the understanding and the will; the former should be directed to truth, and the latter to virtue. The one is the end of logic, and the other that of morality.

Logic may be divided into the Art of thinking, the Art of retention, and the Art of communication.

The Art of thinking has as many parts as the mind has principal operations. We distinguish four principal operations in the mind, viz. apprehension, judgment, reasoning, and method. To apprehension belongs the doctrine of ideas, or perceptions: to judgment, the doctrine of propositions: to reasoning and method, the doctrine of induction and demonstration. But demonstration either ascends from the proposition to first principles; or descends from first principles to the proposition in proof; whence arise analysis and synthesis.

The Art of retention has two branches; the Science of the memory itself, and the Science of the helps to memory. The memory, before considered as a faculty purely passive, is now considered as an active power, improved by reason; and is either natural or artificial. Natural memory depends upon the organs. Artificial memory consists in prænotion and emblem. Without prænotion no particular object can be present to the mind; and emblem employs the imagination to assist the memory.

Artificial representations, as writing, &c. are helps to memory. In writing we use either common, or particular characters: of the first sort are the letters of the alphabet, and of the second are cyphers; whence proceed the Arts of reading, writing, decyphering, and the Science of orthography.

The Art of communication is divided into the Science of the instrument, and the Science of the qualities of discourse. The Science of the instrument of discourse is called grammar; the Science of the qualities of discourse is rhetoric.

Grammar is divided into the Science of signs, pronunciation, syntax, and construction. These signs are articulate sounds; pronunciation, or prosody, is the Art of articulating them: syntax is the Art of applying them, according to the different designs of the mind; and construction is the knowledge of the order they should have in discourse, founded upon custom and reflection. But there are other signs of our thoughts besides articulate sounds, viz. characters and gestures. Characters are either ideal, hieroglypic, or heraldic. Ideal characters are like those of the Indians, each of which denotes a particular idea; and must consequently be as numerous as the real beings they denote. Hieroglyphics were the writing of the world in its infancy: and heraldic characters from the Science of blazoning.

To this Art of communication belong criticism, pædagogy, and philology. Criticism restores corrupt readings, publishes authors, &c. Pædagogy treats of the choice of studies and the manner of teaching. Philology regards the knowledge of universal literature.

To the Art of embellishing discourse belongs versification, or the mechanical part of poetry. We omit the division of rhetoric, because no Art or Science is derived from it, except perhaps the pantomimic Art, from gesture, and declamation from the voice and gesture together.

Morality, which makes the second part of the Science of man, is either general or particular. Particular morality is divided into the law of nature, œconomics, and politics.

The law of nature is the Science of the duties of man, out of society. Œconomics is the Science of man's duties in a family. Politics is the Science of man's duties in society. But morality would be incomplete, unless preceded by the doctrine of the reality of moral good and evil; the necessity of discharging the duties of a good, just, and virtuous man, &c. which is the object of morality, in general.

As societies are under the same obligation of being virtuous, as particular persons; this leads to the duties of societies, or the natural law of society; the œconomies of societies; foreign and domestic commerce, by sea and land; and the doctrine of civil policy relative to each society.

The Science of nature is divided into natural philosophy and mathematics. This division naturally arises from reflection, and man's disposition to form general ideas. From our senses we receive the knowledge of real individuals, the sun, the moon, Sirius, &c.— Air, fire, earth, water, &c.—Rain, snow, hail, thunder, &c. and so of all natural history. At the same time we acquire the knowledge of abstract ideas; as colour, sound, found, taste, odour, density, rarity, heat, cold, soft, hard, fluidity, solidity, rigidity, elasticity, gravity, levity, &c. figure, distance, motion, rest, duration, extension, quantity, impenetrability.

We find by reflection, that some of these abstract ideas, as extension, motion, impenetrability, &c. correspond to all corporeal individuals, which are the object of general physics, or the metaphysics of bodies; and the same properties considered in any particular individual, together with the varieties that distinguish one individual from another, such as firmness, elasticity, fluidity, &c. are the object of particular physics. Another more general property of body, which supposes all the rest, viz. quantity, constitutes the object of mathematics. By quantity, or magnitude, we mean every thing capable of augmentation or diminution. Quantity, as the object of mathematics, may be considered, 1st, either alone, and independent both of the real and abstract individuals we know; or, 2dly, as existing in real and abstract individuals; or, 3dly, in effects fought for from real or supposed causes: and, in this view, reflection divides mathematics into pure, mixed, and physical.

Abstract quantity, the object of pure mathematics, is measured by number, or extension. Abstract quantity, measured by number, is the object of arithmetic; and abstract quantity, as extended, is the object of geometry. Arithmetic is divided into numeral, performed by figures; and algebra, or universal arithmetic, performed by letters; which is only the calculation of magnitudes, in general; its operations being no more than arithmetical operations, performed in a concise manner: for, properly speaking, there is no calculation but in numbers.

Algebra is either elementary or infinitesimal, according to the nature of the quantities to which it is applied. Infinitesimal or fluxionary algebra is either direct or inverse: direct when we descend from the expression of a finite quantity, or of a quantity considered as finite, to its instantaneous increment or decrement; and inverse when we ascend from this expression to that of the finite quantity.

Geometry has, for its primitive object, either the properties of right-lines, and the circle; or comprehends all the species of curves: and therefore is divided into elementary and transcendental.

Mixed mathematics has as many divisions and subdivisions as there are real beings, wherein quantity may be considered. Quantity, considered in bodies as moveable, or tending to motion, is the object of mechanics.

Mechanics has two branches, statics and projectiles. The object of statics is quantity considered in bodies that are in æquilibrio, and have only a tendency to motion; and the object of projectiles is quantity considered in bodies actually moving. Statics and projectiles are each divided into two parts. The former into statics proper and hydrostatics: statics has for its object solid bodies in æquilibrio, barely tending to motion: the object of hydrostatics is quantity considered in equipollent fluids tending to motion. The latter is divided into projectiles proper, which has for its object quantity considered in solid bodies, actually in motion; and hydraulics, whose object is quantity considered in fluids actually in motion. When quantity is considered in water actually in motion, hydraulics is sometimes called hydrodynamics. Navigation might be referred to hydraulics; and gunnery or the throwing of bombs to mechanics.

Quantity, considered in the motion of the heavenly bodies produces geometrical astronomy; whence arises cosmography or the description of the universe; which is divided into uranography, or the description of the heavens; hydrography, or the description of waters; and geography, or the description of the earth: from whence also proceed chronology and gnomonics, or the Art of dialling.

Quantity, considered in light, produces optics; and considered in the motion of light it produces the different branches of optics. Light, moving in straight lines, gives optics, proper; light, reflected in one and the same medium, gives catoptrics; and, as refracted in passing from one medium into another, it affords dioptrics. Perspective is a branch of optics.

Quantity, considered in the air, as to its gravity, motion, condensation, rarefaction, &c. produces pneumatics.

Quantity, considered in the possibility of events, gives the Art of conjecturing; whence the analysis of the games of chance.

The object of the mathematical Sciences being purely intellectual, we need not be surprised at the exactness of their divisions.

Particular physics should have the same distribution as natural history. From histories acquired by the senses, of the stars, their motion, sensible appearances, &c. reflection proceeds to enquire into their origin, the causes of their phænomena, &c. and thus produces the Science of physical astronomy; under which we also rank the Science of their influences, called astrology. From histories, given by the senses, of winds, rain, hail, thunder, &c. reflection proceeds to enquire into their origin, causes, effects, &c. and produces the Science called meteorology.

From natural histories of the earth, the sea, mountains, rivers, flux, reflux, &c. reflection enquires into their origins, causes, &c. and produces cosmology, or the Science of the universe; which is divided into uranology, or the Science of the heavens; aerology, or the Science of the air; geology, or the Science of continents; and hydrology, or the Science of waters.

From the natural history of mines, reason enquires into their formation, the ways of working them, &c. and thus proceeds minerology.

From the natural history of plants, reason enquires into their structure, propagation, culture, vegetation, &c. and thus produces botany, of which agriculture and gardening are two branches.

From the natural history of animals, reason enquires into the means of their preservation and propagation, their organisation, use, &c. and thus produces zoology: whence are derived physic, farriery, the manage, hunting, fishing, falconry, simple and comparative anatomy. Physic, according to the division of Boerhaave, is either employed upon the œconomy of the human body, and reaſoning upon the anatomy thereof; whence proceeds phyſiology; or upon the means of preventing diſeaſes; whence hygieine; or upon morbid bodies, and treats of the cauſes, differences, and ſymptoms of diſeaſes, their nature and effects, under the name of ſemeiotics; or upon the Art of curing diſeaſes, ſubdivided into diet, pharmacy, and chirurgery; which are the three branches of therapeutics.

Hygieine may be conſidered as relative to the health, beauty, and ſtrength of the body; and accordingly is ſubdivided into hygieine proper, coſmetics, and athletics. Coſmetics produces orthopœia, or the Art of procuring a juſt conformation of the limbs; and athletics produces gymnaſtics, or the Arts of exerciſe.

From an experimental hiſtory of the external, ſenſible, and apparent qualities, &c. of natural bodies, reflection riſes to an artificial examination of their internal and occult properties, by means of chemiſtry; which is an Art that imitates and rivals nature: its object being nearly as extenſive as nature itſelf. This Art either analyſes bodies, recompounds them, or transforms them. Chemiſtry gives riſe to alchemy, and natural magic. Metallurgy, or the Art of working metals for human uſes, is an important branch of chemiſtry. Whence alſo proceeds the Art of dying.

Nature has her errors, and reaſon its abuſes. We conſider monſters as errors or wanderings of nature; and the abuſe of reaſon produces thoſe Arts and Sciences, which only manifeſt avidity, malice, or ſuperſtition; and tend only to diſgrace the human ſpecies.

And this is the whole of philoſophy, or the grand branch of human knowledge belonging to reaſon.

IMAGINATION; *whence proceeds* POETRY.

Hiſtory has for its object ſuch individuals as actually exiſt, or have exiſted; and poetry only imaginary individuals, which the mind creates in imitation of the hiſtorical. No wonder therefore if poetry falls under one of the diviſions of hiſtory. But the different kinds of poetry, and the difference of its ſubjects, preſent us two very natural diſtributions. The ſubject of a poem is either ſacred or prophane. The poet therefore relates things paſt, or makes them appear as preſent, by repreſenting them in action; or elſe gives bodies to mere abſtract intellectual beings. The firſt kind is narrative, the ſecond dramatic, and the third parabolic poetry. Epic madrigal, epigram, &c. are generally of the narrative; tragedy, comedy, opera, eclogue, &c. of the dramatic; and allegory, &c. of the parabolic kind.

POETRY. I. Narrative. II. Dramatic. III. Parabolic.

We here underſtand, by poetry, fiction only. As there may be verſification without poetry, and poetry without verſification; we conſider verſification as a quality of ſtyle, and refer it to rhetoric. On the other hand, under poetry we rank architecture, muſic, painting, ſculpture, engraving, &c. for a painter may as juſtly be called a poet, as a poet be called a painter. A ſculptor, or engraver, is a painter in relievo or in creux; as a muſician is a painter in ſounds. The poet, the painter, the ſculptor, the muſician, &c. imitate or counterfeit nature; but the poet employs diſcourſe, the painter colours, the ſculptor, marble, braſs, &c. and the muſician his inſtrument, or his voice. Muſic is either theoretical, practical, inſtrumental, or vocal. Architecture imitates nature but imperfectly in the ſymmetry of its productions, as we have already obſerved.

Poetry has, as well as nature, its monſtrous productions, flowing from a diſordered imagination; and, in all the ſpecies of poetry, ſuch productions may happen.

This is the whole poetical branch of human knowledge, flowing from the imagination; and finiſhes our ſyſtematical view, or genealogical table of the Arts and Sciences.

Thus have we endeavoured to ſhew how the various branches of human knowledge form one regular ſyſtem; nothing therefore remains but to ſay ſomething of the enſuing work, that the reader may form an idea of its utility; and the manner we have purſued in its execution.

We have, in the firſt place, carefully connected the Supplement with the Dictionary, in order to render them both as one work; and thoſe articles which have the ſyllable *Dict.* annexed to it are additions to thoſe under the ſame word in the Dictionary; ſo that what is ſaid on that head in the Dictionary ought firſt to be conſulted.

As it has been our principal view to render this work uſeful to the reader, thoſe branches of learning, which are of more immediate uſe in life, are more largely treated of than thoſe of mere curioſity. Particularly agriculture, gardening, chemiſtry, dying, and the reſt of the mechanic Arts are fully conſidered.

And, as little help in the mechanic Arts could be acquired from books, we were obliged to have recourſe to workmen themſelves, obſerve them at their work, learn their various terms, and clear up and methodiſe what they delivered; and as many of them were unable to explain, in an intelligent manner, the machines they employed in their various Arts, we were obliged alſo to take their machines to pieces, in order to explain their conſtruction, and ſhew the uſes they are applied to.

Every perſon muſt be ſenſible that an attempt of this kind could not be executed without the aſſiſtance of copper-plates; and accordingly the reader will find in the Dictionary and Supplement *One Hundred* and *Seven* folio plates, engraved by the beſt hands. And ſeveral of thoſe relating to mechanic Arts are actually perſpective views of places where their reſpective works were carried on, and the men are repreſented in their proper attitudes, as they perform the various operations. By this method a mechanic Art, which it would be almoſt impoſſible to convey an adequate idea of by words, is eaſily apprehended.

But as there are objects ſo familiar that it would be ridiculous to give drawings of them; and, on the other hand, ſome of the mechanic Arts have machines ſo complicated, that no figures could uſefully repreſent them; we have therefore, in the firſt caſe, truſted to the reader's underſtanding and experience, and in the laſt referred to the objects themſelves. In ſhort, we have endeavoured to obſerve a proper medium, and repreſent that only which was neceſſary, and, at the ſame time, could be uſefully conveyed by figures. To treat any one Art at full length, and give it all the possible plates, would alone require numerous volumes. It would, for instance, be unnecessary to represent in plates the several stages a piece of iron passes through before it is formed into an anchor. The whole process indeed must be described; but we have represented in our figures only the most momentous actions, or address of the artists, which are easy to draw, but very difficult to explain by words. We have, in short, chiefly confined our plates to essential circumstances; which, when once well represented, necessarily shew the rest.

The various branches of natural history are carefully attended to, and those of the greatest use largely treated of; and, in order to convey an idea of the most curious and useful plants, animals, &c. we have represented them in their proper colours on eleven copper-plates; a circumstance not to be found in any other Dictionary of this kind.

With regard to the Sciences and liberal Arts, the method we have pursued in their execution has been mentioned in our Preface to the Dictionary, and therefore need not be repeated here; all that seems necessary to be added is, that those articles which were either omitted or defective are here supplied or completed, and all the discoveries since made in these various branches of literature inserted.

To conclude, neither care, nor expence, has been wanting in our attempts to render this work a complete body of Arts and Sciences; and we shall always enjoy the internal satisfaction of having spared no pains to succeed. But, in surveying so extensive and intricate a labyrinth, who can flatter themselves with having accurately described and delineated the whole? The best performances, even on a single Science, have their errors and defects. The great number of both which we have corrected and supplied in our extracts, has sufficiently convinced us of this; and doubtless several have escaped our circumspection. Nor can we flatter ourselves that those articles, additions, and observations of our own, interspersed through the whole work, are entirely free from errors; but we dare say there are no fundamental ones; and, with regard to others, we hope for the candour and indulgence of the reader.

A List of the Cuts in the Supplement, with Directions to the Binder, for placing them in the Book.

SUPPLEMENT

TO THE

NEW and UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

A symbolic letter, was used as an hieroglyphic by the ancient Egyptians, who, for their first characters, made use either of the figures of animals, or signs that denoted some of their properties: The Ibis is supposed to have been represented by an A, on account of the analogy between its triangular shape and the gait of that bird. Also, when the Phœnician characters, attributed to Cadmus, were adopted in Egypt, the letter A was a character of the symbolic writing consecrated to religion, at the same time that it was used in the common writing for transacting the business of life.

A, among modern writers, is commonly used for anno, as A. D. anno Domini, in the year of our Lord; in England, A. M. stands for artium magister, master of arts.

A, in the Julian calendar, is also the first of the seven dominical letters.

The Romans made use of it long before the time of our Saviour, as the first of the eight nundinales literæ, in imitation whereof it was that the first dominical letters were introduced.

A B, the eleventh month of the civil year of the Hebrews, and the fifth of their ecclesiastical year, which began in the month Nisan. The month Ab answers to the moon in July and the beginning of August, and consists of thirty days. The Jews observe the first day of this month as a fast, on account of Aaron's death, as they likewise do the ninth, for several reasons; first, because both the temple of Solomon, and the second temple built after the captivity, were burnt on that day, the first by the Chaldeans, and the second by the Romans; secondly, from a belief that the spies which were sent into the land of Canaan, after their return, engaged the people in rebellion on this day; and thirdly, in commemoration of the Emperor Adrian's edict, whereby they were prohibited from staying any longer in Judea; wherefore, they on this day always turn their faces towards Jerusalem, and bemoan its fate.

A'BACUS, in accounts and calculations, among the ancients, was a long square, divided by several parallel brass strings, on each of which was strung an equal quantity of small, moveable, wooden or ivory balls, like a pair of beads, by the disposition whereof, and according to the relation which the lower had to the upper ones, they divided the numbers into several classes, and thereby performed all sorts of calculations. This arithmetical table, which was used by the Greeks, was not unknown to the Romans: We find it described by Fulvius Ursinus and Ciaconius, from some antique monuments; but, as some difficulty attended the use of it, they preferred the method of reckoning by counters. In China, and some parts of Asia, the merchants still compute by the help of a set of balls, made either of ebony or ivory, threaded upon brass wire, which they tie to their girdle, and carry about with them.

ABACUS *Logisticus*, a name given by some mathematicians to a rectangled triangle, whose sides, forming the right-angle, contain the numbers from one to sixty; and its area, the product of each two of the numbers perpendicularly opposite. It is also known by the name of a canon of sexagessimals.

A'BAS, a weight used in Persia for weighing pearls. It is an eighth part lighter than the European carat.

A'BASSI, a silver coin in Persia, in figure and size very much like the antient pieces of fifteen sols in France. The Abassi takes its name from Shah-Abas the Second, king of Persia, who ordered the coinage of it. It has on one side, for legend, the profession of the Mahometan faith, There is no God but God, and Mahomet is his prophet; and on the other the king's name, and that of the city where it was coined.

This coin, which has a great currency in Persia, is worth two mammoudis or four chayes; the chaye being estimated at the rate of nine sols six deniers of French money, makes the Abassi worth thirty-eight sols, or seventeen sols of Holland.

ABE'LLIO, or ABELLION, the name of a heathen deity, supposed to be the God of the air; two altars have been discovered, one in Italy, and the other near Nantz in France, inscribed to this God; he was particularly worshipped by the ancient Gauls and Britons, the latter of whom called him diw. Awelion. G. Vossius is mistaken, in supposing him to have been the same with Belinus, or the Apollo of the ancient Gauls, as is Bouchier in asserting, that he had his name from that of the place in which he first was worshipped.

ABE'LMOCH. See MUSK-SEED.

A'BIB, a name given by the Hebrews to their first month of the holy year; it was afterwards called Nisan, and answered to our March. Abib, in the Hebrew, signifies green ears of corn, or fresh fruits, according to St. Jerom's translation, mense novarum frugum. Exod xiii. 4.

ABLACTA'TION *(Dict.)* — As nature has taken care to provide an aliment suitable to the tender stomachs of new-born infants, so has it given us plain directions when to change it for a diet that is more solid and difficult of digestion.

It is well known to observers of nature, that exercise and motion are the grand promoters of digestion, insomuch that a labourer of a moderate strength and constitution shall digest aliment of any kind without difficulty; whereas sedentary people, though much more robust originally, shall in time scarcely be able to sustain a diet of the most innocent food without the symptoms of indigestion. Digestion then seems to be, cæteris paribus, in proportion to motion.

Whilst, therefore, a child is incapable of sufficient exercise and motion to digest solid food, a thin fluid is provided for his sustenance, which is almost converted into nourishment, before it is taken into the stomach of the infant. And, for fear the mother should be so imprudent as to offer it improper aliment, providence seems to have secured the tender stomach, in some degree, from the mischiefs of indigestion, by a singular artifice, that is, by denying the child the use of teeth for the first months.

From these observations it will appear, that a child ought not to be weaned, till nature points out the proper time, by giving it teeth, and making it capable of motion sufficient to comminute, and afterwards to digest an aliment more solid, and more difficult to dissolve, than the milk of its mother.

But, because an infant is furnished by degrees with the instruments of mastication, and the power of using exercise, the transition from milk to solid food should not be sudden.

Agreeable to this are the directions given by authors for the nourishment of young children. They tell us the milk of the parent should be the only food of children, for the first two or three months, provided a sufficient quantity can be supplied without inconvenience; that afterwards pap, panada, and bread boiled with milk, must prudently and gradually be introduced into their diet, till their abilities for mastication and motion render them capable of digesting more solid aliment, and at last flesh.

Hence, it appears, how little those mothers consult the health of their children, who wantonly, and without any necessity, take them from the breast soon after they are born, and substitute a diet not to be digested in their tender stomachs, in the room of that which nature has provided for them, and accommodated to their constitutions.

A very few observations on the usual food of infants will set this in a clearer light.

The milk of a healthy woman, in the flower of her age, is the most easily digestable of any aliment whatever, provided she uses moderate exercise, and a proper diet; and, for that reason, is the greatest restorative in nature. Many instances occur in authors, of grown people, reduced by distempers to the utmost degree of weakness, who have been restored by sucking the milk of women provided for that purpose.

The salutary effects of milk are very easy to be accounted for, if we consider the stomach as the laboratory of health, and milk as a fluid, either secreted from the mass of blood in the glands of the breast, or else communicated immediately to the breast from the receptacle of the chyle, by some ducts not yet discovered. When this is taken warm as it comes from the breast, it gives the stomach very little trouble to digest it, having lately passed the digestive organs of the woman. It is therefore easily convertible again into chyle, from which it differs but very little.

But I must not omit observing, that milk, like all animal fluids, loses most of its virtues when it has been suffered to grow cold; and this irretrievably; for warming it again will not restore them. But, if milk is boiled, the qualities that rendered it an eligible food, are utterly destroyed, and from that moment it becomes an improper aliment for weak and tender stomachs.

Bread boiled in water is a food for children frequently substituted for milk, but is not by far so proper; for bread, thus boiled, will grow glutinous and viscid, if not well fermented, but, if well fermented, it soon turns sour. In both these cases a considerable action of the stomach is required to convert it into chyle; for, otherwise, violent gripings, difficulty of breathing, inflammations of the belly, convulsions, and death, must be the consequence.

It is not possible to lay down rules for the weaning children, adapted to every case that may occur. Regard is to be had to the strength and health of the mother, as well as of the child. Upon the whole we are to pursue the method which nature seems to point out, unless some circumstances interfere, which make it impracticable. Rules may be drawn from what has been represented above, which may, with a little variation, be accommodated to particular cases. *James.*

ABLE'GMINA, in antiquity, were first-fruits, or the choicest and principal parts of victims offered to the Gods; they were first sprinkled with wheat and flour, and then put in little baskets by the persons offering sacrifice, after which, being placed on the altar, and wine poured on them, they were burnt. They were likewise called prosecta, prosiciæ, and magmenta.

ABORI'GINES, *(Dict.)* —The term Aborigines is famous in antiquity. Though at present taken as an appellative, it was originally a proper name of a certain people of Italy, the etymology whereof is greatly disputed among the learned. Aborigines then denoted a nation in Italy, which inhabited the ancient Latium, or country now called Romania or Campagna di Roma. In which sense the Aborigines are distinguished from the Janigenæ, who, according to the false Berosus, were settled in the country before them; from the Siculi, whom they expelled; from the Grecians, whom they descended from; from the Latins, whose name they assumed after their union with Æneas and the Trojans; and lastly from the Ausonii, Volsci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, whether, first, as belonging to any of the species of Aborigines above recited; or, secondly, from their having been Aborigines, i. e. wanderers; or, thirdly, from their inhabiting the mountains, or on what other account, is much disputed.

St. Jerom says, they were so called as being absque origine, the primitive inhabitants of the country after the flood. Dion. Halicarnasseus says, that the name signifies the founders and first fathers of the inhabitants of that country; others think them so called, as being originally Arcadians, who claimed to be earth-born, and not descended from any people.

Aurelius Victor, and after him Festus, derive Aborigines by corruption from Aberrigines, wanderers, or vagabonds, and pretend that the Pelasgians, another name sometimes given them, is of the same import, and denotes vagabonds. Pausanias rather thinks they were thus called, ἀπὸ ὀρέων, from the mountains which they inhabited; which opinion seems confirmed by Virgil, who, speaking of Saturn, the legislator of his people, says,

> *Is genus indocile, ac dispersum montibus altis*
> *Composuit, legesque dedit.*

The Aborigines were either the original inhabitants of the country, settled there by Janus, as some imagine, or by Saturn or Cham, as others, not long after the dispersion, or even, as some think, before it; or they were a colony sent from some other nation, who, expelling the ancient inhabitants the Siculi, settled in their place. About this mother nation there is great dispute: Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the first under the conduct of Oenotrius, son of Lycaon, four hundred and fifty-five years before the Trojan war; and others under the conduct of Hercules: Some derive this colony from the Lacedæmonians, who fled from the severe discipline of Lycurgus. All these, uniting, are said to have formed the kingdom or nation of the Aborigines. Others will have them of Barbarian, rather than Grecian origin, and to have come from Scythia, others from Gaul, and lastly, others will have them to be Canaanites, who were expelled out of their country by Joshua.

ABO'RTION, *(Dict.)* — Astringent medicines and applications, and an astringent regimen, as they prevent hæmorrhages in general from the uterus, are particularly recommended for that reason, as preservatives against Abortion.

For this reason, all those medicines that are found effectual in moderating a profuse flux of the menses, are also serviceable in this case.

For this purpose tincture of roses is frequently prescribed, and Sydenham directs the following electuary:

Take conserve of dried roses two ounces. Troches of Lem-nian earth, a drachm and half. Pomegranate peel and red coral, of each two fcruples. Blood-ftone, dragon's blood, and Armenian bole, each a fcruple. Syrup of coral, a fufficient quantity to make an electuary.

Let the patient take the quantity of a large nutmeg in the morning, and at five in the afternoon, drinking after it fix fpoonfuls of the following julap. Take of the fimple water of oak-buds and plantain, each three ounces. Of barley, cinnamon-water, and fyrup of red rofes, each an ounce. Spirit of vitriol enough to make it agreeably acid.

Reftringent plaifters are ordered to be applied to the region of the loins by Sydenham, made of equal parts of diapalma and the rupture-plaifter. Others direct the fame, with an addition of the red-lead plaifter, or plaifters of other reftringent ingredients, as dragon's blood, Armenian bole, maftic, galls, biftort-root, and red coral, made up, with Cyprus turpentine, into the confiftence of plaifter.

It would be endlefs to give forms of medicines, frequently prejudicial, becaufe they are capable of being mifapplied, unlefs particular regard is had to the caufes of the diforder they are intended to remove, to which they muft be adapted, as circumftances fhall direct. The reader will be more inftructed by the following cautions.

1. Let nothing reftringent be either given internally, or applied, when an approaching mifcarriage is fo far advanced as to make the preventing it improbable, or impoffible; for whatever then retards it is pernicious. Reftringents then are particularly prejudicial, as they oppofe the relaxation of the internal 'office of the uterus, at this time fo neceffary to the expulfion of the fœtus and fecundines.

2. When there is reafon to believe the fœtus is dead, let no aftringents of any kind be made ufe of, becaufe whatever then prevents a mifcarriage does harm.

3. When a tenfion and ftricture of the uterus make it incapable of a fufficient dilatation, and thereby endanger a mifcarriage, aftringents are improper, as they increafe the tenfion, and confequently the danger. I am fenfible fome authors are of opinion, that aftringents are fometimes neceffary, even in the cafes laft mentioned, to moderate a violent flux of blood. But they cannot anfwer the end propofed, fo long as the fœtus, placenta, or any part of it, or the clotted blood, keep the uterus diftended, and the blood-veffels thereof open; and, when thefe are brought away, they are generally fuperfluous, becaufe the hæmorrhage ufually ceafes without any further affiftance, unlefs a laceration of the uterus, or fome extraordinary accident, render both a prudent regimen and medicines neceffary.

The precautions that are taken againft a mifcarriage, during the time of pregnancy, are feldom fo effectual as thofe which are taken in the interval betwixt a mifcarriage and the next impregnation. Thefe confift in reftoring to the woman a perfect ftate of health in general, particular regard being had to the diforders of the uterus.

If, from the fymptoms of great pain, tenfion, and hardnefs about the region of the uterus it is too tenfe to admit of fufficient dilatation, the general habit of body muft be relaxed, or the fibres of the uterus may be foftened by emollient fomentations, cataplafms, injections, or peffaries. *Jame's Dict.*

ABRA'SA, in furgery, ulcers attended with abrafion of part of the fubftance; or ulcers where the fkin is fo tender and lax as to be fubject to abrafion.

ABRI'DGEMENT, epitome, fummary, fubftance, &c. An Abridgement is a difcourfe, in which we reduce to fewer words the fubftance of what is elfewhere treated of more at large, and more circumftantially.

Abridgement, in the common law, fignifies, particularly, the making a declaration or account fhorter, by fevering fome of the fubftance from it. A man is faid to abridge his plaint in affize, and a woman her demand in an action of dower, where any land is put into the plaint or demand, which is not in the tenure of the defendant: For, if the defendant pleads non-tenure, joint tenancy, &c. in abatement of the writ, the plaintiff may leave out thofe lands, and pray that the tenant may anfwer to the reft. The reafon of this Abridgement of the plaint is, becaufe the certainty is not fet down in fuch writs, but the run in general; and, though the demandant hath abridged his plaint in part, yet the writ will be good for the remainder.

ABRI'DGING, in algebra, implies a method of reducing a compound equation to a more fimple expreffion. When there are feveral known quantities in the fame term, mathematicians generally exprefs them by a fingle letter. Thus in the equation $x^3 - axx + abx - abc = o$; by putting $n = a$, $p = ab$, and $q = abc$, we fhall have $x^3 - nxx - px - q = o$, inftead of the propofed equation. This abridged equation is called a formula.

ABROTONI'TES, a wine mentioned by Diofcorides impregnated with abrotanum or fouthernwood, in this manner:

Take of fouthernwood bruifed and fifted a hundred ounces, (an ounce is eighteen penny-weights five grains $\frac{1}{4}$ troy) inclofe it in a linnen bag, and put it into a veffel containing about feven gallons of muft. It is good in diforders of the ftomach, lofs of appetite, and in a jaundice, for it is diuretic. Diofcorides. l. 5. c. 62.

ABROTA'NUM. — There are two very different plants defcribed by botanical writers under the fame general name of Abrotanum, and diftinguifhed by the addition of mas and fœmina. The male Abrotanum is the plant we call fouthernwood, and the female is what we call lavender cotton.

Southernwood, or *male Abrotanum*, is one of the *fyngenefia polygamia fuperflua* of Linnæus, and one of the *herbæ corymbiferæ floribus non radiatis* of Ray. It is defcribed by all the botanical writers under the name of Abrotanum vulgare, Abrotanum mas, and Abrotanum anguftifolium majus. It grows to four or five feet high, and is a fhrubby and ftrong plant. Its ftalks are hard and woody, but not tough; they are of a reddifh colour, and lightly ftriated on the furface, and have a hollow filled with a whitifh medullary fubftance within. The leaves are very numerous; they are of a whitifh green colour, very finely divided into fegments, and of a ftrong, and to fome people very difagreeable fmell; though there are others who are fond of it.

Their tafte is acrid and bitter; the flowers ftand thick together, about the tops of the branches, and are of a yellowifh colour, and much like thofe of the common wormwood, but fmaller; they are compofed of a number of fmall and hollow flofcules, which are divided into five fegments at the end. Thefe are all contained in one common cup, and each of them ftands on an embryo feed, which afterwards ripens and is oblong, and like the feed of wormwood, but fmaller, and has no downy matter annexed to it. In the whole it greatly approaches to the nature of the wormwood kind, in all things but its external appearance. It grows in great abundance on the Pyrenean mountains, and on moft of the mountains of France and Italy. With us it is not found wild, but is cultivated in the gardens about London for its fmell, and to fupply the fhops.

A pound of frefh tops of fouthernwood, diftilled by the retort, yields firft about two ounces and a half of a limpid phlegm, of the fmell and tafte of the plant; after this about ten ounces of a ftronger-fcented liquor, of an acid, and with it of fomewhat of the volatile alkaline tafte; after this, about half an ounce of a brownifh liquor, of an empyreumatic fmell, and of a ftrongly volatile alkaline tafte, but with fomewhat alfo of the acid yet in it; after this comes over about half an ounce of an oil partly fluid, and partly thick as butter. The remainder in the retort, calcined in an open fire and lixiviated, yields two drachms of a fixed alkaline falt.

The ftrong fmell and tafte of fouthernwood, as well as the active principles it is refolved into by analyfis, plainly fhew that it is a powerful medicine; and it has been very juftly lamented by Etmuller, that it is not brought more into ufe. It is evidently of the tribe of attenuants, and would be ferviceable in all obftructions of the vifcera. It deftroys worms by its bitter effential oil, and at the fame time acting as an attenuant on the foul vicious matter in the bowels, without which worms cannot live or breed there, it prevents a return of the complaint.

It is recommended by fome in fuppreffions of urine, a drachm of it in powder for a dofe. But S. Pauli, who recommends it moft ftrenuoufly on this occafion, orders fome nitre to be added to it, and perhaps the effects that he found from that compound powder, were as much owing to the nitre, as to the plant. A decoction of it is in repute with fome as a lotion for the recovering hair upon the head when fallen off; and others recommend its juice as a great cleanfer and healer of old ulcers. We fometimes meet with a diftilled water of it in the fhops; but few make it, and fewer ufe it when made. It poffeffes but a fmall fhare of the virtues of the plant; an infufion in water, or a conferve made of the young tops in fpring, feems much better calculated to anfwer the purpofes intended by it.

Lavender cotton, or the *female Abrotanum*, is a plant of the fame clafs with the former, but is extreamly different from it in its manner of growth and general external figure. It is defcribed by the botanical writers under the name of *fantolina*, *chamæcypariffus*, and *Abrotanum fœmina*. Tournefort calls it *fantolina foliis teretibus*, and C. Bauhine, *Abrotanum fœmina foliis teretibus*.

It grows in form of a thick and low bufh; its main ftalks are woody and hard; they grow to two or three feet high, and are divided into a number of flender branches which are whitifh or hoary. The leaves are about an inch long, very thick and narrow; they are minutely ferrated round the edges, or, more properly fpeaking, they are befet in all parts with rows of little tubercles, four in a feries. They are more white and hoary than the ftalks, and have a very ftrong and fragrant fmell, and are of an acrid and bitter tafte. At the extremity of every branch there ftands a fingle flower, moderately large and of the flofculous kind, or compofed of a number of little tubular flofcules, cut into five fegments at the edges, and feparated by feveral imbricated leaves. They are of a bright yellow colour, and when in their perfection, and a great number open upon the plant at once, they make a very beautiful appearance. The whole clufter of flofcules that compofe one flower, are contained in one common cup of the fquammous kind, and each of them is fucceeded by a fmall oblong and ftriated feed of a brown colour. Its root is hard, woody, and

and is often divided into a great number of branches. It is common in many parts of Italy, and in France wild by the road sides, in mountainous places; with us it is cultivated in gardens for its beauty more than for its medicinal use, though it is rather of the number of those plants which escape our notice, than of those that do not merit it.

A pound of the fresh tops of lavender cotton, distilled in a retort, yield first about two ounces or a little more of a limpid and colourless phlegm, smelling and tasting of the plant, but, in taste, somewhat obscurely acid. This is in quantity about seven, or between seven and eight ounces; after this come over about two ounces of a reddish liquor, partly acid and partly alkaline, and, after this, about eight grains of a volatile alkaline salt, in a solid form; and finally near an ounce of a thick oil like butter. The remainder in the retort, calcined in an open fire and lixiviated, yields about a drachm and half of a fixed alkaline salt.

The virtues, ascribed to the santolina or female Abrotanum, are in general the same with those of the male; it is, however, particularly recommended in uterine complaints. The seed of this plant is accounted little inferior to the semen santonicum for destroying worms, and is not unfrequently sold by the druggists as a succedaneum for it.

Matthiolus recommends the powder of the dried leaves, half a drachm for a dose, and to be continued a considerable time, as a remedy for the fluor albus. And Garidelli tells us of the same dose having been given with great success in pleurisies and peripneumonies.

A'BSCESS, *(Dict.)*—Mr. Petit has presented to the royal academy of surgery a very important paper on tumors of the gall-bladder, which have often been mistaken for Abscesses in the liver, and, by the many curious remarks wherewith that memoir is replete, has enriched pathology with an accurate account of a new species of disease. He gives us the diagnostic signs which distinguishes the tumors of the gall-bladder, when distended by the bile retained in it, from Abscesses of the liver; compares that retention of the bile, and the biliary stone, with the retention of urine, and the stone in the bladder; and proposes the performing operations on the gall-bladder similar to those made in the vesica. See Mem. de l'Acad. de Chirurgie, tom. 1. Very considerable Abscesses often happen in the fundament, and occasion fistula's. See the article FISTULA *in ano.*

Mr. Littre observes, Hist. de l'Academie, an. 1701, p. 29, on occasion of an inflammation of the parieties of the left ventricle of the heart, that the ventricles of the heart must be less subject to Abscesses than inflammations; because an Abscess consists in an extravasated fluid, which coagulates, corrupts, and turns into pus; and an inflammation in a swelling of the vessels, caused by too great a quantity of fluid. If then we suppose, that from the coronary arteries, which nourish the substance of the heart, it extravasates, and diffuses the blood that does not at first enter the coronary veins destined to receive it, it will be difficult that the continual motion of the contraction, and dilatation of the heart, does not force it to re-enter therein, or at least break and attenuate in such manner, as to escape into the ventricles across the parietes. With regard to an inflammation, the heart has no other remedy than what it receives from some other part of the body, either to prevent it, or deliver itself from it.

We have, in the history of the royal academy of sciences for the year 1730, p. 40, the history of a cure of an Abscess in the liver, which ought to be publickly known. Mr. Soulier, surgeon at Montpellier, was called to a youth of about thirteen or fourteen years of age, who, after having been violently heated, had put his feet into cold water, and thereby contracted a fever, which was attended with no less dreadful a consequence than that of a very large tumor in the liver, which Mr. Soulier opened; he found the liver considerably imposthumated on the outside, and convex, and in it a hole capable of receiving half of an hen's egg; at each dressing there was discharged a bloody, thick, yellow, bitter, and inflamed matter, which he soon discovered to be the gall, accompanied with flakes of the substance of the liver.

In order to discharge the matter from this Abscess, Mr. Soulier contrived a silver canula, blunted at the end, so that it might be introduced into the liver without injuring it, and pierced with several lateral apertures to receive the peccant humour, and bring it off externally, where it fell upon a plate of lead, which he had applied to the wound, so that the matter could not excoriate the skin: This expedient had the wished-for success; the fever lessened, a good habit of body came on, the wound cicatrised, and the patient was cured.

ABSCI'SSA, *(Dict.)*—In the parabola, the Abscissa is a third proportional to the parameter and semiordinate; and the parameter a third proportional to the Abscissa and semiordinate.

In the ellipsis, the square of the subordinate is equal to the rectangle of the parameter into the Abscissa, subtracting another rectangle of the same Abscissa into a fourth proportional to the axis, parameter, and Abscissa.

In the hyperbola, the squares of the semiordinates are to each other, as the rectangles of the Abscissa into another line composed of Abscissa and the transverse axis.

ABSINTHI'TES *Vinum.* Dioscorides describes several ways of making the vinum Absinthites. The best way, in the opinion of Fuchius, is to bruise an ounce of the best wormwood, and, tying it up in a thin linnen rag, infuse the same in nine gallons of wine. Then put must (wine never fermented) to it and let it work, leaving a hole open, that it may not burst the vessel.

The vinum Absinthites is good for the stomach, excites urine, accelerates concoction, relieves such as labour under distempers of the liver, the stone, or yellow jaundice, removes a nausea, and helps infirmities of the stomach. It is effectual also for an inveterate distension of the hypochondria, and all inflammations; kills round worms, restores the suppressed menses, and is an antidote against the poison of the white chamæleon, provided it be drank in a large quantity, and returned by vomit.

ABSO'RBENT *Vessels*, in anatomy, those minute vessels which imbibe the nutritious and other juices of the human body.

The learned Dr. Mead, in his Monita & Præcepta, has given us the following remarkable case of the vessels absorbing the water in a dropsical person.

I attended a certain merchant for an ascitical dropsy, with another physician of great experience: And, after trying the usual remedies to no purpose, we resolved upon the paracentesis, as the ultimate resource. Accordingly the operation was performed, and about twenty pints of clear water were drawn off. In a few weeks his belly filled again. Whereupon we agreed to meet the surgeon next morning, in order to draw off the water by a second tapping. As we came to the patient, he looked at us, and smiled; saying that he had no occasion for any sort of assistance; and, stripping off the cloaths, he shewed his abdomen, which was soft and relaxed. At this we were vastly surprized, and, having asked him if he had any kind of evacuation in the night, he assured us that he had had none, either by stool, or urine, or sweat, more than usual. Wherefore all the water must have been absorbed by the glands and capillaries of the peritonæum and adjacent membranes. But afterwards this patient very imprudently committed himself to the care of a certain quack, who, to prevent a return of the disease, gave him very strong cathartics, which so exhausted him that he soon died consumptive. Yet upon dissection there was little or no water found in the Abdomen.

Anatomists have long since discovered, that water is absorbed from the belly into the circumjacent parts: for, if a pint of warm water be injected, through a small wound, into the abdomen of a live dog, and his abdomen be laid open a few hours afterwards, not a single drop of the water will be found therein. Thus, as Hippocrates has justly observed, every part of the body, both outward and inward, are perspirable. But I refer the reader to the perusal of what the learned Dr. Abraham Kaav has published on this subject; who demonstrates that the humours are admitted into, and transude through, all the membranes of the body, both in health and sickness.

ABSTRACTI'TIUS, *Abstractitius*, a name given to the native spirits of aromatic vegetables, to distinguish them from spirits produced by fermentation. *Castellus*, from *Libavius*.

ACA'CIA, in botany, the name of a genus of trees, of which M. Tournefort has enumerated twelve, and Mr. Miller twenty-four species.

The characters of the tree are these:—It hath a tubulose flower consisting of one leaf, with many stamina, or threads, which are many of them collected into a kind of sphere or globe: the pointal of the flower afterwards becomes a pod, in which are included several seeds, each of which is separated by transverse diaphragms, and are generally surrounded by a whitish pulp. *Miller's Dict.*

ACA'DEMY *(Dict.) Royal* ACADEMY *of Sciences and Belles Lettres of Prussia.* Frederic the First, king of Prussia, founded it in the year 1700, and appointed M. Leibnitz to be the first president thereof: the list of the members of this Academy was, at its first establishment, adorned with some of the greatest names in the republic of letters. This Academy, in the year 1710, published the first volume of its transactions under the title of Miscellanea Berolinensia; and, though Frederic's successor gave but little encouragement to letters, the Academy continued to publish new volumes in the years 1723, 1727, 1734, 1737, and 1740. At length, Frederic the Second, the present king of Prussia, thought proper to give new vigour to the Academy; for which purpose he invited to Berlin such strangers as were of the most distinguished merit in literature, and encouraged the best of his subjects to prosecute the study and cultivation of it, by giving them ample rewards; so that, in the year 1743, there appeared a new volume of the Miscellanea Berolinensia, in which the new force that the Academy had acquired plainly appeared. However, that prince did not think fit to confine himself there: he thought that the Royal Academy of Sciences of Prussia, in which, till that time, some minister, or great nobleman, had presided, would find an advantage from having a man of letters at its head, and accordingly he made choice of M. Maupertius, a gentleman well known all over Europe, and engaged him to settle at Berlin; he himself, at the same time, giving

giving a new regulation to the Academy, and taking upon him the title of its protector. This Academy has, since the year 1743, published three volumes of memoirs, wrote in French, and nearly upon the same plan as the history of the Royal Academy of Sciences at Paris, but with this difference, that, in the second of these volumes, the extracts of the memoirs are suppressed, as they are intended to be in the future volumes, one of which is to be published every year. The academists hold two public assemblies in the year; one in January, on the present king's birth-day, and the other in May, on the day of his accession to the throne. At the latter of these assemblies is given a prize, consisting of a gold medal of the value of fifty ducats: the subject for this prize is successively natural philosophy, mathematics, metaphysics, and erudition. This Academy has this in particular, that it includes metaphysics, logic, and morality, which are not the objects of any other Academy: there is a particular class which is engaged in these matters, and is called the class of speculative philosophy.

The Imperial ACADEMY *of Petersburg.* — Czar Peter the First, sirnamed the Great, by whose means Russia shook off the yoke of barbarism, which had reigned for so many ages in that kingdom, coming into England and France, in the year 1717, and observing the great utility of literary societies and Academies, resolved to establish one in his capital; and had actually taken the necessary measures for that purpose, when he was taken off by death in the year 1725. His successor, the czarina Catharine, being fully informed of his intentions, laboured upon the same plan, and, in a short time, formed one of the most celebrated Academies in Europe, composed of the most considerable foreigners, some of whom came and settled at Petersburg. This Academy, which is employed in cultivating the sciences and polite literature, hath, since the year 1726, published ten volumes of memoirs, which are all wrote in Latin, and are highly valuable, particularly for the mathematical part, which contains a great number of excellent pieces. Most part of the foreigners who composed that Academy being either dead, or retired out of the kingdom, it was in a very desponding and languishing condition upon the czarina Elisabeth's accession to the throne; but that princess, happily for herself, named count Rasomouski to be president; gave the Academy a new body of statutes; and left nothing neglected which could re-establish its ancient splendor. This Academy has this modest motto, *Paulatim.*

ACÆ'NA, ἄκαινα, in antiquity, a ten-feet rod, used by the Greeks in measuring their land.

ACAJOU', the name of the tree which produceth the cashew-nut, or anacardium. See ANACARDIUM in the dictionary.

ACANTHOPTERY'GII *, in natural history, a term used to express one of the general classes of fishes, the rays of whose fins are bony, and some of them sharp or pointed.

* The word is Greek, ἀκανθοπτερύγιοι, and formed from ἄκανθα, a thorn, and πτερύγιον, a fin.

ACATALE'PSIA (*Dict.*) — The Pyrrhonists, or Sceptics, asserted an absolute Acatalepsia: all human science and knowledge, according to them, went no farther than to appearances and verisimilitude: they declaimed much against the senses, and charged them with a principal share in seducing and leading us to error.

Arcesilas was the first assertor of the Acatalepsia, and reasoned as follows: We can know nothing, said he, not even so much as what Socrates advanced, that we are ignorant of our knowing nothing. This impossibility proceeds both from the nature of things, and of our faculties, and even more from the nature of our faculties, than from that of things.

We must then either deny or assert any thing whatsoever; for it is unworthy of a philosopher both to approve of any thing that is false, or uncertain, and to pass his judgment without being instructed. But every thing having almost the same degrees of probability, pro and con, a philosopher may then declare himself against that which he either denies or affirms, whatever it be; being sure at length either of finding the truth of what he seeks for, or fresh reasons to believe that it is not made for us. In this manner Arcesilas searched after it, during his whole life, perpetually quarrelling with the philosophers of his own time: but, says he, if neither sense nor reason are sufficient to be attended to in the schools of philosophy, they are at least so in the conduct of life, when there is no danger of following probabilities; since we live among such people as have not themselves any better means to determine them.

ACATA'STATOS, a physical term, signifying inconstant, and is applied to irregular fevers, where the periods of exacerbation are uncertain, and the appearances in the urine perpetually changing. It is applied also to shivering fits in fevers, which return at irregular periods, sometimes every day, sometimes every other day, or every third day; or it is applied to urines which are turbid, but do not deposit any regular sediment.

A'CCENT (*Dict.*) — It is a question whether these Accents and aspirates are now to be marked upon Greek words. F. Sanadon, in his preface to Horace, tells us, that he writes the Greek without Accents. This is certain, that we pronounce the words of the dead only according to the inflections of living languages: we do not touch the quantity of the Greek and Latin, except upon the penultima, though the word consists of more than two syllables; but, with regard to the tone, or accent, we have lost the ancient pronunciation: yet, not to lose the whole, and, as it often happens that two words have no other difference between them than in the Accent, we think, with the author of the Greek method of P. R. that we ought to preserve the Accents in writing the Greek; but must add, that we are to look upon them as signs of a pronunciation which is now disused; and I am persuaded, that the learned, who would, at present, regulate their pronunciation by these Accents, would be hissed at by the Greeks themselves, were it possible that they should hear them.

As for the Latins, it is commonly thought that the Accents were only made use of in writing, to fix the pronunciation, and make it easy to strangers. At present, in the Latin grammar, they give the name of Accent only to the three signs (see CHARACTER in the dictionary) the grave, the acute, and circumflex, and this last is never marked but thus [ˆ], and not as in the Greek.

The ancient Latin grammarians had not restrained the name of Accent to these three signs. Priscian, who lived in the sixth century, and Isidore, who flourished a little time after him, both say that the Latins have ten Accents: these ten Accents, according to those authors, are,

1. The acute.
2. The grave.
3. The circumflex.
4. The long line, used to mark a long vowel — longa linea, says Priscian; longa virgula, says Isidore.
5. The mark of the shortness of a syllable, brevis virgula [◡].
6. The hyphen, which served to join two words, as antetulit; they marked it, according to Priscian, thus [◡], and, according to Isidore, thus [◠]. The French use the tiret, division, or stroke of union, for that purpose; porte-manteau, arc-en-ciel.
7. The diastole, on the contrary, was a mark of separation; they marked it thus [ↄ], under the word supposita versui. Isid. de sig. accentuum.
8. The apostrophe, which we still make use of: the ancients placed it also at the top of the word, to shew the suppression of a letter; as tho' for though.
9. The δασεῖα. This was the sign of the aspiration of a vowel, RAC. δασὺς, hirsutus, hairy, rough: they marked it over the letter thus [c]; it is the rough aspirate of the Greeks, which the copyists have turned into an h, in order to a facility of writing quick, without the trouble of raising the pen to mark the aspirate upon the aspirated letter.
10. Lastly, the ψιλή, which shewed that the vowel was not to be aspirated: it is the soft aspirate of the Greeks, which was wrote in contradistinction to the rough aspirate.

They likewise had, as well as we, the asterisk, and several other notes, which Isidore mentions, Orig. l. 1. and says that they were very ancient.

As to the Hebrews, towards the fifth century, the doctors of the famous school of Tiberias laboured upon the criticisms of the books of the holy scriptures, that is to say, to distinguish the apocryphal books from those which were canonical; afterwards they divided them by sections and verses, and fixed their reading and pronunciation by points, and other marks, which the Hebreans call Accents; so that they give this name not only to signs which mark the elevation and depression of the voice, but also to the signs of punctuation.

These doctors were called massorets, from the word massore, which signifies tradition; because those doctors stuck close in their operations to preserve, as much as was in their power, the traditions of their fathers, in the manner of reading and pronouncing.

As for our part, we give the name of Accent primarily to the inflection of the voice, and to the manner of pronunciation of particular countries. Thus we say of the French Accent, &c. that man has a foreign Accent, i. e. that he has some inflection of voice, and a manner of speaking, which is dissimilar to that of persons born in the capital; in this sense Accent comprehends the elevation of the voice, and the quantity, and particular pronunciation, of each word, and of each syllable.

In the second place, we have kept the name of Accent to each of the three signs of tone, which is either acute, grave, or circumflex: but these three marks have lost, among us, their ancient destination; they are no more, on that account, than printed Accents: this is the use we make of them in Greek, Latin, and French.

As to the Greek, we pronounce it our own way, and place Accents according to the rules that grammarians give us, without using those Accents as guides for raising or lowering the tone. As for the Latin, we at present distinguish the quantity of words only in respect to the penultima, though the word consists of more than two syllables; for the words which have but two syllables are pronounced equally, whether the first be long or short: for example, in verse, the a is short in pater, and long in mater; yet we pronounce both as if they were of the same quantity.

In books designed for public reading, the acute Accent is made use of, and placed differently, according as the penultima is either short or long; for instance, in matutinus we perceive the quantity only on the penultima ti, and, because this penultima is long, we place an acute Accent thereon, matutínus.

On the contrary, this penultima ti is short in serótinus, in which case we put the acute Accent on the antepenultima ró, whether that penultima be short or long. In verse, this acute Accent then serves to shew us, that we must rest upon that accented antepenultima, in order to pass more easily on the penultima, and to pronounce it short.

As the method of accenting, though used but by few authors, is of great use, it were to be wished that this practice equally prevailed as to classical books, thereby to accustom young people to pronounce the Latin regularly.

ACCE'PTOR, in commerce, the person who accepts a bill of exchange.

The Acceptor, who is generally the person on whom the bill is drawn, becomes personal debtor by the acceptance, and is obliged to pay, even though the drawer happens to fail before the bill becomes due.

A'CCIDENT, in logic, is when we join a confused and indetermined idea of substance with a distinct idea of some mode: that idea is capable of representing all things, wherein that mode will be, as the idea of prudent, prudent men, and the idea of round, all round bodies. That idea, expressed by an adjective term, prudent, round, gives the fifth universal, which is called Accident, because it is not essential to the thing to which we attribute it; for, if it was, it would be difference, or proper. But here it is to be observed, that, when we consider two substances together, we may consider one of them as the mode of the other; thus, a dressed man may be considered as a whole, composed of that man and of his clothes; but, to be dressed in respect to that man, is only a mode, or fashion of being, under which we consider him, though his habits may be substances.

ACCIPE'NSER, a name given, by Linnæus, to a genus of fishes, whose characters are, that the mouth is tubulated, and without teeth, and the gills have only one hole, or aperture, on each side.—The sturgeon, among others, belongs to this genus.

ACCI'PITER, in zoology, the hawk. Linnæus has given this name to an order of birds, the distinguishing character of which is, their having a crooked beak. There are three genera belonging to this order, the owl, the hawk, and the falcon.

ACCLAMA'TION, a token of joy, or applause, whereby the public testifies its esteem, or approbation. Antiquity has transmitted to us several sorts of Acclamations. The Hebrews were accustomed to cry hosanna; and the Greeks ἀγαθῇ τύχῃ, good fortune, good luck. The historians speak of some magistrates of Athens who were elected by Acclamation, which was not manifested by calling out, but by holding up the hands. The Barbarians testified their approbation by a confused noise, or clashing of their arms. We have a more circumstantial knowledge of the customs of the Romans on this head, which may be reduced to three different kinds of Acclamations, those of the people, those of the senate, and those of the assemblies of the learned.

The Acclamation of the people took place upon the public entries of emperors and generals, at the shews given by the princes, or magistrates, and of triumphs of conquerors; this was originally no more than a confused outcry of a multitude transported with joy, and a simple undisguised expression of public approbation; plausus tunc arte carebat, says Ovid. But, under the emperors, and even under Augustus, this impetuous motion, to which the people abandoned themselves, as it were by enthusiasm, became an art, and a studied harmony; a musician set the tune, and the people, giving two chears, alternatively repeated the form of Acclamation. On the false report of Germanicus's recovery being spread over Rome, the people flocked to the capitol, with torches and victims, singing, Salva Roma, salva patria, salvus est Germanicus. Seneca and Burrhus were the first in their Acclamations to Nero (who was passionately fond of music) when he played upon the harp in the theatre, and these were followed by five thousand soldiers, called augustales, who roared out his praises, which the rest of the spectators were obliged to repeat. These musical Acclamations were continued to the reign of Theodoric. Applauses in cadence were also sometimes joined with these Acclamations; the most common formula's were, feliciter, longiorem vitam, annos felices; those of triumph, were verses in praise of the general, and the soldiers and people cried out, at certain intervals, io triumphe; though the soldiers sometimes mingled with these praises very sharp and satyrical railleries upon the conqueror. The Acclamations of the senate, though they were more serious, yet had the same end, that of honouring the prince, and often of flattering him. The senators testified their consent to his propositions by these formula's, omnes, omnes, æquum est, justum est. We have had instances of the elections of emperors made by Acclamation, without any preceding deliberation. Men of learning either recited their compositions, or declaimed in the capitol, or in the temples, and in the presence of a numerous assembly; and Acclamations were then given nearly in the same manner as at the public shews, as well in respect of the music, as of the accompaniments. As those Acclamations ought to be suitable to the subject, as well as to the persons to whom they were given, they had several of them, some adapted to the philosophers, others to the orators, others to the historians, and others again proper for the poets. One of the most common of these formula's was the saphos, which they repeated three times; neither were comparisons or hyperboles spared in the least, especially by those admirers who were hired to applaud; for there were people of this sort, as we learn from Philostratus.

ACCO'MPAGNAGE, a term used in silk manufactories, and signifies a fine woof of the same colour with the gilding, whereof the stuff is wrought, helping to enrich the ground under which it passes, and to hinder it from striking cross the gilding itself, which would diminish its gloss and lustre. All rich stuffs, the warps whereof are of a different colour from the gilding, ought to be accompanied.

ACCO'MPANIMENT, in music, is the execution of a complete and regular harmony upon any instrument, as the organ, harpsichord, theorbo, guitar, &c. we shall, in this place, consider it in respect to the harpsichord.

Here we have one of the parts of music, which is commonly the bass, for our guide. The bass is touched on the left hand; and on the right the harmony is pointed out, either by the movement of the bass, the tone of the other parts which we hear at the same time, the divisions which we have before our eyes, or by the figures which are commonly added to the bass. The Italians shew no regard to the figures, the quickness and nicety of their ear supplying the want of them, and they accompany extremely well without that apparatus; a faculty of playing, for which they are entirely indebted to their own natural genius. Other people, who are not, like them, born for music, when they come to practice, find infinite difficulties in Accompaniment, and require ten or twelve years to succeed tolerably well in it. What then can be the causes that retard the progress of the scholar, and embarrass even the masters themselves, for so long a time, as the difficulty alone of that art cannot occasion it?

There are two which are the principals; the one is in the manner of figuring the bass, and the other in the methods of Accompaniment. The signs which are used to figure the basses are too numerous. If there are so few fundamental concords, why must there be a multitude of figures to express them? The very signs are equivocal, obscure, and insufficient; for instance, they scarce ever determine the nature of the intervals which they express; or, what is still worse, point them out quite contrary: the one is barred to have the place of diesis, and the other is barred to hold the place of *b* flat: the greater intervals, and even the lesser ones, are often expressed in the same manner. When the figures are doubled, they are too confused, and, when single, they scarce ever give us any more than the idea of only one interval, so that we always have several others of them to understand and express. What method then must be taken to remedy these inconveniencies? Must the signs be multiplied, in order to express the whole? To this it may be answered, that we complain, that there are too many of them already. Must we then reduce them? Why, if we do, we shall then leave more things to be guessed at by the accompanier, who is already too much taken up. What then is to be done? We must invent new signs, perfect the fingering, and make signs of fingering two ways combined, which at the same time concur to help the accompanier. This is what M. Rameau has, with great sagacity, attempted in his dissertation on the different methods of Accompaniments.

As the ancient music was not so well composed as ours is, either for harmony or singing, and had scarcely any other bass than the fundamental, all the Accompaniments consisted in a series of perfect concord, wherein the accompanier from time to time substituted a sixth to a fifth, as the ear guided him: this was all the ancients knew; but, of late years, since we varied the modulations, and overcharged, and perhaps spoiled the harmony by a croud of dissonances, we are constrained to follow other rules. M. Campion conceives, it should be that which we call the rule of the octave; and it is by that method that the major part of the present masters shew the Accompaniments.

The concords are determined by the rule of the octave, relatively to the rank which the notes of the bass take up in any given tone. Thus, the tone being known, the note of the bass continues the rank of that note in the tone, the rank of the note that immediately precedes it, and the rank of that which follows it; and the player will not be much mistaken in accompanying by the rule of octave, if the composer has followed the most natural and simple harmony; but this is what we must not scarce expect in the modern music: besides, how can we have all these things present? And, notwithstanding that the accompanier is well acquainted with them, what must become of his fingers? He is scarce got at one

one concord but another presents itself; the instant of reflection is precisely that of execution; so that there is nothing but a consummate habitude of music, a reflected experience, and a facility of reading a line of music at first sight that can help him; and yet, even with this assistance, the most skilful musicians are often guilty of blunders.

Suppose, that, before we attempt Accompaniment, we have waited till the ear is formed, till we know how to read music fast, and that we are able to unravel a division upon opening the book; yet we shall still be at a loss, because we still want a habit of fingering, founded upon other principles of Accompaniment than those hitherto laid down by M. Rameau.

The most zealous masters have been perfectly sensible of the insufficiency of their principles; and, in order to remedy them, they have had recourse to enumeration, and the knowledge of consonances, whose dissonances are prepared and preserved. This is a prodigious detail, as is sufficiently apparent by the multitude of dissonances.

There are some who advise us to learn composition before we attempt Accompaniment, as if Accompaniment was not composition itself, exclusive of the talent to which we ought to join the practice of the other. And, on the contrary, how many people are there that would have us begin by Accompaniment to learn composition?

The movement of the bass, the rule of the octave, the manner of preparing and keeping dissonances, and composition in general, occur only to point out the succession of one concord to another; so that at each concord there is a new object and a fresh subject for reflection. What labour is here for the mind? When will it be sufficiently instructed, and the ear so thoroughly exercised, that the fingers may be no longer stopped?

It is to M. Rameau (who, by his invention of new signs, and the perfection of fingering, has shewn us the means of facilitating Accompaniment) that we are indebted for a new method, which secures us from the inconveniences of all the others that we have hitherto followed; and it is he who was the first that brought us acquainted with the fundamental bass, and discovered the true foundations of an art in which every thing had appeared arbitrary.

We shall, in a few words, lay before the reader the principles upon which his method is founded.

In harmony there are only consonances and dissonances; so that there are no more than consonant and dissonant concords. Each of these concords is fundamentally divided by thirds (this is M. Rameau's system). The consonant is composed of these notes, as *ut*, *mi*, *sol*; and the dissonant of four, as *sol*, *si*, *re*, *fa*.

Whatever distinction or distribution may be made of the consonant concord, there always must be in it three notes, *ut*, *mi*, *sol*; whatever distribution is made of the dissonant concord, we shall always find in it four notes, *sol*, *si*, *re*, *fa*, setting aside the supposition and suspension, which others of them introduce in the harmony, as it were, *per licentiam*. Either the consonant concords succeed each other, or the dissonant concords are followed by other dissonants, or the consonants and dissonants are intermingled.

The perfect consonant concord agrees only with the tonic, the succession of concords furnish so many tonics, and consequently the alterations of sound.

The dissonant concords commonly succeed each other in the same tone. The dissonance connects the harmonic sense. A concord makes us wish for another, and gives us to understand that the phrase is not finished. If the tone changes in that succession, the alteration is always declared by a diesis or by a *b* flat. As to the third succession, to wit, the intermingling of consonant and dissonant concords, M. Rameau deduces that succession to two cases, and asserts, in general, that a consonant concord cannot be preceded by any other dissonant than that of the seventh predominant, or that of the sixth fifth of the subpredominant, excepting in a broken cadence and suspensions; and he further pretends, that there are no exceptions as to the ground. It appears to us, that the perfect concord may still be preceded by a concord of the seventh diminished, and even by that of the sixth superfluous; two original concords, the latter whereof never defeats itself.

Here then are three different temperatures of harmonic phrases; of tonics that succeed themselves and occasion a change of tone; of consonances and dissonances which intermingle with each other, and where the consonance is, according to M. Rameau, necessarily preceded by the seventh of the predominant, or the sixth fifth of the subpredominant; what then remains to be done for the facility of Accompaniment, if it is not to indicate to the accompanier, that it is that of those temperatures which reigns in that which he accompanies?

This is what M. Rameau would have executed by characters: one single sign might easily indicate the tone, tonic, and its concord.

From thence we gather the knowledge of the diesis and of the *b* flats, which ought to enter into the series of the concords of one tonic into another.

The fundamental succession, either by fifths or thirds, as well in ascending as in descending, gives the first temperature of harmonic phrases intirely composed of consonant concords.

The fundamental succession by thirds or fifths, in descending, gives the second temperature, composed of dissonant concords, to wit, of concords of the seventh, and that succession gives the descending harmony.

The principal harmony is furnished by a succession of fifths in ascending, or fourths in descending, accompanied by the dissonance proper to that succession, which is the sixth added; and this is the third temperature of harmonic phrases, which has not hitherto been observed by any one; though M. Rameau has found the principle and origin of it in the irregular cadence. Thus by the ordinary rules harmony, which springs from a succession of dissonances, always descends, though, according to its true principles, and to reason, it ought to have in ascending a progression intirely as irregular as in descending.

The fundamental cadences give the fourth temperature of harmonic phrases, where the consonances and dissonances intermingle together.

All these temperatures may be denoted by single, clear, and few characters, which will at the same time indicate when the dissonance in general is necessary; for its place is always determined by the temperature itself.

We begin by exercising ourselves upon these temperatures taken separately, since we make them succeed each other upon each tone and upon each mode successively. With these precautions M. Rameau asserts, that we may make a greater progress in Accompaniments in six months, than before in six years, as he himself found by experience. *Diderot's Encycl.*

ACCOMPANIMENTS, in painting, are those objects which are added either by way of ornament or probability; it is natural to see guns, dogs, game, &c. in an hunting-piece; but it is not necessary, for the sake of probability, to put all sorts of them in; when we do introduce them, they are the Accompaniments which always greatly ornament a picture. We say of a picture that represents sportsmen, this piece should have some Accompaniment, as guns, games, &c. We say fine Accompaniments; that thing accompanies that part, group, &c. very well.

ACCOUNT, or ACCOMPT, *(Dict.)*—Is used collectively for the several books which merchants, traders, and bankers, keep, and in which they enter all their business, traffic, and bargains with each other. Hence they say, to make out an Account, to pass Accounts, &c.

To open an Account, is to enter it for the first time into the ledger. This is done by writing in large characters the christian name, firname, and place of abode of the person with whom an Account is thus opened: Afterwards the articles are posted to it, either on the debit or credit side, as affairs occur.

When an Account is opened in the ledger for any one, his name must be entered at the same time in the alphabet, and the folio of the book set down, where the Account is entered, for the more easily referring to it.

Merchants, who keep open Accounts with each other, sometimes agree to honour the bills of exchange, which they draw reciprocally.

To post a sum to Account, is to enter into the ledger, either on the debit or credit side, the articles for which persons become either debtors or creditors.

Order of an Account, is its division into three heads, of receipt, expence, and defalcation; that is, the deduction of such sums as are taken into the Account, and not received or admitted. The French call it reprise.

To examine an Account, is to read it exactly, to point the articles of it, and prove the computation, in order to know if there be no errors, and whether the balance be right. I have examined your Account, it is right, there is nothing to except against it.

To settle an Account, is to cast up, and calculating every article of it, and balancing the same. In the like sense are used the words to shut, to balance, to close, to make up an Account. Accounts are balanced upon the ledger on two occasions; the one, when traders settle or adjust affairs with some debtor or creditor, in order to know what they owe, or what is due to them: The other, when it is necessary, to carry over Accounts to some new folio's in the same book, or into another, in order to continue them, for want of room in the former.

Prudent merchants ought to settle their Accounts at the end of every year, in order to open new ones in the beginning of the next.

To place to Account, is to give one credit for a sum received, either of him, or for him. It signifies also to make him debtor for a sum paid to him, or for him. Thus, in a bill of exchange, the drawer puts sometimes these words after the sum, Which you will place to my Account, or to the Account of, &c.

Balance of an ACCOUNT, is the sum in which the debt exceeds the credit, or the credit the debt, when the Account is duly examined and settled, and the balance taken. I owe you 300 l. for the balance of our Account. There is so much due to me for the balance of our Account.

ACCOUNT *in bank*, is a fund which merchants, traders, bankers, and

and other private perſons, if they think fit, depoſit into the common caſh of ſome bank, to be employed in the payment of bills of exchange, promiſſary notes, bonds, debts contracted, either in trade or otherwiſe, as by buying eſtates in land, &c.

ACCOUNT *in company*, is a ſpecies of Account between two merchants, or traders, in conſequence of a kind of aſſociation, or partnerſhip between them.

ACCOUNT *of ſales*, is an Account given by one merchant to another, or by one factor to his principal, of the diſpoſal, charges, commiſſion, and net proceeds of certain merchandizes ſent for the proper, or company Account of him, who conſigned the ſame to ſuch factor or vender. When the like Account is inland or domeſtic, the ſame is tranſmitted in the current money of that country, wherein the buſineſs is tranſacted. As from a Blackwell-hall factor to the clothiers in the country, or from the warehouſe-men in town, who deal by commiſſion for the country manufacturers, as baiz-factors, drugget and duroy-factors, and the like.

The following is the natural form of a Blackwell-hall factor's Account of ſales to a clothier.

Account of ſales, charges, and net proceeds (or produce) C | D | of 20 pieces of ſuperfine cloth, received per A B's 1 a 20. waggon of — —, conſigned to me by C. D. of Wiltſhire, for his Account, marked and numbered as per margin.

	l.	*s.*	*d.*
January 5th, 1754. Sold to E. F. draper, 6 pieces of ſuperfines, per A B, quantity — yards at — per yard, to pay in 6 months.			
January 12th, 1754. Sold to G. H. 14 pieces, ditto, quantity — yards, at — per yard, to pay in 6 months.			
Charges.			
Paid carriage to London — —			
Porterage and warehouſe room —			
Poſtage of letters — —			
Commiſſion at — per cloth — —			
Deduct charges from the ſales.			

The net proceed is paſt the credit of your Account, without my prejudice.

London, February 10th, 1750. E. E. N. O.

An example of a foreign Account of ſales.

Account of ſales, and net proceeds of 2 bales of druggets, received per the Hollandia, Cap. Jan. Roeloff Smith, for the Account of M. P. of London.

November 4th, 1750. Conſigned the above two bales of druggets, quantity 112 pieces, quantity 4875 yards, as per factory (i. e. invoice which is frequently ſtiled ſo) which, at 3 ½ palms per yard, are palms 18280 net, at ſols 9 s. 4 d. per palm, to pay in two months — —	8530	13	4
Sold and conſigned 2 pieces of white druggets for wrappers as above, for	140	00	0
	8670	13	4
Charges, viz.			
Freight and primage — —	106	5	0
Porters landing and carrying to warehouſe	6	0	0
Opening to viſit, aſſorting and making up	4	0	0
Warehouſe room — —	8	0	0
Brokerage 2 ½ per cent — —	43	7	0
To commiſſion, and ſtanding to bad debts at 4 per cent.	346	16	4
	514	8	4
	8156	5	0
Aggio deducted at 118 ½ per cent	1283	0	2
Genoa, November 30, 1750. E. E. * Bco.	6873	4	10

* *E. E.* ſignifies errors excepted in the Account rendered, and *Bco.* ſignifies the bank money of Genoa. *Poſtlethwayt.*

ACENTE'TUM, a name given by the ancients to the fineſt ſort of rock cryſtal.

A'CER, in botany, the maple. See MAPLE.

ACE'RRA, in antiquity, and particularly among the Romans, was a ſort of altar erected near the bed of a dead perſon, and upon which the parents and friends of the deceaſed continually burnt incenſe till the inſtant of the funeral.

Acerra, more properly, ſignifies a little pot which held the incenſe and perfumes for ſacrifices, ſuch as are now made in the form of a ſmall boat, and are uſed in the church of Rome at this day. The rich, ſays Horace, offered boxes full of the fineſt perfumes to the deities:

Et plena ſupplex veneratur Acerra:

And the poor, according to Lucian, were excuſed for making a bow, and throwing ſome incenſe into the fire that burnt upon the altars. They were alſo placed, according to Feſtus, before dead bodies, and were quadrangular, like the greater arks or cheſts called κιβωτοί.

ACERSECO'MES, a name of Apollo; it ſignifies long-haired, becauſe they commonly repreſented this God with a head of hair like that of a young man.

ACE'STIDES, in foundery, a name given by the ancients to the chimnies of their furnaces, wherein braſs was made. They diminiſhed or narrowed from the bottom to the top, in order that the fumes of the metal when in fuſion might be collected therein, and that the cadmia might be formed there in great quantities.

ACETA'BULUM, in natural hiſtory. The Acetabulum has been formerly claſſed among the marine plants, but is now known to belong to the animal kingdom, and to be produced by ſea inſects: This production, by its ſubſtance, which is ſtony, does not appear to be analogous to plants, and is much leſs ſo when we conſider the figure. It is a ſmall baſon, formed in the ſhape of a cone reverſed, which, at its point, adheres to a very thin, longiſh pedicle: There are ſeveral of theſe pedicles, which ſeem to come out of a ſtone, ſhell, or ſome other hard body, to which they are faſtened. This appearance, together with other circumſtances, had introduced a miſtake in regard to the nature of the Acetabulum, as well as of many other pretended ſea plants, which was currently received till Mr. Peyſſonel diſcovered that they were animal productions. *Diderot's Encyclop.*

ACETO'SA, in botany, ſorrel. See the article SORREL.

ACE'TOUS, or ACETOSE, ſomething relating to vinegar: We ſay an Acetous taſte, Acetous qualities, &c. wine, and all other vinous liquors, are rendered Acetous, by exciting their ſalts, and tempering or abating their ſulphurs. Chemiſts give the preparation of divers aceta or Acetous liquors.

ACHA'NE, ἀχάνη, in antiquity, an ancient Perſian corn meaſure, containing forty-five Attic medimni. *Arbuthn. Diſſertat.* p. 104.

ACHA'TES. See AGAT.

ACHE'LAA, the name of one of the harpies: her ſiſters were called Alope and Ocypete.

ACHI'LEA, a name given by the ancient phyſicians to that ſpecies of gum called at preſent *ſanguis draconis*, or dragon's blood.

A'CHIA, a kind of cane, preſerved or pickled in vinegar with pepper, ſpices, and other ingredients: It is about the ſame length and conſiſtence with our girkins, of a yellow colour and fibrous texture. The Dutch import it from the Eaſt-Indies in earthern jars.

ACHI'LLEID, or ACHILLEIS, in polite literature, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but, being prevented by death, he has only treated of what concerns the infancy and education of his hero, and that hiſtory has remained imperfect. We call it a hiſtory, though we are not ignorant, that ſome celebrated authors have called it an epic poem; and that Julius Scaliger has even given Statius the preference to all the Greek and Roman heroic poets. But it is at preſent generally agreed, that Statius has treated his ſubject rather as an hiſtorian than as a poet, without attaching himſelf to that which makes the eſſence and conſtitution of a true epic poem; and that, as to diction and verſification, in endeavouring to raiſe himſelf, and appear great, he has fallen into bombaſt.

An epic poem is not the hiſtory of the whole life of a hero.

ACHIO'TTE, a red drug imported from America, generally called anatta. See ANATTA.

A'CHITH, in natural hiſtory and botany, a ſort of wine that grows in the iſland of Madagaſcar, and yields a fruit, which is called voachit, about the ſize of a green grape, and ripens in December, January, and February.

ACHO'ROU, is a ſpecies of laurel which grows in America, and is called Indian wood. This Indian wood grows to a large ſize, is hard, red, and uſed in works where ſolidity is required; its leaves and fruit are aromatic; the decoction of its leaves is taken in diſorders of the nerves, and in dropſies. Its fruit, which is in ſhape of a grape, and whoſe berries are rather oval than round, is of a deep violet colour, covered with a pellicule, which is thin and full of juice. It incloſes purple-coloured ſeeds, ſhaped like a kidney; the fleſh of thoſe birds who eat theſe ſeeds, is purple-coloured, and of a very bitter taſte.

ACHTE'LING, a liquid meaſure made uſe of in Germany; thirty-two Achtelings make an heemer, and four ſchiltens make an Achteling.

ACHTENDEE'LEN, or Achteling, a corn meaſure uſed in ſome parts of Holland; two hoeds of Gurmiheug make five Achtendeelens; twenty-eight Achtendeelens of Aſpeſen make thirty-two of Rotterdam, but there muſt be but twenty-ſix of thoſe of Worcum; twenty-nine Achtendeelens of Delft make twelve viertels of Antwerp; four Achtendeelens 1⁄2 of Delft make the hoed of Bruges.

A'CIDS, (*Dict.*)— Acids are, with great reaſon, looked upon by phyſicians, as one of the general cauſes of diſeaſes, and they undoubtedly occaſion ſeveral accidents, according to the part which they affect, while they are contained in the ſtomach.

mach. They cauſe ſour belchings, ſenſations of hunger, and painful prickings, which bring on the cardialgia, or heart-burn: When they get into the inteſtines, they, in the duodenum, diminiſh the action of the bile, and in others produce ſpaſmi, and the iliac paſſion; by cloſing up the lacteal veſſels they give birth to chronical diarrhœas, which often terminate in dyſenteries; when they mingle with the blood, they alter its quality, and produce a thickening in it, to which the lymph that ſhould ſupply matter for the ſecretions likewiſe finds itſelf ſubject; from thence ariſe obſtructions in the glands of the meſentery, a diſeaſe common to young children, the fibres, of which their parts are compoſed, being as yet too ſoft to blunt the points of the Acids which they meet in moſt parts of the aliments that they take. Sedentary perſons and ſtudents are often attacked with diſeaſes, of which the Acid acrimony is productive; diſſipation and exerciſe are very neceſſary to prevent thoſe diſorders, by promoting and augmenting perſpiration. The green ſickneſs to which girls are ſubject, either before the menſes have appeared, or on their being by any accident ſtopped, are likewiſe owing to an Acid acrimony; and this occaſions that depraved appetite which they have for coals, chalk, the plaiſter of walls, and other things of that ſort; all which are abſorbent, and reſiſt the Acids.

We attain the end in deſtroying the Acids, and ſtopping the ravages which they make, when we are ſo happy as to find their exiſtence in the ſtomach, by partly evacuating them by the help of emetics, which muſt be followed by the uſe of abſorbents, and aperitive and martial remedies, which are very proper to give a ſpring to the ſolids, and fluidity to the liquids: In ſhort, by making uſe of thoſe remedies that, readily fermenting with the Acids, form ſalts of a particular nature, and which have a ſtimulating and diaphoretic virtue, and are capable of reſolving obſtructions.

All theſe remedies muſt be adminiſtered with great caution, and we muſt always have a regard to the ſtrength, age, conſtitution, and ſex of the patient. *James's Med. Dict.*

ACI'DULATED, in pharmacy, ſignifies in general whatever has an acid juice mixed with it, in order to render certain refreſhing liquors of an agreeable taſte; as limonade, gooſberry water, verjuice, juice of barberries, and the tincture of roſes, in which they put ſome drops of ſpirit of vitriol, juſt to give them an agreeable acidity.

Mineral ſpirits, dulcified with ſpirit of wine, muſt here find a place, ſuch as ſpirit of vitriol, ſulphur, nitre, and ſea ſalt. This name is ſuitable to cold water; and ſome phyſicians have given them that appellation, to diſtinguiſh them from Bath waters, which are hot.

ACME'LLA, in botany, a plant which comes from the iſland of Ceylone, where it is very common. P. Hotton, profeſſor of botany at Leyden, gives this account of it. The flowers of this plant grow on the extremities of the ſtalks, and are compoſed of a great many tubulous yellow floſculi, which by their union form a head ſuſtained by a perianthium of ſix leaves; when theſe floſculi fall off, the ſeeds appear, which are of a dark grey, long and ſmooth, except that at the top, immediately under the floſculi, they are furniſhed with a double beard, which make them forked; the ſtalk is ſquare, and cloathed with leaves that grow by pairs like thoſe of the lamium or dead-nettle, but longer and more pointed.

The great reputation it has obtained in diſſolving and curing the ſtone has rendered it famous. In the year 1690, a Dutch officer affirmed to the Dutch Eaſt-India company, that he had cured upwards of a hundred perſons of the ſtone and nephritic complaints, only by the uſe of this plant, and this teſtimony was confirmed by that of the governor of Ceylon. In 1699, the firſt ſurgeon of the hoſpital in the city Columbo wrote the ſame things of the Acmella to P. Hotton; that ſurgeon, in his letter, diſtinguiſhed three ſorts of Acmella, differing from each other, particularly in the colour of the leaves, and he recommends that ſort with a black ſeed and large leaves, as the beſt; the leaves are gathered before the flowers appear; they are dried in the ſun, and taken in powder, in tea, or ſome other convenient vehicle. A ſpirit is alſo prepared by diſtillation from the root, ſtalks, and branches, infuſed in ſpirits of wine; they likewiſe uſe the flowers, the extract of the root, and the ſalt of this plant, in pleuriſies, cholics, and fevers.

As a plant of ſo great an importance and uſe cannot be too well known, we ſhall, to the preceding deſcription, add that of Breynius; that author ſays, the root is fibrous and white, its ſtalk ſquare, and about a foot in height, dividing itſelf into ſeveral branches; that its leaves are long, pointed, rough, and a little dented, and that its flowers grow at the extremity of its branches.

The ſame author adds, that the tincture of Acmella made with ſpirits of wine, or in ſome antinephritic decoction, may be taken twice or three times in a day to facilitate the voiding of gravel and ſtones.

We cannot too much excite the naturaliſts to ſearch into the properties of this plant: What happineſs might there redound to mankind, if upon a ſtrict examination thoſe virtues which are attributed to it, ſhould be diſcovered: And what man would better merit immortality, than he who ſhould undertake the taſk? Perhaps indeed he might be obliged to make a voyage to Ceylon.

Animal ſubſtances acquire ſingular qualities by the uſe which animals make of certain aliments, rather than of others; and why may it not be the ſame with vegetable ſubſtances? If this induction be reaſonable, it follows, that any given plant, gathered on one ſide of a mountain, will have a virtue that is not to be found in a plant of the ſame ſort, gathered on the other ſide; that ſuch a plant had formerly a property, which it has not at preſent, and perhaps will never regain; that fruits, vegetables, and animals, are in perpetual viciſſitude, in reſpect of their qualities, forms, and elements; that our anceſtors, who lived four thouſand years ago, did not, or rather that our poſterity ten thouſand years hence will not, perhaps, know thoſe fruits which we now have, by comparing them with the moſt exact deſcriptions, which we have made of them; and, conſequently, that we ought to be extreamly reſerved in the judgments we paſs on thoſe paſſages, wherein the ancient hiſtorians and naturaliſts treat of form, virtues, and other qualities, which are in a perpetual motion of alteration.

It may indeed be ſaid, if ſalubrious aliments degenerate into poiſons, on what muſt animals live? There are two anſwers to this objection; firſt, that, the form and conſtitutions of animals altering in the ſame proportion, and by the ſame ſenſible degrees, the one is always ſuitable to the other. Secondly, that, if a ſubſtance happen to degenerate with too great rapidity, animals will abandon the uſe of it. We are told, that the malum Perſicum, or peach, was firſt brought to us from Perſia as a poiſon; however, it is in our climate an excellent fruit, and a very wholſome food.

A'CORN, in natural hiſtory and agriculture, the fruit produced by trees of the oak kind. For the method of planting acorns, &c. ſee t he article OAK.

A'CRIMONY, in the humours, is a malignant quality, which they contract by a great number of cauſes, as too much agitation, &c. This quality conſiſts in looſening the ſalts, and ſome tendency to alkalization, in conſequence of the extream diſſipation of the aqueous vehicle that envelops them; from whence we plainly ſee, how hurtful long abſtinence muſt be to the generality of conſtitutions.

A'CTION, is a term ſometimes made uſe of in mechanics, to denote the effort which one body or power makes againſt another body or power, and ſometimes the effect itſelf of that effort.

It is in order to conform ourſelves to the common language of mechanics, and natural philoſophers, that we give this double definition: For if we are aſked, what we ought to underſtand by Action, by attaching to that term clear ideas only, we anſwer, that it is a motion that a body really produces, or tends to produce, in another, that is to ſay, ſuch a motion as it would have produced if nothing had hindered it. See MOTION in the dictionary.

In effect, all power is no more than a body which is actually in motion, or which tends to move itſelf, that is to ſay, a body which would move itſelf, if nothing hindered it. Whence it follows, that, in a body which actually moves, or that tends to move, we clearly ſee the motion only which it has, or that it would have, if it had no obſtacle. The Action therefore of body manifeſts itſelf to us by its motion only, and, therefore, we muſt not fix any other idea of the word Action, than that of an actual motion, or a ſimple tendency; and it is only confounding that idea to join thereto that of I know not what metaphyſical being, which we imagine reſides in the body, and of which no one can have a clear diſtinct notion; it is to the ſame miſtake that we are indebted for the famous queſtion of living forces, which, according to all appearances, had never been a ſubject of diſpute, if we had thoroughly obſerved, that the only preciſe and diſtinct notion that one can give to the word force, reduces it to its effect, that is, to the motion it produces or tends to produce.

ACTION, in the military art, is an engagement between two armies, or between different bodies of troops belonging thereto. The word is likewiſe uſed to ſignify ſome memorable act done by an officer or commander of a body of troops.

ACTION, in law, is a judiciary demand, founded upon a title or law, whereby the plaintiff ſummons the defendent to ſatiſfy him for that to which he is obliged, in virtue of the one or the other, and, for defect whereof, he requires that he ſhould be condemned by the judge.

Actions are divided, by Juſtinian, into two general kinds; real, or thoſe againſt the thing, and perſonal, or thoſe againſt the perſon; for whoever brings an Action, either does it againſt one obnoxious to him, in reſpect either of contract or of offence; in which caſe ariſe Actions againſt the perſon, which require to do or give ſomething; or he does it againſt one not obnoxious, yet with whom a controverſy is riſen, touching ſome matter; as if Caius holds a field, which Julius claims as his property, and brings his Action for the ſame. See the Inſtitut. l. 4. tit. 4. where the principal Actions introduced by the Roman law are ſummarily explained.

C There

There is also a third kind of Action, which arises out of the two former classes of real and personal Actions, and which is called a mixed Action.

Real Action, is that whereby the plaintiff sues for the right which he has to lands, tenements, rents, or other payments; and of this there are two sorts, either the possession or demand. An Action is merely real when it singly attacks the thing, and the detainer is clear upon giving it up; but, if he is personally obliged to the restitution of fruits or interests, in that case it is mixed.

Personal Action, is that which one man has against another, in consequence of a contract, whereby he is obliged to pay or do something, or by reason of an offence done by him, or by some other person for whose fact he is answerable. In the first case the Action is civil, and in the other it is or may be criminal.

Mixed Action, is that which is either laid against the person of the detainer of the thing, or for the thing detained, being thus called, because it hath a mixed respect, both to the thing and to the person.

They generally reckon three sorts of mixed Actions, the Action of partition between coheirs, of division between associates, and limitations between neighbours.

Actions, are also divided into civil, penal, or criminal: The civil Action, is that which tends only to the recovery of that which belongs to a man, by virtue of a contract, or of some some such-like cause; as if any one should endeavour to recover, by way of Action, a sum of money which he has lent.

Penal or *criminal* Action, tends to the punishment of the party accused or prosecuted, either corporally or pecuniarily.

French Actions, in commerce. There are at present three sorts of them, to wit, simple Actions, rentiere Actions, and interested Actions.

The simple Actions, are those which have a share in all the profits of the company; and are likewise liable to bear all losses, having no other security than the funds of the company.

The rentiere Actions, are those which are intitled to a sure profit of two per cent. for which the king is surety, as he was for the rents upon the city.

The interested Actions hold, if I may say so, the middle place between the other two: They have two per cent. fixed income with the king's warrantry, in the same manner as the rentiere Actions; and, besides which, they are also to share the overplus of the dividend with the simple Actions. These last Actions have been created in favour of ecclesiastical communities. *Savary's Dict. Com.*

A'CULER, in the menage, is used for the motion of a horse, when in working upon volts he does not go far enough forward, at every motion, so that his shoulders take in too little ground, and his croupe comes too near the center of the volt.

ADA'MICA *Terra*, in natural history. The bottom of the sea is covered with a salt, glutinous, fat, and mucilaginous mud, like a jelly, as is easily discovered after the tide is out. This mud makes those places it has abandoned so slippery, that it is difficult to walk upon them; it appears to be a settlement of all the most slimy and unctuous parts contained in the waters of the sea, which is continually precipitating themselves in the same manner as the sediment which fresh water insensibly throws down to the bottom of those vessels wherein it is contained, from a kind of slime or silt, which is called Adamica terra. It is conjectured, that, besides the great quantity of fish and plants which continually die and perish in the sea, the air still contributes something to the augmentation of that mud we are speaking of, for it is observed that the Adamic earth is found in greater quantities in such vessels as are only covered with a cloth, than in those which have been hermetically sealed. Memoirs of the Royal Academy of Sciences, for the year 1700, page 29.

A'DAR, in ancient history and theology, the twelfth month of the holy year of the Hebrews, and the sixteenth of their civil year. It consists but of 29 days, and answers to our February; sometimes it enters into the month of March, according as the moon's course falls out.

As the lunar year, which the Jews followed in their calculations, is shorter than the solar year by eleven days, which, at the end of three years, makes one month, they then intercalate a thirteenth month, which they call Veadar, or the second Adar, which has twenty-nine days.

A'DDER, in natural history, a venomous reptile of the serpent kind, generally called a viper. See VIPER in the dictionary.

A'DDER's *Tongue*, in botany. See OPHIOGLOSSUM.

ADDI'TIONS, in distillation, a general name for whatever is added to the wash in the time of fermentation, in order to increase the vinosity of the spirit, procure a larger quantity, or give it a particular flavour.

These Additions may be included under the four heads of salts, acids, aromatics, and oils. A little finely powdered tartar, nitre, or common salt, may be thrown into the fermenting liquor, at the beginning of the operation: or in their stead a little of the vegetable, or fine mineral acids, may be dropt in, at different times, where they are found necessary: As particularly in the case of treacle, honey, and other sweet and rich vegetable juices, which either want a natural acid, have been robbed of it, or hold it but in a small proportion. To this end may be used juice of lemon, oranges, &c. spt. sal. Glaub. ol. sulphur. per campan. &c. But the most effectual thing for the purpose is a particular aqueous solution of tartar; a succedaneum for which may be tamarinds, or the robs of some very acid fruits; or, better still, the media substantia vini. On which foundation stands the ingenious practice of constantly using a suitable proportion of the still-bottoms, or remaining wash, in the subsequent brewing. The Additions are manifestly designed to give a vinous acidity, or improve that naturally afforded by the subject, without any expectation of considerably increasing the quantity of the spirit; which is the more immediate use and design of aromatics and oils; at the same time that they give, alter, or improve a flavour.

All the pungent aromatics have a surprizing property of increasing the quantity of spirit; but their use requires a close or compressed fermentation; and, if the quantity intended be large, that the Addition be not made all at once, lest the oiliness of the ingredients should hinder the operation. But, if flavour be the only thing required from them, these Additions should be delayed till towards the end of the fermentation. After the same manner a very considerable quantity of any essential vegetable oil may, by the proper encheiresis, be converted into a surprisingly large quantity of inflammable spirit; but great care must here again be had not to drop it in too fast, or too much at a time; which might easily damp the fermentation; and is one of the known ways of checking, or totally stopping this operation at any point of time required. The best method of introducing the oil, so as to avoid all inconvenience, is to bring it into an elæosaccharum; which will readily enter the body of the liquor, and directly ferment along with it. In the like prudent manner of proceeding, a large proportion of brandies, or highly rectified spirit of wine, may be introduced into any fermenting liquor. *Shaw's Distil.*

A'DDITIVE *Equations*, in astronomy, are those which are to be added to the sun's mean anomaly, in order to discover the true anomaly.

ADENO'GRAPHY, in anatomy, a description of the glands. This word is compounded of the Greek ἀδὴν, a gland, and γράφω, to describe.

We have a book wrote by Wharton, intituled Adenography, printed in 12°. at London, in 1650, and another work under the same title wrote by Nucke printed in octavo at Leyden, in 1691 and 1722.

ADHE'SION, in philosophy.—The Adhesion of leaden balls is so very considerable, that with two (not weighing above a pound each, nor touching upon more than $\frac{1}{50}$ of a square inch surface) I have lifted above 150 pounds weight. In order to this, the surfaces by which they touch, must be finely planed with the edge of a sharp penknife, and equally pressed together with a considerable force, with a gentle turn of the hand at the same time; and thus two common leaden bullets will adhere so firmly together, as to require upwards of 50 pounds, to separate them.

In polished surfaces that are very hard, as glass, brass, &c. It is impossible to bring them into such close contact as to cohere without the interposition of water, or something humid to fill the pores by expelling the air contained therein, which prevents the planes coming together while dry; the humidity in this case proves a cement which holds the planes together by all its force of attraction on either side.

This force of attraction between the brass planes is greater with oil than with water; and greater with any sort of grease or fat that will harden with cold, than with oil. I never yet could meet with two men strong enough to separate planes thus put together, which are but four inches and a half diameter; and, therefore, they cohere with a force much superior to the force or pressure of air on such a surface, which contains about 14 square inches, and, allowing 15 pounds for pressure to every inch, it will amount to but 210 pounds, which is not near equal to the strength of two men pulling against each other to the best advantage.

Professor Muschenbroeck has made many experiments to shew the force of cohesion between planes of various substances, and about 2 inches diameter, well polished, having first heated them in boiling water, and then besmeared them first with a cold tallow-candle, and afterwards with boiling grease, and the weights to separate them were as in the following table:

	cold grease	hot grease
Planes of glass ——	130 lb.	300 lb.
of brass ——	150	800
of copper ——	200	850
of marble ——	225	600
of silver ——	150	250
of iron ——	300	950

These

These planes adhere by other sorts of matter with forces, as in the table below, where the weights necessary to separate them are specified:

With water	— —	12 ounces.
With oil	— —	18 ounces.
With Venice turpentine		24 ounces.
With rosin	— —	850 pounds.
With tallow candle	—	800 pounds.
With pitch	— —	1400 pounds.

Though these experiments would not always give the same numbers, yet they sufficiently shew the vast attractive forces, and the very great difference between them.

After this he gives us an account of his experiments made, to find the force with which bodies cohere naturally, or what is the absolute force of cohesion in various bodies, which he estimates by the weights required to pull them asunder, drawing according to their length; this he tried first in wood, and afterwards in metal. His pieces of wood were of a long square form, of which each side was $\frac{26}{100}$ of an inch, and by weights suspended they were drawn asunder, according to the several sorts, as mentioned below:

Wood of linden-tree	— —	1000 lb.
of alder	— —	1000
of fir	— —	600
of oak	— —	1150
of elm	— —	950
of beech	— —	1250
of ash	— —	1250

The trial he made with metals, was of weights suspended to wires of each sort, whose diameter was $\frac{1}{10}$ of a Rhindland inch; or, because the Rhindland foot is to ours as 139 to 135, the wire was $\frac{103}{1000}$ part of an inch English.

The metals and weights were as follow:

Of copper	—	299$\frac{1}{4}$ lb.
Of yellow brass		360
Of gold	— —	500
Of silver	—	370
Of iron	— —	450
Of tin	—	40$\frac{1}{2}$
Of lead	— —	29$\frac{1}{4}$

These experiments shew the absolute force of cohesion in bodies. That which he calls the relative force, is that by which any body resists the force of any other body, acting upon it in a direction perpendicular to its length; and this he estimated in the same pieces of wood as before, by putting one end into a square hole of a metal plate, and hanging weights towards the other end sufficient to break each piece of wood at the hole. These weights and distances from the hole were in his experiments as follow:

	distances.	weights.
Fir	— 9 inches	40 ounces.
Oak	— 8$\frac{1}{2}$	— 48
Elm	— 9	— 44
Pine	— 9$\frac{1}{2}$	— 36$\frac{1}{2}$
Alder	— 9$\frac{1}{4}$	— 48
Beech	— 7	— 56$\frac{1}{4}$

Such as would see more on this subject, may consult the author's admirable *Essai de Physique*; and his treatise of the cohesion of bodies, altogether on the subject.

ADIA'NTUM. See the article MAIDENHAIR in the dictionary.

A'DMIRAL, a name given a very beautiful shell of the voluta kind. (See *Plate* III. *fig.* 1.) The enamel which covers it is very bright and elegant, and variegated with bands of yellow, representing, in some measure, the flags of a ship of war; whence it obtained its name. Its distinguishing character is a fine denticulated line, running along the center of the large yellow band.

There are four species of these shells. 1. The grand admiral. 2. The vice admiral. 3. The orange admiral, and 4. The extra admiral. But the first is by far the most valuable.

ADRA'STIA, in antiquity, an epithet given to the goddess Nemesis, or revenge; because king Adrastus first erected a temple to that Deity.

ÆGAGRO'PILA, or ÆGAGROPILUS, in natural history; see the article *German* BEZOAR, in the dictionary.

A'EM, or AM, a liquid measure used in most parts of Germany, and contains generally 20 vetals, or 80 masses. At Heidelberg it is 12 vertels, and the vertel 4 masses, which reduces the Aem to 48 masses: and in Wirtemberg the Aem is 16 yunes, and the yune 10 masses, which makes the Aem amount to 160 masses.

AERO'GRAPHY *, a description of the air or atmosphere, its properties, limits, dimensions, &c.

* The word is compounded of the Greek ἀὴρ, air, and γράφω, to describe.

AFFECTA'TION, in language and conversation, is a very common fault in those who pass under the denomination of fine speakers. It consists in using far fetched terms and hard words, those too, sometimes ridiculously chosen, in speaking of trivial or common subjects: for this reason fine speakers are so intolerable to men of genius, who are more ambitious of thinking than speaking well, or rather because men of genius are of opinion, that in order to speak well it is sufficient to think well; that a thought, which is new, strong, just, and clear, carries its own expression along with it; and that a common thought should never be dressed above itself, that is to say, higher than in common language.

AFFECTATION, in style, is nearly the same thing as Affectation in language, but with this difference, that what we write must naturally be more correct, than what we speak, because we are supposed to think more accurately on what we write; whence it follows, that those who are sometimes affected in their conversation, are not always so in their writing.

AFFE'CTION, in a physiological sense, may be taken in general for the impression that internal or external Beings make on the soul. But Affection is taken more commonly for that lively sense of approbation or dislike, which objects, whatever they are, create in us; thus we say of a picture, which represents things offensive in nature to the senses, that we are shocked, or disagreeably affected at it. We say of an heroic action, or rather of its recital, we are delightfully affected by it.

Such is our frame and the construction of our bodies, that, when the soul is in a disposition to conceive love or hatred, pleasure or aversion, there arise in the body certain muscular motions, on which, in all probability, the intenseness or relaxation of these conceptions depends. Joy is attended with a great dilatation of the heart, the pulse beats high, the heart palpitates in a very sensible degree, the transpiration is so extraordinary as often to have been followed by swoonings, and sometimes even death itself. Anger either suspends or increases all the motions in the body, especially the circulation of the blood, which makes the body hot, red, trembling, &c. Now it is evident, these symptoms are more or less violent, according to the disposition of the parts and the mechanism of the body. The mechanism of the body is rarely such, that it can suspend the free action of the soul by the force of its impressions. But, that this has sometimes happened, there is no room to doubt; it is in the mechanism of the body we must seek the cause why different men are so differently affected by the same object. In this we resemble musical instruments which have strings of a different extension. External objects perform on us the office of bows on these strings, and we all give sounds more or less sharp. Our constitutions, our education, our principles, our systems, our prejudices, all modify our Affections, and the motions of the body, which are the consequences of them. An Affection may be so instantaneous and so strong, that what causes the Affection may seem to produce effects which make free agency a question. But it is evident by what has been said above, that the first motion is more or less durable, according to the difference of constitutions and in infinite number of other circumstances. Let us therefore be very cautious how we judge of those actions that proceed from violent passions. It is better in these cases to be favourable than severe in our sentence; to suppose that the weakness rather than the wickedness of men may have carried them beyond themselves: we pity weakness, abhor wickedness; and surely pity is more suitable to the human character than hatred.

A'GATE, see ACHATES in the Dictionary.

Agate and jasper stones are easily tinged, but such of these stones as are naturally smooth, are for the same reason composed of so many heterogeneous parts, that the colour will not strike uniformly, so that we can only make spots, to compleat the regularity of those we find in them; but not entirely change their colour, as we can in the white Agate called the chalcedony. If you put a solution of silver in spirit of nitre, on a piece of the white Agate, or chalcedony, and expose it to the sun, you will find it tinged at the end of some hours, of a brown colour, approaching to red; and, if some fresh solution be applied, it will pierce deeper still, and the tincture will entirely penetrate the stone. If the Agate exceeds not the thickness of two twelfth parts of an inch, and the tincture be applied on both sides, it does not act uniformly. There are in this sort of Agate, and the generality of other hard stones, veins, which, tho' almost imperceptible, are more easily penetrated by the tincture than by the other parts, become more deeply tinged, and form a very agreeable variety. If you add to the solution above one fourth of it's weight, or thereabouts, of soot and red tartar mixed together, the colour will be brown of a grey cast. Instead of soot and tartar if you apply the same quantity of allum, the colour will be a deep violet, approaching to black. A solution of gold only gives the Agate a light brown, which penetrates very little; of tin, a colour that in a direct light looks of a darkish white, but brown in a side-light. Other solutions of metals and minerals applied in the same manner have no effect.

To succeed in this operation, it is necessary to expose the Agate to the sun. Monsieur Du Fay tried some under a muffle, but the colour struck very weak and imperfectly. He has frequently observed even that those exposed to the sun have taken less colour in the course of the whole first day, than in half an hour of the second, without adding any fresh solution, which made him suspect that a humidity of air is requisite to make the metalline particles penetrate. In short, he made

made Agate take their tinge very readily, by carrying them into a damp place, as soon as the sun had dried the solution, and then exposing them to the sun again.

To trace figures of some regularity on the chalcedony, or white Agate, the best way is to take the solution of silver on a feather or little cleft stick, and trace the contour or outlines with a pin; if the Agate be unpolished, the stroke is never very fine, because the solution soon spreads itself; but, if it be well charged with silver, and the Agate immediately exposed to the sun, there is no great risk of too much diffusion, and the strokes will be neat enough; they will not, however, be so fine as those drawn by a pencil, and, consequently, inferior to those little trees which we see so delicately formed in the dentrite.

Supposing, however, we could find a method of imitating them, there are two ways of distinguishing the natural from the artificial; first, if you heat the Agate coloured by art, it loses a great quantity of its colour, which it will not recover without a fresh application of solution of silver. The second, which is, indeed, the easiest and most simple way, is to put a little aqua fortis, or spirit of nitre, on coloured Agate, keep it from the sun, and, in one night's time, it will take the tinge entirely out: after the experiment is made, the colour may be restored by exposing the Agate several days following in the sun; but we must not depend much on this, as you will see in the sequel.

It is very well known, we can change the colour of most precious stones by fire; thus you may make sapphires and amethists white: put these stones into a crucible, surround them with sand, or steel filings, and they lose their colour in proportion as they receive heat; they are sometimes taken out perfectly white. If you heat the common chalcedony in the same manner, it becomes a darkish white; if you make spots in it with a solution of silver, they turn into a yellow citron, on which aqua fortis effects no mutation. Solution of silver put on the chalcedony, blanched in this manner, and set in the sun several days following, makes brown spots in it.

Solution of silver gives the oriental Agate a deeper black than the common chalcedony. To the Agate interspersed with yellow spots it gives a purple. See Mem. of the Acad. 1728, by M. Du Fay. I have observed before, speaking of the method to discover whether the colour of Agate be natural or artificial, we should not trust too much to aqua fortis. In short, M. De la Condamine put two natural dendrites into aqua fortis three or four days, and they suffered no mutation; the same dendrites, on which the experiment had been made, being accidentally left in a window fourteen or fifteen days, in a wet season, a little rain casually got into the aqua fortis, by which means the branches and lines in the dendrites were totally effaced; the same thing happened to another, at least, as much of it as had been dipped in the aqua fortis.

A'GRICULTURE *(Dict.)*—To cultivate lands to advantage, we must be previously acquainted with the nature of the soil; this requiring one culture, that another; this is better adapted to one kind of grain, that to another. Under the articles LAND and SOIL the reader will find what generally relates to this subject; and, under the names of the different species of corn and plants, their proper soil and culture: we shall here only consider Agriculture or tillage in general. This consists in dividing the ground by the spade, plough, hoe, or other instruments, which divide by a sort of attrition, or contusion, as dung does by fermentation. See DUNG.

Every time the earth is broken by any sort of tillage, or division, there must arise some new superficies of the broken parts which never has been open before: for, when the parts of earth are once united and incorporated together, it is morally impossible that they, or any of them, should be broken again, only in the same places; for, to do that, such parts must have again the same numerical figures and dimensions they had before such breaking, which, even by an infinite division, could never be likely to happen; as the letters of a distich, cut out and mixed, if they should be thrown up never so often, would never be likely to fall into the same order and position with one another, so as to recompose the same distich.

Although the internal superficies may have been drained by a preceding crop, and the next plowing may move many of the before-divided parts, without new breaking them, yet such as are new broken, have, at such places where they are so broken, a new superficies, which never was, or did exist before; because we cannot reasonably suppose, that any of those parts can have in all places (if in any places) the same figure and dimensions twice.

For, as matter is divisible ad infinitum, the places or lines whereat it is so divisible must be, in relation to number, infinite, that is to say, without number; and must have at every division superficies of parts of infinite variety in figure and dimensions.

And, because it is morally impossible the same figure and dimensions should happen twice to any one part, we need not wonder how the earth, every time of tilling, should afford a new internal superficies (or artificial pasture;) and that the tilled soil has in it an inexhaustible fund, which, by a sufficient division (being capable of an infinite one) may be produced.

Tillage, as well as dung, is beneficial to all sorts of land. Light land, being naturally hollow, has larger pores, which are the cause of its lightness: this, when it is by any means sufficiently divided, the parts being brought nearer together, becomes, for a time, bulk for bulk, heavier, i. e. the same quantity will be contained in less room, and so is made to partake of the nature and benefits of strong land, viz. to keep out too much heat and cold, and the like.

But strong land, being naturally less porous, is made, for a time, lighter, as well as richer, by a good division; the separation of its parts makes it more porous, and causes it to take up more room than it does in its natural state; and then it partakes of all the benefits of lighter land.

When strong land is plowed, and not sufficiently, so that the parts remain gross, it is said to be rough, and it has not the benefit of tillage, because most of the artificial pores, or interstices, are too large; and then it partakes of the inconveniences of the hollow land untilled.

For, when the light land is plowed but once, that is not sufficient to diminish its natural hollowness, or pores; and, for want of more tillage, the parts into which it is divided by that once (or perhaps twice) plowing, remain too large; and consequently the artificial pores are large also; and, in that respect, are like the ill-tilled strong land.

Light land, having naturally less internal superficies, seems to require more tillage or dung to enrich it; as when the poor, hollow, thin downs have their upper part (which is the best) burnt, whereby all, except a caput mortuum, is carried away; yet the salts of this, spread upon that barren part of the staple which is unburnt, divide it into so very minute particles, that their pasture will nourish two or three good crops of corn: but then the plough, even with a considerable quantity of dung, is never able afterwards to make a division equal to what those salts have done; and therefore such burnt land remains barren.

Artificial pores cannot be too small, because roots may the more easily enter the soil that has them; quite contrary to natural pores; for these may be, and generally are, too small, and too hard for the entrance of all weak roots, and for the free entrance of strong roots.

Insufficient tillage leaves strong land with its natural pores too small, and its artificial ones too large. It leaves light land with its natural and artificial pores both too large.

Pores that are too small, in hard ground, will not easily permit roots to enter them.

Pores that are too large, in any sort of land, can be of little other use to roots, than only to give them passage to other cavities more proper for them; and, if in any place they lie open to the air, they are dried up and spoiled before they reach them.

For fibrous roots (which alone maintain the plant, the other roots serving to receive the chyle from them, and convey it to the stem) can take in no nourishment from any cavity, unless they come into contact with, and press against, all the superficies of that cavity which includes them; for it dispenses the food to their lacteals by such pressure only: but a fibrous root is not so pressed by the superficies of a cavity whose diameter is greater than that of the root.

The surfaces of great clods form declivities on every side of them, and large cavities, which are as sinks to convey, what rain and dew bring, too quickly downwards below the plowed part.

The first and second plowings with common plows scarce deserve the name of tillage; they rather serve to prepare the land for tillage.

The third, fourth, and every subsequent plowing, may be of more benefit, and less expence, than any of the preceding ones.

But the last plowings will be most advantageously performed by way of hoeing. See HOEING.

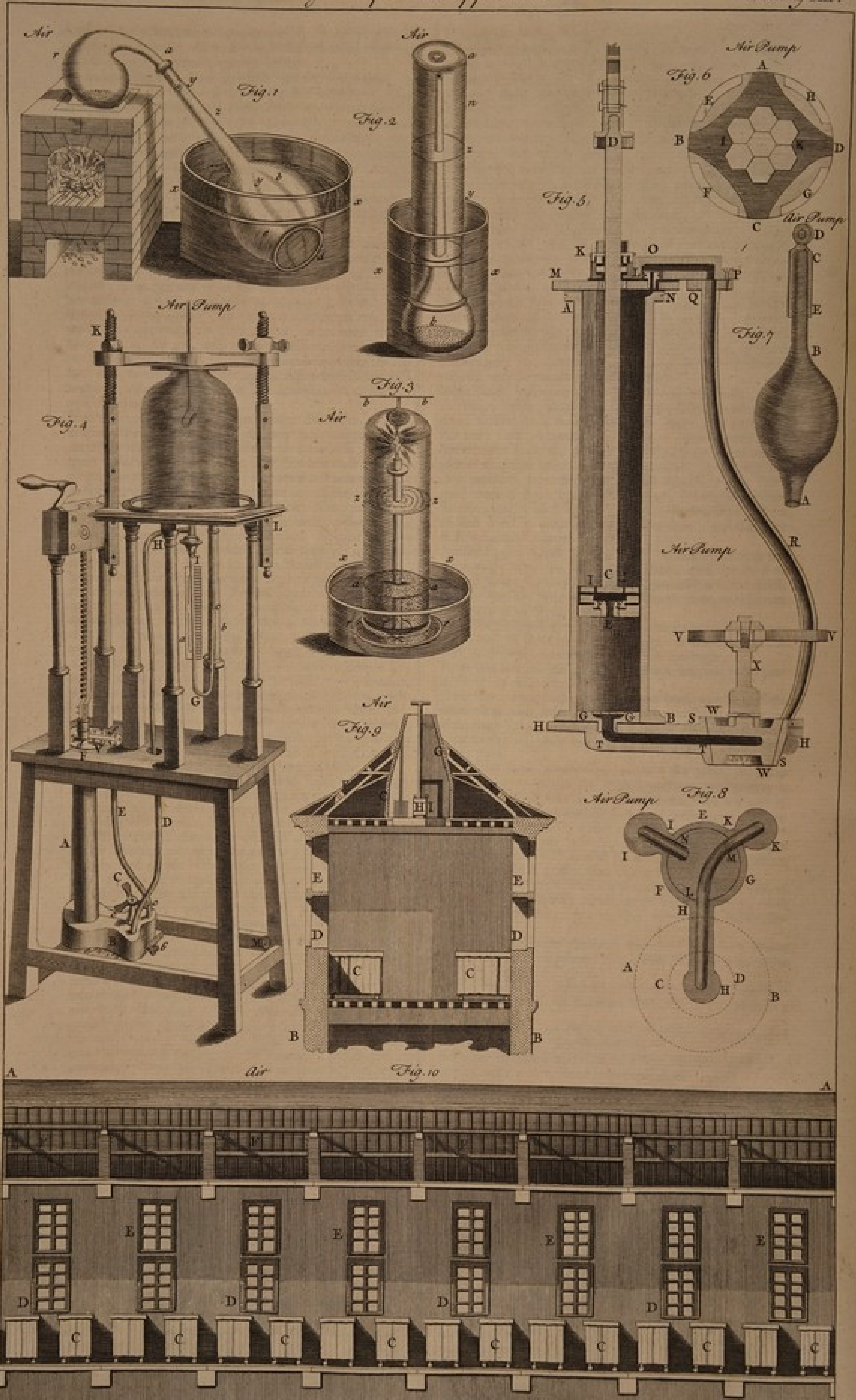
For, the finer land it is made by tillage, the richer will it become, and the more plants it will maintain.

It has been often observed, that when part of a field has been better tilled than the rest, and the whole ground constantly managed alike afterwards for six or seven years successively; this part that was but once better tilled, always produced a better crop than the rest, and the difference remained very visible every harvest.

One part being once made finer, the dews more enriched it; for they penetrate in and beyond the superficies, whereto the roots are able to enter: the fine parts of the earth are impregnated, throughout their whole substance, with some of the riches carried in by the dews, and there reposited; until, by new tillage, the insides of those fine parts become superficies; and, as the corn drains them, they are again supplied as before; but the rough large parts cannot have that benefit; the dews not penetrating to their centers, they remain poorer.

I think nothing can be said more strongly to confirm the truth of this, than what is related by the authors quoted by Mr. Evelyn, to this effect, viz.

'Take of the most barren earth you can find, pulverize 'it well, and expose it abroad for a year, incessantly agita- 'ted; it will become so fertile as to receive an exotic plant 'from



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"from the fartheſt Indies to cauſe all vegetables to proſper in "the moſt exalted degree, and to bear their fruit as kindly "with us as in their natural climates."

This artificial duſt, he ſays, will entertain plants which refuſe other violent applications; and that it has a more nutritive power than any artificial dung or compoſt whatſoever: and further that, by this toil of pulverizing, "it is found, "that ſoil may be ſo ſtrangely altered from its former nature, as "to render the harſh and moſt uncivil clay obſequious to the "huſbandman, and to bring forth roots and plants, which "otherwiſe require the lighteſt and holloweſt mould."

It is to be ſuppoſed, that the Indian plants had their due degree of heat and moiſture given them; and I ſhould not chuſe to beſtow this toil upon the pooreſt of earth in a field or garden, though that is the moſt proper wherein to make the experiment.

I never myſelf tried this way of pounding or grinding, becauſe impracticable in the fields.

But I have had the experience of a multitude of inſtances, which confirm it ſo far, that I am in no doubt, that any ſoil, be it rich or poor, can ever be made too fine by tillage.

For it is beyond diſpute, that one cubical foot of this minute powder may have more internal ſuperficies, than a thouſand cubical feet of the ſame, or any other earth tilled in the common manner; and, I believe, no two arable earths in the world exceed one another in their natural richneſs twenty times; that is, one cubical foot of the richeſt is not able to produce an equal quantity of vegetables, cæteris paribus, to twenty cubical feet of the pooreſt; therefore it is not ſtrange, that the pooreſt, when by pulverizing it has obtained one hundred times the internal ſuperficies of the rich untilled land, ſhould exceed it in fertility; or, if a foot of the pooreſt was made to have twenty times the ſuperficies of a foot of ſuch rich land, the pooreſt might produce an equal quantity of vegetables with the rich. Beſides, there is another extraordinary advantage, when a ſoil has a larger internal ſuperficies in a very little compaſs; for then the roots of plants in it are better ſupplied with nouriſhment, being nearer to them on all ſides within their reach, than it can be when the ſoil is leſs fine as in common tillage; and the roots in the one muſt extend much farther than in the other, to reach an equal quantity of nouriſhment; they muſt range and fill perhaps above 20 times more ſpace to collect theſame quantity of food. But, in this fine ſoil, the moſt weak and tender roots have free paſſage, to the utmoſt of their extent, and have alſo an eaſy, due, and equal preſſure every-where, as in water.

Hard ground makes a too great reſiſtance, as Air makes a too little reſiſtance, to the ſuperficies of roots.

Farmers, juſt when they have brought their land into a condition fit to be further tilled to much greater advantage, leave off, ſuppoſing the ſoil to be fine enough, when, with the help of harrows, they can cover the ſeed; and afterwards with a roller they break the clods, in order, that, if the crop ſucceed, they may be able to mow it, without being hindered by thoſe clods: by what I could ever find, this inſtrument, called a roller, is ſeldom beneficial to good huſbandry, it rather untils the land, and anticipates the ſubſiding of the gound, which in ſtrong land happens too ſoon of itſelf.

But more to blame are they, who neglect to give their land due plowing, truſting to the harrow to make it fine; and, when they have thrown in their ſeed, go over it twenty times with the harrows, till the horſes have trodden it almoſt as hard as a highway, which in moiſt weather ſpoils the crop; but, on the contrary, the very horſes, when the earth is moiſt, ought all to tread in the furrows only, as in plowing with a hoe-plough they always do, when they uſe it inſtead of a common plough. *Tull's Horſe-hoeing Huſbandry.*

AGROSTOGRA'PHIA *, in phyſiology, the hiſtory or deſcription of gramens, or plants of the graſſy kind.

* The word is formed from the Greek, ἄγρωστις, graſs, and γράφω to deſcribe.

AIR, *(Dict.)*—— Air is a principal cauſe of the vegetation of plants, an inſtance of which we have from Mr. Ray, in the Philoſophical Tranſactions, of lettice-ſeed, that was ſown in the glaſs receiver of the Air-pump, which was exhauſted and cleared from all Air, which grew not at all in eight days time; whereas ſome of the ſame ſeed that was ſown at the ſame time in the open Air, was riſen to the height of an inch and an half in that time; but, the Air being let into the exhauſted receiver, the ſeed grew up to the height of two or three inches in the ſpace of one week.

Another inſtance of the uſefulneſs of the Air in vegetation, is the ſedum, which will puſh out roots without earth and water, and live for ſeveral months: and ſome ſort of aloes, if hung up in a room entirely ſecured from froſts, will remain freſh for ſome years, though they will ſenſibly loſe in their weight.

Air is capable of penetrating the porous and ſpongy parts of plants, and being there contracted, and dilating itſelf again.

The Air operates alſo within the bowels of the earth, and, by its ſubtilty perſpiring thro' the pores, aſſiſts in the rarefaction of the crudities of the earth, and in the diſpelling all ſuperfluous moiſture entering into the very pores and veins of the trees, plants, herbs, &c. carrying along with it thoſe ſalts contained either in itſelf, or lodged in the earth; which ſalts or juices are altered according to the ſeveral figures or dimenſions of the different ſtrainers or veſſels of thoſe ſeveral plants which grow upon the ſame ſpot of earth, which is ſo impregnated with theſe ſalts: and thence thoſe varieties in taſte and ſmell proceed, notwithſtanding they all receive their nouriſhment from the ſame ſtock that is lodged in the earth.

The Air alſo affects the branches, leaves, and flowers of trees, plants, and herbs, entering and perſpiring through them, and even thro' the bark and body of trees; and by the ſame kind of ſubtilty it does, by its refreſhing breezes, moderate the intenſeneſs of the ſun-beams, cooling, chearing, blowing, opening, and extending all the offspring of nature. The Air fixes and inſinuates its aereal ſubſtance into the liquid ſap of vegetables: and, as all the agitations in nature proceed from the contrariety of parts inhabiting together, in this aereal and liquid ſubſtances, being mixed, cauſe the agitation and motion in vegetables, or, more properly, ſet it all into a ferment, whether it be in the roots, or in the ſtem; and it riſes by co-operation of the ſun, which is the third agent in vegetation, up to the top of a tree, &c. as liquids riſe by fire to the top of the containing veſſel.

The Air, we find, produces a vibratory motion in ſeveral bodies; and, particularly in plants, the Air-veſſels thereof perform the office of lungs: for the Air contained in them, ſometimes contracting, and ſometimes expanding, according as the heat is increaſed or diminiſhed, preſſes the veſſels, and eaſes them again by turns; and thus promotes a circulation of their juices, which could ſcarce be otherwiſe effected.

Air, ſays the learned Dr. Hales, is a fine elaſtic fluid, with particles of very different natures floating in it, whereby it is admirably, fitted by the great author of nature, to be the breath or life of vegetables, as well as animals, without which they can no more live nor thrive than animals can. As a proof of the great quantities of Air in vegetables, he refers to the third chapter of his excellent treatiſe of vegetable ſtatics, where, he ſays, in the experiments on vines, the great quantity of air was viſible, which was continually aſcending through the ſap in the tubes; which manifeſtly ſhews what plenty of it is taken in by vegetables, and is perſpired off with the ſap through the leaves.

He adds ſeveral experiments, as to an apple-branch, apricot-branch, birch, and other plants, to prove the ſame thing.

And Dr. Grew has obſerved, that the pores are ſo large in the trunks of ſome plants, as in the better ſort of thick walking-canes, that they are viſible to a good eye without a glaſs; but, with a glaſs, the cane ſeems as if ſtuck at top full of holes with great pins, ſo large as very well to reſemble the pores of the ſkin in the ends of the fingers, and ball of the hand.

In the leaves of pines, they likewiſe, through a glaſs, make a very elegant ſhew, ſtanding almoſt exactly in rank and file thro' the length of the leaves. Whence it may be thought probable, that the Air freely enters plants, not only with the principal fund of nouriſhment by the roots, but alſo through the ſurface of their trunks and leaves, eſpecially at night, when they are changed from a perſpiring to a ſtrongly imbibing ſtate.

Dr. Hales likewiſe tells us, that, in all thoſe experiments that he tried to this purpoſe, he found that the Air entered very ſlowly at the bark of young ſhoots and branches, but much more freely through old bark; and that in different kinds of trees it had different degrees of more or leſs free entrance.

And likewiſe, that there is ſome Air both in an elaſtic and unelaſtic ſtate, mixed with the earth (which may well enter the roots with the nouriſhment) he found by ſeveral experiments, which he gives in the above-mentioned treatiſe.

The excellent Mr. Boyle, in making many experiments on the Air, among other diſcoveries found, that a good quantity of Air was produceable from vegetables, by putting grapes, plums, gooſeberries, peaſe, and ſeveral other ſorts of fruits and grain, into exhauſted and unexhauſted receivers, where they continued for ſeveral days emitting great quantities of Air.

This put the curious Dr. Hales upon further reſearches to find out what proportion of Air he could obtain out of the vegetables in which it was lodged and incorporated; this he performed by divers chymico-ſtatical experiments, which he gives in many inſtances, in his treatiſe of the analyſis of the Air, plainly ſhewing in what manner he performed them.

One of which was by diſtillation; another by fermentation.

That by diſtillation is as follows: The matter to be diſtilled is put into the retort *r (plate I. fig. 1.)* and then at *a* is cemented very faſt the glaſs veſſel *a b*, which was very capacious at *b*, and had an aperture *c d*, or hole at the bottom. The bolt-head *a b* being immerſed in water, with one leg of an inverted ſyphon put up as far as *z*, the water would riſe in the bolt-head, and drive out the Air through the ſyphon, which being taken out, the water will remain in the veſſel to the part *z*; at the ſame time, while the bolt-head is under water, it is placed in the veſſel *x x*, which, with the bolt-head and retort, is carried to the chymical furnace, where the retort has the heat and fire gradually communicated to it, and the bolt-head *a b* and veſſel *x x* well ſkreened from the heat of the fire.

As the matter diftilled, all except the Air, would go down into the water of the bolt-head and veffel; the Air that was generated or deftroyed by the procefs, would be fhewn by caufing the furface of the water in the bolt-head to ftand below or above the point *z*, as at *y*, when all was fet afide till it became quite cold. Thus, if the body diftilling generates Air of an elaftic quality, that added to the former will not permit the water *y* to rife fo high as *z*, and the fpace between *z* and *y* below will fhew how much Air was produced from its fixed ftate.

But if, when all is cold, the furface of the water *y* be feen above the point *z*, it then fhews that the diftilled body did deftroy, that is, imbibe or abforb, a part of the natural air above *z*; and the fpace between *z* and *y*, filled with water, will fhew what quantity was changed from a repellent elaftic to a fixed ftate, by the ftrong attraction of the abforbing particles of the diftilled body. This quantity of generated or abforbed Air it is eafy to meafure in cubic inches, by ftopping the end of the bolt-head with a cork, and then from a quantity of water of a known weight to fill it firft to *z*, and afterwards to *y*; and the difference of weight in the two bulks of water gives the number of cubic inches, from a table of fpecific gravities.

The other method which the doctor made ufe of for eftimating the furprizing effects of fermentation, from various mixtures of folid and fluid fubftances, in generating and abforbing Air, was as follows: He put the ingredients into the bolt-head *b*, (*fig.* 2.) and then run the long neck thereof into a tall cylindric glafs *ay*, and inclining both almoft horizontally, in a large veffel of water, the water ran into the veffel *ay*, and, driving out part of the Air, would poffefs its place upon turning them up, and placing both in a veffel of water *xx*, as you fee in the figure, where the furface of the water ftands in the inverted glafs *a y* at the point *z*.

If the ingredients generated Air, then the water would fall from *z* to *y*, and the empty fpace *zy* was equal to the quantity of generated Air; but, if on fermentation they abforbed or fixed the active particles of Air, then the furface of the water would afcend from *z* to *n*; and the cylinder *z n* would be the bulk of Air abforbed, which is eafily known in cubic inches.

When the fubjects for trying thefe experiments were a burning candle, burning brimftone, nitre, gun-powder fired, living animals, &c. the doctor ufed to make ufe of a pedeftal, on the top of which was a plate, whereon he laid the matter to be fired; then inverting the tall cylindric glafs over it, and drawing the water up to *zz* (*fig.* 3.) with an inverted fyphon, he fet fire to the matters lying on the plate, by means of a burning-glafs, concentering the fun's rays in its focus upon the fame. See the figure.

But the beft way is, inftead of having the cylindric glafs clofe upon the top at *bb*, to have it open by a fmall neck, on which a brafs cap is cemented with a female-fcrew to receive a ftop-cock, to take off the communication of the external Air, when occafion requires. Thus the ufe and trouble of the fyphon is fuperfeded; and in cafe of noxious fumes, vapours, &c. from aquafortis, burning brimftone, &c. a fyringe fcrewed on to the ftop-cock will draw off the Air, and raife the water to what height you pleafe, without the cumberfome ufe of a large pair of bellows, as the doctor made ufe of.

From half a cubic inch, or 135 grains of heart of oak, frefh cut from a growing tree, he found there were 108 cubic inches of Air generated, which is a quantity equal to 216 times the bulk of the piece of oak; that the weight of it was above 30 grains, one quarter part of the weight of 135 grains.

And he adds, that he took the like quantity of thin fhavings from the fame piece of oak, and dried them at fome diftance from a gentle fire, for 24 hours; in which time they evaporated 44 grains of moifture; which 44 grains being deducted from 135 grains, there remain 91 grains for the folid part of the oak: then 30 grains will be one-third of the weight of the folid part of the oak.

He gives us another experiment of Indian wheat, which grew in his own garden: he took 388 grains of it, when it was not come to its full maturity, and there were generated from it 270 cubic inches of Air; the weight of which Air was 77 grains, viz. one-fourth of the whole weight of the wheat.

He alfo found, that a cubic inch, or 318 grains, of peafe generated 396 cubic inches of Air, or 113 grains, i. e. fomething more than one-third of the weight of the peafe.

And again, that from one ounce, or 437 grains of muftard-feed, 270 cubic inches of Air were generated, or 77 grains, which is more than one-fixth part of the ounce weight.

He likewife adds, that there is a great plenty of Air incorporated into the fubftance of vegetables, which, by the action of fermentation, is roufed into an elaftic ftate, as is evident from thefe experiments following.

On the fecond day of March, he poured 42 cubic inches of ale from the tun, which had been there fet to ferment 34 hours before, into a bolt-head; and from that time, to the 9th of June, it generated 639 cubic inches of Air, with a very unequal progreffion, more or lefs, as the weather was warm, cool, or cold; and fometimes, upon a change from warm to cool, it reforbed Air, in all 32 cubic inches.

From the 2d of March to the 16th of April, 12 cubic inches of Malaga raifins, with 18 cubic inches of water, generated 411 cubic inches of Air; and then, again, it reforbed 35 cubic inches in two or three cold days. From the 21ft of April to the 16th of May, it generated 78 cubic inches; after which, the 9th of June, it continued in a reforbing ftate, fo as to reforb 13 cubic inches: that there were at that feafon many hot days, with much thunder and lightning, which deftroy the elafticity of the Air: there were generated in all 489 cubic inches, of which 48 were abforbed. The liquor was at laft vapid.

On the 10th of Auguft, 26 cubic inches of apples being mafhed, they generated 986 cubic inches of Air in 13 days time, which is a quantity equal to 48 times their bulk; after which they reforbed a quantity equal to their bulk, in three or four days, notwithftanding the weather was then very hot; after which time they were ftationary for many days, neither generating nor abforbing.

From the above-mentioned experiments on raifins and ale, the ingenious author concludes, that wine and ale do not turn vapid in warm weather by imbibing the Air, but by fermenting and generating too much; by which means they are deprived of their enlivening principle, the Air: for which reafon, thefe liquors are beft preferved in cool cellars, whereby this active invigorating principle is kept within due bounds; which when they exceed, wines are upon the fret, and are in danger of being fpoiled. Upon thefe, and many other experiments, which the learned author has given in his aforefaid treatife, he obferves, that the Air which arifes in fo great quantities from fermenting and diffolving vegetables, is true permanent Air; which is certain, by its continuing in the fame expanded and elaftic ftate for many weeks and months; which expanded watery vapours will not do, but foon condenfe, when cold.

Upon the whole, he concludes, that Air abounds in vegetable fubftances, and bears a confiderable part in them: and, if all the parts of matter were only endowed with a ftrongly attracting power, all nature would then immediately become one unactive cohering lump.

Wherefore it was abfolutely neceffary, in order to the actuating this vaft mafs of attracting matter, that there fhould be every-where mixed with it a due proportion of ftrongly repelling elaftic particles, which might enliven the whole mafs by the inceffant action between them and the attracting particles.

And fince thefe elaftic particles are continually in great abundance reduced by the power of the ftrong attracters, from an elaftic to a fixed ftate, it was therefore neceffary, that thefe particles fhould be endued with a property of refuming their elaftic ftate, whenever they were difengaged from that mafs in which they were fixed, that thereby this beautiful frame of things might be maintained in a continual round of the production and diffolution of vegetable, as well as animal bodies.

The Air is very inftrumental in the production and growth of vegetables, both by invigorating their feveral juices, while in an elaftic active ftate, and alfo by greatly contributing, in a fixed ftate, to the union and firm connection of the feveral conftituent parts of thofe bodies, viz. their water, fire, falt, and earth.

To conclude, by reafon of thofe properties of the Air beforementioned, it is very ferviceable to vegetables, in that it blows up and breaks open the clouds, thofe treafures of rain, which nourifhes the vegetable tribe.

The Air alfo helps to waft or difperfe thofe foggy humid vapours which arife from the foil, and would otherwife ftagnate, and poifon the whole face of the earth.

The Air, by the affiftance of the fun, affumes and fublimates thofe vapours into the upper regions; and thefe foggy humid vapours are, by this fublimation, and the coercive power of the Air and fun, rarefied, and made again ufeful in vegetation.

And, on the contrary to the benign quality of the Air, which is fo many ways fubfervient to vegetables, it is alfo fometimes, and upon fome accounts, injurious and pernicious to them; not only to the ligneous, herbaceous, and flowery parts above, but alfo to the roots and fibres below: for, becaufe the Air penetrates into the earth, it is eafy to be concluded, that a dry, hufky, fcorching Air may be very prejudicial to the tender fibres of new-planted trees.

It may be likewife fuppofed, that all bodies of earth are more or lefs capable of imbibing the fluid air, and of attracting fuch falts as either can give, or the earth is capable of receiving.

In chymiftry, it is by no means indifferent whether the procefs be made in the Air or out of it, whether in a confined or open Air. Thus camphire, burnt in a clofe-ftopped veffel, goes all into falts; inftead of which, during the procefs, if you open the veffel and approach it with a wax taper, it all diffipates into fmoke. In like manner, to make fulphur inflammable, there muft be an open Air. In a clofe cucurbit you may fublimate it even a thoufand times without its taking fire. If fulphur be put under a bell glafs with fire underneath it, a fpirit of fulphur will arife; but, if there be the leaft crack in the glafs, to permit a communication between

 the

the interior and exterior Air, the ſulphur will immediately take fire. An ounce of charcoal, incloſed in a well-luted crucible, will remain there without decay fourteen or fifteen days in the middle of a furnace with a ſtrong fire, though, in open Air, the thouſandth part of the fire would have reduced it into aſhes in a minute; Van Helmont even adds, that all this time the charcoal keeps its black colour, but, on the intromiſſion of a little Air, it immediately changes into white aſhes. The ſame thing may be ſaid of all animal and vegetable ſubſtances, which can only be calcined in open fire, but in ſtopped veſſels can only be reduced to black coals. The Air can effect infinite mutations in ſubſtances, not only with regard to its mechanical properties, as gravity, denſity, &c. but alſo on account of the heterogeneous parts which enter into all ſubſtances. As, for example, where there is a great many, the Air is impregnated with a biting vitriolic ſalt, which deſtroys every thing on the earth round about, and frequently appears on the ſurface of the ground in a kind of whitiſh efflorescence.

At Fohlun, in Sweden, a town famous for its copper mines, which have procured it the name of Copperburgh, the mineral exhalations affect the Air ſo ſenſibly, that the ſilver and copper money people carry in their pockets, changes colour by the means of it; and M. Bayle was informed by a gentleman of property in thoſe parts, that from the veins of metals and minerals, frequent in that country, columns of a kind of ſmoke or ſteam frequently aroſe, ſome of which had a very bad ſcent, others none at all, and ſome an agreeable one. In Carniole and other places, where there are mines, the Air is at ſome ſeaſons very unhealthy: from whence proceed ſeveral epidemical diſtempers. We ſhall add, that, about the cape of Good-hope, the mines of arſenic, which are numerous in that neighbourhood, emit ſuch noxious vapours, that no animal can live, and they were therefore obliged to ſhut them up again, after having been opened ſome time. Dr. Hales has lately contrived a machine for evacuating foul Air. We are not yet ſufficiently acquainted of what importance it is, that the Air we breathe ſhould be pure and free from all mixture of nauſeous and offenſive particles; but, if ſuch a quality of Air is ſo much to be deſired by every body, how much more eſſentially neceſſary is it for thoſe whom ſickneſs has made ſuſceptible of every external impreſſion, and thoſe who, pent up in a ſhip, during the courſe of a long voyage, are obliged to live between decks, and are forced to hard labour in different places of the lower part of the veſſel, which receive very little Air from without, and where it is always motionleſs, and as it were ſtagnated? What renders this ſtill more deplorable, is thoſe very places into which we would chuſe to have pure Air are in general filled with the contrary; the Air of hoſpital-rooms is almoſt always mixed with the vapours that continually exhale from the bodies of the ſick, their cloſe-ſtools, and the different remedies adminiſtered to them: the terrible ſickneſſes ſome people of the ſtrongeſt conſtitutions have been attacked with, on their entering into theſe places at firſt, are a proof paſt contradiction of the impurity of the Air and its effects. The ſame thing happens in ſhips, where the exhalations that ariſe from the proviſions, from the pores of the men and living creatures on board, produce effects nearly like to thoſe obſerved in hoſpitals.

In order to prevent the accidents, which Air mixed with theſe noxious vapours may occaſion more certainly, it will be right, firſt, to examine into the nature of theſe vapours. The leaſt attention will convince us, they are almoſt entirely volatile; we muſt conclude, therefore, they will always naturally riſe toward the ceiling of the rooms, and this motion upward muſt be increaſed by the motion of the Air, which aſcends in proportion to its rarefaction.

If this propoſition wanted proof, it is eaſy to demonſtrate it; only raiſe a ladder againſt the wall of a room in an hoſpital, and you will find, as you advance towards the ceiling, the ſmell, which you could ſupport below, grow continually more offenſive, and the Air hotter; this being admitted, it will be eaſy to let out the foul Air and introduce freſh, only by placing windows cloſe under the ceiling, and leaving the top ſquares always open; for the hot and putrified Air would continually go off, and a circulation of freſh Air be promoted every moment.

The ſame effect might be produced by erecting a cupola or dome at each extremity of a ward in an hoſpital; the Air would naturally be drawn to them, and paſs off by them; this has been practiſed at Lyons with ſo much ſucceſs, that you can ſcarce perceive any ſmell at all in the hoſpital, but, if you ſhould go up on the inſide of the cupola, the ſtench is inſupportable.

However certain the means we have mentioned, of renewing Air in hoſpitals, may appear to be and really are, they can only be uſed in new fabrics of this kind; to attempt it in the old, would be often impracticable, and always expenſive.

Monſieur Duhamel has found out a method of remeding this inconvenience; he, in the room at one end, makes a large fire-place, like one of your great kitchen chimnies; the opening of this ſtock is on a level with the cieling, and abuts above on a funnel, like thoſe of common chimnies; but three or four times as large, and this is ſufficient to procure a circulation of Air; one of this kind built in a ſtable entirely freed ſome neighbouring apartments from the ſmell of the dung, which before affected them: but to increaſe the draught of Air, and determine it in a more certain manner to take this courſe, put a ſtove within the chimney, the funnel of which muſt go out at its opening, and the mouth diſcharge itſelf in the garret; light a fire in it ſufficient to heat the Air contained within the chimney; the rarefied Air will aſcend in the funnel, and the draught conſequently become quicker. The hotter the weather, the more this adventitious help will be required, becauſe the difference between the ſuperior and inferior Air will become ſo much leſs; and the machine will introduce new Air in proportion as the fire is increaſed.

As we ſhall be obliged to increaſe the draught in ſummer, it will ſometimes perhaps be neceſſary to leſſen it in winter; it might pump too powerfully, and the room be chilled by it. For this, however, M. Duhamel has contrived a very eaſy remedy, that is, by putting a kind of cover either on the chimney or its funnel, which you may open or ſhut at pleaſure, and ſo increaſe or diminiſh the draught, as ſhall be found neceſſary.

But there is no danger of rendering the Air of the room too chilly, even by the briſkeſt draught, if we make funnels behind the ſtock or underneath the hearth, for through theſe a ſufficient quantity of Air will paſs to fill the ſpace that is diſſipated by the chimney; or it will be the ſame thing if the funnels are made near the ſtove in which a continual fire is kept, ſomething after the manner propoſed by M. Gauger in his treatiſe on mechanics by fire, for thus, in whatever quantity this Air enters, it will ſupply the place of the Air in the room, without chilling it.

But how are we to apply theſe means to the under decks of ſhips, in which we can neither build cupola nor chimney? M. Duhamel propoſes a very eaſy method, notwithſtanding the ſeeming difficulty of applying them to theſe purpoſes; with very little alteration in the machine, he places, under the hearth of the chimney in the cook-room, a great box of hollow iron, the top of this ſerves for the fire-place. This box has two funnels, one goes down toward the under decks, the other is carried directly up in the brick-work, and diſcharges itſelf above; the Air, being continually rarefied in the box, by the action of the fire becomes lighter and goes off through the aſcending funnel, which is continually ſupplied by that which the deſcending funnel draws from the under decks; by this contrivance a circulation of Air is obtained by a draught through the ſcuttles and other openings of the veſſel, and the Air which otherwiſe would have ſtagnated, is carried off through the aſcending funnel: thus we ſhall find ourſelves delivered from the accidents that might happen from corrupted Air, without expence, or any inconvenience to the veſſel.

Plate I. *fig.* 9, 10, repreſents two profiles of the ward of an hoſpital, the one A A, the length; the other B B, the breadth; C C, beds of the patients, D D, uſual poſition of the windows, E E, a better poſition, F F, timbers of the roof. In the ſecond profile, the correſponding places are marked by the ſame letters. G, G, the fire-place, on the floor of the garret, at one of the ends of the ward. H, a ſtove in the fire-place, the tube of which riſes above it, and is carried above the funnel. I, the place where the ſtove is to be faſtened to one of the ſides of the fire-place, for lighting the fire by an aperture at the other ſide of this wall.

Dr. Deſaguliers and Dr. Hales have invented two different machines for the ſame uſe, the former of which the reader will find under CENTRIFUGAL *Wheel*, and the latter under VENTILATOR.

AIR-*bladder*, a ſmall bladder or veſicula, found in the bodies of fiſhes. Its uſe is to enable them to either riſe or ſink in the water, or ſuſtain themſelves at any depth.

A bubble of Air, immerſed in a fluid, dilates itſelf in proportion as it approaches the ſurface; becauſe the weight or preſſure of the incumbent water thereon continually decreaſes; and from hence the diſcovery of the uſe of Air-bladders took its riſe. For the Air in the bladder is like the bubble, more or leſs compreſſed according to the depth the fiſh ſwims at, and takes up more or leſs ſpace; and, conſequently, the body of the fiſh, part of whoſe bulk this bladder is, is greater or leſs according to the ſeveral depths, though it retains the ſame weight. The rule of hydroſtatics is, that a body heavier than ſo much water, as is equal in quantity to the bulk of it, will ſink; a body lighter will ſwim: a body of equal weight will reſt in any part of the water. By which rule, if the fiſh in the middle region of the water be of equal weight with an equal bulk of the water, the fiſh will reſt there, without any tendency either upwards or downwards; and, if the fiſh be deeper in the water, its bulk becoming leſs by the compreſſion of the bladder, and yet retaining the ſame weight, it will ſink and reſt at the bottom: on the other ſide, if the fiſh be higher than the middle region, the Air dilating itſelf, and the bulk of the fiſh conſequently increaſing, without any increaſe of the weight, the fiſh will riſe and reſt at the top of the water.

Perhaps the fish by some action, can emit Air out of the bladder, and afterwards out of its body; and also, when there is not enough, take in more Air, and convey it to this bladder; in which case it will be no wonder, that there should be always a fit proportion of Air in the bodies of all fishes, to serve their use, according to the depth of water they live in: perhaps also, by some muscle, the fish can contract this bladder beyond the pressure of the weight of water; and perhaps it can by its sides, or some other defence, keep off the pressure of the water, and give the Air leave to dilate itself. In these cases, the fish will be helped in all intermediate distances, and may rise or sink from any region without moving a fin. *Phil. Transf.* N°. 114. p. 310.

If the Air-bladder of a fish be pricked or broken, the fish presently sinks to the bottom, unable either to support or raise itself up again. Flat fishes, as soles, plaise, &c. which always lie groveling at the bottom, have no Air-bladder.

In most fishes there is a manifest channel, leading from the gullet, or upper orifice of the stomach, to the Air-bladder, which doubtless serves for conveying Air into it. In a sturgeon, Mr. Willoughby observed, that, upon pressing the bladder, the stomach presently swelled; so in that fish it seems the Air passes freely both ways. Possibly the fish, while alive, may have a power to raise up this valve, and let out Air on occasion.

Air-*pump*. Under this article in the dictionary we have given an account of the structure of the common Air-pump, and also that of a portable one; we shall here add an account of a very great improvement made in that machine, by the ingenious Mr. Smeaton, from the *Philos. Transact.* vol. 47. pag. 415.

The principal causes of imperfection in the common pumps arise, first, from the difficulty in opening the valves at the bottom of the barrels; and, secondly, from the piston's not fitting exactly, when put close down to the bottom; which leaves a lodgment for Air, that is not got out of the barrel, and proves of bad effect.

In regard to the first of these causes, the valves of Air-pumps are commonly made of a bit of thin bladder, stretched over a hole generally much less than one tenth of an inch diameter; and to prevent the Air from repassing between the bladder and the plate, upon which it is spread, the valve must always be kept moist with oil or water.

It is well known, that at each stroke of the pump the Air is more and more rarefied, in a certain progression, which would be such, that an equal proportion of the remainder would be taken away, was it not affected by the impediments I have mentioned: so that, when the spring of the Air in the receiver becomes so weak, as not to be able to overcome the cohesion of the bladder to the plate, occasioned by the fluid between them, the weight of the bladder, and the resistance that it makes by being stretched, the rarefaction cannot be carried farther, though the pump should still continue to be worked.

It is evident, that the larger the hole is, over which the bladder is laid, a proportionably greater force is exerted upon it by the included Air, in order to lift it up; but the aperture of the hole cannot be made very large, because the pressure of the incumbent Air would either burst the valve, or so far force it down into the cavity, as to prevent its lying flat and close upon the plate, which is absolutely necessary.

To avoid these inconveniences as much as possible, instead of one hole, I have made use of seven, all of equal size and shape; one being in the center, and the other six round it: so that the valve is supported at proper distances, by a kind of grating, made by the solid parts between these holes: And to render the points of contact, between the bladder and grating, as few as possible, the holes are made hexagonal, and the partitions filed almost to an edge. As the whole pressure of the atmosphere can never be exerted upon this valve, in the construction made use of in this pump; and as the bladder is fastened in four places instead of two; I have made the breadth of the hexagons three tenths of an inch, so that the surface of each of them is more than nine times greater than common. But as the circumference of each hole is more than three times greater than common, and as the force, that holds down the valve, arising from cohesion, is, in the first moment of the Air's exerting its force, proportionable to the circumference of the hole; the valve over any of these holes will be raised with three times more ease than common. But as the raising of the valve over the center-hole is assisted on all sides by those placed round it; and as they altogether contribute as much to raise the bladder over the center-hole, as the Air immediately acting under it; upon this account the valve will be raised with double the ease, that we have before supposed, or with a sixth part of the force commonly necessary.

It is not material to consider the force of the cohesion, after the first instant: for, after the bladder begins to rise, it exposes a greater surface to the Air underneath, which makes it move more easily. I have not brought into this account the force, that keeps down the valve, that arises from the weight of the bladder, and the resistance from its being stretched; for I look upon these as small, in comparison of the other.

I was not however contented with this construction of the valves, till I had tried what effect would be produced, when they were opened by the motion of the winch, independent of the spring of the Air: and though the contrivance I made use of seemed to me less liable to objection than any thing I was acquainted with, that had been designed for that purpose; yet I did not find it to answer the end better than what I have already described; and therefore laid it aside, as it rendered the machinery much more complex, and troublesome to execute.

But, supposing all those difficulties to be absolutely overcome, the other defect, that I mentioned in the common construction, would hinder the rarefaction from being carried on beyond a certain degree. For, as the piston cannot be made to fit so close to the bottom of the barrel, as totally to exclude all the Air; as the piston rises, this Air will expand itself; but still pressing upon the valve, according to its density, hinders the Air within the receiver from coming out; hence, were this vacancy to equal the 150th part of the capacity of the whole barrel, no Air could ever pass out of the receiver, when expanded 150 times, though the piston was constantly drawn to the top; because the Air in the receiver would be in æquilibrio with that in the barrel, when in its most expanded state. This I have endeavoured to overcome, by shutting up the top of the barrel with a plate, having in the middle a collar of leathers, through which the cylindrical rod works, that carries the piston. By this means, the external Air is prevented from pressing upon the piston; but that the Air, that passes through the valve of the piston from below, may be discharged out of the barrel, there is also a valve applied to the plate at the top, that opens upwards. The consequence of this construction is, that, when the piston is put down to the bottom of the cylinder, the Air in the lodgment under the piston will evacuate itself so much the more, as the valve of the piston opens more easily, when pressed by the rarefied Air above it, than when pressed by the whole weight of the atmosphere. Hence, as the piston may be made to fit as nearly to the top of the cylinder, as it can to the bottom, the Air may be rarefied as much above the piston, as it could before have been in the receiver. It follows therefore, that the Air may now be rarefied in the receiver, in duplicate proportion of what it could be upon the common principle; every thing else being supposed perfect. Another advantage of this construction is, that, though the pump is composed of a single barrel, yet, the pressure of the outward Air being taken off by the upper plate, the piston is worked with more ease than the common pumps with two barrels: and not only so, but when a considerable degree of rarefaction is desired, it will do it quicker; for the terms of the series expressing the quantity of Air taken away at each stroke do not diminish so fast, as the series answering to the common one.

I have found the gages, that have been hitherto made use of, for measuring the expansion of the Air, very unfit to determine in an experiment of so much nicety. I have therefore contrived one of a different sort, which measures the expansion with certainty, to much less than the 1000th part of the whole. It consists of a bulb of glass something in the shape of a pear, and sufficient to hold about half a pound of quicksilver. It is open at one end, and at the other is a tube hermetically closed at top. By the help of a nice pair of scales, I found what proportion of weight a column of mercury, of a certain length, contained in the tube, bore to that, which filled the whole vessel. By these means I was enabled to mark divisions upon the tube, answering to a 1000th part of the whole capacity, which, being of about one tenth of an inch each, may, by estimation, be easily subdivided into smaller parts. This gage, during the exhausting of the receiver, is suspended therein by a slip-wire. When the pump is worked as much as shall be thought necessary, the gage is pushed down, till the open end is immerged in a cistern of quicksilver placed underneath: the Air being then let in, the quicksilver will be driven into the gage, till the Air remaining in it becomes of the same density with the external; and as the Air always takes the highest place, the tube being uppermost, the expansion will be determined by the number of divisions occupied by the Air at the top.

The degree, to which I have been able to rarefy the Air in experiment, has generally been about 1000 times, when the pump is put clean together: but the moisture, that adheres to the inside of the barrel, as well as other internal parts, upon letting in the Air, is in the same succeeding trials worked together with the oil, which soon renders it so clammy, as to obstruct the action of the pump upon a fluid so subtile as the Air is, when so much expanded; but in this case it seldom fails to act upon the Air in the receiver, till it is expanded 500 times, and this I have found it to do, after being frequently used for several months, without cleaning. I have also generally found it to perform best, the first trial at each time of using; though nothing had been at it from the time preceding; which, after a great many trials made with this view, I also attribute to the vapours of the

Air

Air mixing with the oil. An experiment, where the Air was expanded 1000 times, was tried about two years fince in your prefence; at which were prefent alfo Dr. Knight and Mr. Canton; and I lately did the fame thing with Mr. Watfon. The pump, which I intend myfelf the honour of fhewing the Society, is the fame, that I juft now mentioned, and the fecond that I made, with a view to improve upon this principle.

The degree of rarefaction, produced by the beft of the three pumps, that you procured the trial of, and which you efteemed good in their kind, and in complete order, never exceeded 140 times, when tried by the gage above defcribed.

I have alfo endeavoured to render the pneumatic apparatus more fimple and commodious, by making this Air-pump act as a condenfing engine at pleafure, by fingly turning a cock. This not only enables us to try any experiments under different circumftances of preffure, without changing the apparatus, but renders the pump an univerfal engine, for fhewing any effect, that arifes from an alteration in the denfity or fpring of the Air. Thus, with a little addition of apparatus, it fhews the experiments of the Air-fountain, wind-gun, &c.

This is done in the following manner: the Air above the pifton being forcibly driven out of the barrel at each ftroke, and having no-where to efcape, but by the valve at the top; if this valve be connected with the receiver, by means of a pipe, and at the fame time the valve at the bottom, inftead of communicating with the receiver, be made to communicate with the external Air, the pump will then perform as a condenfer.

The mechanifm is thus ordered. There is a cock with three pipes placed round it, at equal diftances. The key is fo pierced, that any two may be made to communicate, while the other is left open to the external Air. One of thefe pipes goes to the valve at the bottom of the barrel; another goes to the valve at the top, and a third goes to the receiver. Thus, when the pipe from the receiver, and that from the bottom of the barrel, are united, the pump exhaufts: but turn the cock round, till the pipe from the receiver, and that from the top of the barrel, communicate, and it then condenfes. The third pipe, in one cafe, difcharges the Air, taken from the receiver into the barrel; and, in the other, lets it into the barrel, that it may be forced into the receiver.

The figures delineated on *plate* I. will fufficiently explain this inftrument.

Fig. 4. Is a perfpective view of the principal parts of the pump together. A is the barrel. B the ciftern, in which are included the cock, with feveral joints. Thefe are covered with water to keep them air-tight. A little cock to let the water out of the ciftern, is marked 6. C *c c* is the triangular handle of the key of the cock: which, by the marks on its arms, fhews how it muft be turned that the pump may produce the effect defired. D H is the pipe of communication between the cock and the receiver. E is the pipe that communicates between the cock and the valve, on the upper plate of the barrel. F is the upper plate of the pump, which contains the collar of leathers *d*, and V the valve, which is covered by the piece *f*. G I is the fiphon-gage, which fcrews on and off, and is adapted to common purpofes. It confifts of a glafs tube hermetically fealed at *c*, and furnifhed with quickfilver in each leg; which, before the pump begins to work, lies level in the line *a b*; the fpace *b c* being filled with Air of the common denfity. When the pump exhaufts, the Air in *b c* expands, and the quickfilver in the oppofite leg rifes, till it becomes a counter-balance to it. Its ufe is fhewn upon the fcale I *e*, by which the expanfion of the Air in the receiver may be nearly judged of. When the pump condenfes, the quickfilver rifes in the other leg, and the degree may be nearly judged of by the contraction of the Air in *b c*: marks being placed at $\frac{1}{2}$ and $\frac{1}{3}$ of the length of *b c* from *c*; which fhews when the receiver contains double or treble its common quantity. K L is a fcrew-frame to hold down the receiver, in condenfing experiments, which takes off at pleafure; and is fufficient to hold down a receiver, the diameter of whofe bafe is 7 inches, when charged with a treble atmofphere: in which cafe it acts with a force of about 800 pounds againft the fcrew-frame. M is a fcrew, that faftens a bolt, which flides up and down in that leg, by means whereof the machine is made to ftand faft on uneven ground.

Fig. 5. Is a perpendicular fection of the barrel and cock, &c. where A B reprefents the barrel. C D the rod of the pifton, which paffes through M N the plate, which clofes the top of the barrel. K is the collar of leathers, through which the pifton-rod paffes. When the pifton is at the bottom of the cylinder, the upper part of K is covered by the cap at D, to keep out duft, &c. L is the valve on the upper plate, which is covered by the piece O P, which is connected with the pipe Q R, which makes the communication between the valve and cock. C E is the pifton; and E F F is the pifton-valve. I I are two little holes to let the Air pafs from the pifton-valve into the upper part of the barrel. G G K is the principal valve at the bottom of the cylinder. H H is a piece of metal, into which the valve G G K is fcrewed, and clofes the bottom of the cylinder; out of which alfo is compofed S S the cock, and K T T the ducts from the cock to the bottom of the barrel. W W is the key of the cock. X the ftem; and V V the handle.

Fig. 8. Is an horizontal fection of the cock, through the middle of the duct T T. A B reprefents the bignefs of the circular plate, that clofes the bottom of the barrel. C D reprefents the bignefs of the infide of the barrel. E F G is the body of the cock; the outward fhell being pierced with three holes at equal diftances, and correfponding to the three ducts H H, I I, K K, whereof H H is the duct that goes to the bottom of the barrel. I I is the duct that communicates with the top of the barrel; and K K is the duct that paffes from the cock to the receiver. L M N is the key, or folid part of the cock, moveable round in the fhell E F G. When the canal L M anfwers to the ducts H H and K K, the pump exhaufts, and the Air is difcharged by the perforation N. But, the key L M N being turned till the canal L M anfwers to I I and K K, the perforation N will then anfwer to H H; and in this cafe the pump condenfes. Laftly, when N anfwers to K K, the Air is then let in or difcharged from the receiver, as the circumftance requires.

Fig. 6. Is the plan of the principal valve. A B C D reprefents the bladder faftened in four places, and ftretched over the feven holes I K, formed into an hexagonal grating, which I fhall call the honey-comb. E F G H fhews where the metal is a little protuberant, to hinder the pifton from ftriking againft the bladder.

Fig. 7. Reprefents the new gage, which I call the pear-gage. It is open at A; B C is the graduated tube, which is hermetically clofed at C, and is fufpended by the piece of brafs D E, that is hollowed into a cylinder, and clafps the tube.

AIR-*Shafts*, in minerology, imply fhafts or holes cut from the furface to the adits, in order to furnifh frefh Air.

AIR-*Veffels*, in plants, are certain ducts or canals, whereby a kind of refpiration is performed in vegetable bodies. See PLANT in the Dictionary and Supplement.

AI'RING *of horfes*. Airing brings feveral advantages to horfes. Firft, it purifies their blood, if the Air be clear and pure; it purges the body from many grofs and fuffocating humours, and by that means fo hardens a horfe's fat, that it is not near fo liable to be diffolved by ordinary exercife.

Secondly, it teaches him how to let his wind rake equally, and keep time with the other actions and motions of his body.

Thirdly, it fharpens the appetite, and provokes the ftomach, which is of great advantage both to gallopers and hunters, which are apt to lofe their ftomach either through excefs or want of exercife, for the fharpnefs of the Air will drive the horfes natural heat from the outward to the inward parts, which heat, by furthering concoction, creates an appetite.

Markham directs, if a horfe be very fat, to Air him before fun-rife, and after fun-fetting; and another author fays, that nothing is more wholefome than early and late Airings: others again do not approve of this, and urge, that all things that any ways hinder the ftrength and vigour of nature, are to be avoided; now that extremity of cold and being out early and late do fo, is evidently feen by horfes that run abroad all winter, which, however hardily bred and kept with the beft care and fodder, yet cannot by any means be advanced to fo good cafe in winter, as an indifferent pafture will raife them to in fummer; and, as this holds true of nocturnal colds, it muft needs be verified in fome proportionate meafure of the morning and evening dews, and that piercing cold which is obferved to be more intenfe at the opening and clofe of the day, than any part of the night.

Befides that, the dews and moift rimes do as much injury to a horfe as the fharpeft colds or frofts, and, if a horfe is any ways inclinable to catarrhs, rheums, or any other cold diftemper, he is apt to have the humours augmented, and the difeafe fenfibly increafed by thefe early and late Airings.

But, if he be not had forth to Air till the fun be rifen, it will chear his fpirits; and it is feen that all horfes love the fun's warmth, as in thofe that lie out at nights, who will repair to thofe places where they can have moft benefit of the beams of the fun, after he is rifen, to relieve them from the coldnefs of the preceding night.

And, befides the benefit of the fun, the Air will be more mild and temperate, as that it will rather invigorate than prey upon his fpirits, and more increafe his ftrength than impair it.

And, as for bringing down a horfe's fat, we need not be at a lofs for that, and to keep him from being purfive, and too high in flefh, to reduce him to cleannefs, and a more moderate ftate of body: for it is but keeping him out fo much longer at a time, both morning and evening, and you will undoubtedly obtain your end by fuch long Airing, joined with true found heats; and it is from the length of Airings that you muft expect to bring your horfe to a perfect wind and true courage. *Markham's Farriery.*

ALABA'STER, *Alabaftrum, (Dict.)*— This is of a fubftance that may be calcined, being lefs hard than marble. It is of different colours, fome white, but moft commonly of a dirty yellowifh yellowish white, some reddish, some variegated with different colours, red, brown, &c. In some are discovered veins or streaks which may be compared to those of the onyx stone. In this sense we may say there is onyx Alabaster; and there is some found with little spots and branches, in such a manner as to resemble the dendrite. Alabaster is somewhat transparent, and its transparence so much the more sensible, as its colour approaches nearer to white. They polish it: but it is by no means capable of so fine and lively a polish as marble, because it is more soft; besides, when it has been polished, its surface looks as if it had been rubbed with grease. This cast obscures its polish, and, as it is but little transparent, it in some sort resembles wax. Though Alabaster be so soft, and takes no fine polish, yet it is employed in different uses; tables, chimney-pieces, vases, statues, *&c.* are made of it. There are two sorts of Alabaster, the oriental and common; the oriental is much the best, finest and hardest, as well as that its colours are more lively, which makes it more valuable and more sought after than the common, but this is scarce; we meet with it indeed in France, about Cluny, and other places. There is some in Lorain and Germany, but especially in Italy about Rome. It is however more common than one would imagine.

ALABASTRI'TÆ, or *alabasters*, in natural history, the name of a genus of fossiles, composed of large separate concretions, of great brightness, and an elegant, but stately structure, not very hard, soluble in acids, and easily calcinable.

ALA'RM, the name of an instrument for awaking persons at a certain hour. The weavers use a very simple contrivance of this kind. See WEAVER's *Alarm*.

ALATE'RNUS, in botany, the name of a genus of plants, whose characters are: the flower has no empalement, and consists of one leaf, which is divided into four parts; this is succeeded by a round berry, resting upon part of the flower, which is divided into three cells, each containing a single seed. To which may be added, the leaves growing alternately upon the branches, by which, at any time of the year, it may be distinguished from the phillyrea.

Mr. Miller has enumerated six pieces of Alaternus, and Tournefort eight.

ALBU'GO, (*Dict.*) ——This is a troublesome disease, which is more or less offensive to the sight, according to the greater or less portion of the transparent part of the cornea affected by it. For sometimes it fixes on the exterior surface only of this membrane, sometimes on the interior, and sometimes it runs more or less deep into it.

It is most commonly the consequence of inflammations, by the extravasation of humours, between the membranes of this tunicle; and particularly in the small-pox, by the suppuration of pustules upon this part.

I have made use of two methods of cure for this disorder of the sight; the one in the outward sort, the other in the inward. In the former case I ordered the following powder:

Take of common glass any quantity. Pound it in a mortar, into very fine powder; then add an equal quantity of white sugar-candy, and levigate the mixture on a marble with great labour, till it becomes quite impalpable.

A little of this powder, put into the eye with a quill, every day, gradually absterges and wears off the spot by its inciding quality. The other method above-mentioned of removing this speck is, to order a dexterous surgeon to pare it cautiously every day with a knife; for this tunicle is composed of several lamellæ one over another, and has thickness enough to bear paring off some of its parts. I have seen several instances of cures by the eye-powder; but the paring of the coat has not succeeded with me above once or twice. However, it is better to try a doubtful remedy than none. *Mead's Monita & Præcepta.*

ALCA'NNA, or *Alcana*, a drug used in dying, being the leaves of the Egyptian privet. The colour extracted from the leaves is either red or yellow, according to the menstruum made use of; yellow, when infused in common water, and red, when steeped in vinegar or allum-water.

ALCE'A, in botany, *vervain mallow*, a genus of plants whose characters are: it hath the whole habit of the mallow or althæa, but differs from both in having its leaves deep divided, somewhat like the vervain.

Tournefort has enumerated twenty species of Alcea. It is sometimes used in medicine as an emollient, its virtues being much the same with those of the mallow, but in a less degree.

ALCHIMI'LLA, *ladies mantle*, in botany, the name of a genus of plants, of which Mr. Miller has enumerated 13 species. The characters are these: The leaves are serrated: the cup of the flower is divided into eight segments, which are expanded in form of a star: the flowers are collected into bunches upon the tops of the stalks: the seed-vessels contain, for the most part, two seeds in each.

ALCHIMILLA, in the Linnæan system of botany, the name of a genus of plants, the characters of which are these: the cup is a tubular perianthium, remaining till the seed ripens; it is composed of one leaf, divided at the extremity into eight segments alternately larger and smaller; it has no petals; the stamina are four very small erect, pointed filaments, inserted in the rim of the cup; the antheræ are roundish; the germen of the pistillum is of an oval figure; the style is slender, of the length of the stamina, and inserted on the basis of the germen; the stigma is of a globose figure. The neck of the cup, shutting together, makes it serve in the place of a fruit, containing a single compressed seed of an elliptic figure. *Linnæus, Gen. Plantar.*

AL'CORAN, (*Dict.*) ——The Alcoran is allowed to be written with the utmost elegance and purity of language, in the dialect of the Koreishites, the most noble and polite of all the Arabians; but with some mixture of other dialects. It is the standard of the Arabic tongue, and, as the orthodox believe, and are taught by the book itself, inimitable by any human pen; and therefore insisted as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original; and to this miracle did Mahomet himself chiefly appeal, for the confirmation of his mission, publickly challenging the most eloquent schoolmen in Arabia to produce a single chapter comparable to it. A late ingenious and candid writer, who is a very good judge, allows the style of the Alcoran to be generally beautiful and fluent, especially when it imitates the phrophetic manner, and scripture phrase; concise, and often obscure; adorned with bold figures, after the eastern taste; enlivened with florid and sententious expressions; and, in many places, especially where the majesty and attributes of God are described, sublime and magnificent. *Sale.*

The most elegant passage in the whole Alcoran, in the judgment of all the commentators, is that in the chapter of Hud, wherein God, to put a stop to the deluge, says, "O earth, "swallow up these waters! and thou, O heaven, withdraw "thy rain! And immediately the waters abated; the decree "was fulfilled; the ark rested on the mountain, and a voice "was heard, Woe to the ungodly". *Alkor.* c. 11. p. 180. *Herbel. Bibl. Orient.*

The Alcoran, besides the inconveniencies to which all books of revelation are subject, viz. to be differently understood and interpreted, has some peculiar ones. Mahomet placed the stress and merit of his Alcoran on the excellency of the style. This is subject to inconveniencies; the composition and argument of words admit of infinite varieties, and it can never be absolutely said, that any one is the best possible. Accordingly Hamzah Benahmed wrote a book against the Alcoran, with at least equal elegancy; and Moselema another, which even surpassed it, and occasioned a defection of a great part of the mussulmen.

AL'DER *Tree.* See ALNUS.

A'LIMENT.—The health of the human body evidently depends upon the quantity and quality of the blood and juices; whence it is plain, that all those Aliments which preserve and maintain a just temperament, and a due quantity of these, are beneficial to health, and that such as have a contrary tendency are to be reckoned unwholsome.

For blood of a just temperament, and neither exceeding nor falling short in quantity, as it circulates most easily through the body, and is clear of all foreign particles, is admirably adapted to nourish the parts and increase strength; so that it may be called the real treasure of life.

Blood of a due temperament, and benign quality, by its progressive as well as intestine motion, which continues during the whole course of life, is not only continually wasted, but likewise requires a morbid disposition, and degenerates into an impure and excrementitious mass.

Experience proves, that the blood of those who have fasted long is converted into saline and bilious excrements, which are discharged by stool, urine, and sweat, and even loses that natural balsamic quality which is necessary to health, and the mass of humours is by this means rendered so thin and fluid, that it becomes intirely unfit for nourishing the parts. This appears still more plainly from continual fevers, and hectic disorders, the nature of which diseases is to waste the juices, and convert the most benign humours into useless, salt, and bilious excrements. Labour also, and exercise, because they augment the intestine and progressive motion of the blood considerably, lessen the quantity of superfluous humours, as persons of full plethoric habits experience, to the no small advantage of their health.

Because the blood, by its continual motion, is wasted and converted into an excrementitious mass, utterly unfit to nourish the solids, or recruit that fine fluid which supplies the body with sense and motion, it is plain that life and health cannot be preserved, unless these natural motions be continually repaired, and new juices substituted in the room of those thrown out of the body as excrementitious.

The reason is therefore plain, why people stand in need of continual ingestion and egestion, or, in other words, of eating, drinking, and evacuations; for health cannot long be preserved, unless the place of the corrupted humours discharged be supplied by new juices.

Solid foods of a good quality, as well as liquors, recruit the lost juices; and, therefore, all those Aliments that are nearly of the same nature with the blood, and easily mix with it, ought to be reckoned amongst wholesome Aliments.

Blood and juices, fit for nourishment, are of a benign quality, of a due temperament, and resemble a jelly, consisting of

small

ſmall earthy, aqueous, oily, and eaſily moveable particles, thoroughly mixed with each other: hence all thoſe Aliments, which abound with a mucilaginous juice of a due temperament, are moſt fit for ſanguification, or the production of new blood.

The fleſh of young animals, their juices, and broths made of them, eſpecially of young beef, veal, and mutton, afford a large quantity of jelly, and on that account are juſtly reckoned among the Aliments which are moſt quickly turned into blood. All ſorts of the hen kind and pigeons, with their young, are likewiſe well diſpoſed for nouriſhment, becauſe they afford a more ſubtile jelly than the animal-fleſh abovementioned, though in a ſmaller quantity.

It is worth while to obſerve, that the clean animals, which, according to Moſes, were uſed by the Iſraelites in their ſacrifices, were principally ſuch as afforded a good and wholeſome nouriſhment, ſince they abounded more than others with nutritive mucilaginous juices.

Broths and jellies made of fleſh are, therefore, not without reaſon, preſcribed for recruiting the ſtrength of thoſe who either by large hæmorrhages or violent fevers have ſuſtained a loſs of blood; and people who feed much on theſe mucilaginous Aliments, which the French above all other people in the world do, can bear to have blood taken from them more frequently, and in larger quantities, than people who are not ſo much accuſtomed to them.

The chyle is the immediate matter of the blood, and reſembles a natural emulſion, made of ſoft, oily, inſipid, watery, and mucilaginous particles; for this reaſon all thoſe Aliments, into the compoſition of which parts, reſembling chyle, enter, are proper for nouriſhing the parts, and producing lymph and blood.

Milk, which is nothing but chyle, is an univerſal Aliment, and, in reſpect of nouriſhment, to be preferred to all others.

And, for this reaſon, milk is given as the firſt Aliment, not only to children, but to robuſter animals, that their bodies may grow the faſter, and acquire ſtrength and maturity the ſooner; for food that is ſolid, of a firm coheſion, or hard digeſtion, does not well agree with young and tender bodies, becauſe the ſtomach and inteſtines have not that ſtrength and force which are neceſſary for the digeſtion and expulſion of ſolid foods. Hence, a reaſon may be aſſigned, why ſome people, eſpecially the Swiſs, who are great lovers of milk, and make much uſe of it in food, grow ſo very large and tall, that ſcarce any nation in Europe can ſurpaſs them in that particular.

All mild ſeeds which abound with a milky juice are to be reckoned among the claſs of nouriſhing Aliments.

Hence appears the reaſon, why ſeeds and grains of moſt kinds, ſuch as barley, wheat, oats, rye, beans, peaſe, almonds, cheſnuts, pine-nuts, peſtachia-nuts, rice, maiz, and Turkiſh corn, are extremely proper for nouriſhing animals, and why the meals of theſe baked into bread are the principal and moſt general Aliments made uſe of; from this likewiſe one may account for people's being able to live tolerably on bread and water only.

Among all other Aliments, bread holds the principal place, nor can we poſſibly want it without injuring health. Its uſe is proper at all ſeaſons, and accommodated to all conſtitutions, and may therefore properly be called an univerſal Aliment; nor can fleſh and other ſubſtances be taken alone, and without it, ſince in that caſe they create a nauſea.

The texture of the parts of bread is admirably adapted to the nature of the nutritious juices; for it is mixed with mild, oily, and mucilaginous particles, and likewiſe with a ſubtile acid ſalt, which are very grateful to the ſtomach, and quicken the diſſolving power of the ſalival and fermentative juices. But, as all bread is not made of one and the ſame grain, ſo one kind of bread is preferrable to another with regard to its healthful qualities. The beſt and moſt nouriſhing bread is made of dry rye-meal, not very white, but mixed with the ſmaller and finer parts of the bran. For, by a chymical analyſis, blackiſh coarſe bread upon diſtillation affords more oil, which diffuſes a more agreeable flavour, and more effectually recruits ſtrength, than that which is drawn from fine bread. But that which is made of barley, oats, Turkiſh corn, or even of acorns or cheſnuts, is heavier on the ſtomach, nor is it ſo effectual for repairing loſt ſtrength.

Eggs, becauſe they contain a very fine, balſamic, pellucid lymph, which approaches neareſt to the immediate matter of nouriſhment, therefore afford a very ſpeedy nouriſhment to the parts.

Eggs afford a very ſpeedy nouriſhment, if they are new laid and ſoft, according to that maxim of the Scola Salernitana, Si ſumas ovum, molle ſit atque novum, *i. e.* If you incline to eat an egg, let it be ſoft and new laid. The yolk contains many unctuous, fat, and ſulphureous parts; the white, on the other hand, conſiſts of moiſt, balſamic parts like thoſe of the ſerum, ſo that, if any food is univerſal, this is certainly ſuch, and is in a peculiar manner adapted to increaſe the ſeminal liquor. Eggs are particularly proper, when the body, either weakened by an effuſion of blood, or waſted by the ſhocks of a fever, requires a very ſpeedy ſupply of nouriſhment.

Cheeſe and butter are univerſal and moſt excellent Aliments. Since milk is reſolved into butter and cheeſe, and ſince the butter contains its oily, and the cheeſe its mucilaginous and terreſtrial parts, it is therefore plain that theſe two, eſpecially with the addition of bread and water, muſt be a very valuable and univerſal nouriſhment, fit for perſons of all ages and conſtitutions. The newer butter is, it is of conſequence at once the more grateful to the ſtomach, and the more conducive to health; but, when long kept, it grows fœtid and rancid. The too great or too frequent uſe of it, by relaxing the fibres of the ſtomach, weakens its tone, and excites nauſeas. Butter joined with cheeſe is likewiſe very nouriſhing; but cheeſe ſhould be neither too new nor too old. If too new, it loads the ſtomach, and binds the belly; if too old, it increaſes the acrimony and impurity of the humours, as it is endowed with a poignant taſte, and a fœtid ſmell.

As the blood, the nutritive juice, and in general all the parts of the body, are made up of three elements, viz. Firſt, of one white, ſulphureous, oily, and inflammable: Secondly, one of an earthy, ſubtile, alcaline nature, which is nevertheleſs more fixed: Thirdly, one of an aqueous; ſo the ſeveral kinds and virtues of Aliments may be moſt commodiouſly reduced to theſe three claſſes.

Aliments of theſe three ſeveral qualities, duly mixed with one another, afford a proper nouriſhment for the human body.

The fleſh of animals, eſpecially when roaſted, affords the body its principal ſupply of the ſulphureous part; but it is to be obſerved, that wild animals are preferrable in this reſpect, to thoſe of the tame and domeſtic kind, becauſe their oils and ſalts are exalted by their habitual exerciſe.

That the fleſh of animals contains more of a ſubtile oil, than vegetables, is plain from this, that in the ſummer fleſh very ſoon turns putrid and offenſive, which is not found to be the caſe with reſpect to vegetables.

Vegetables have an acid in their compoſition, and their oils, excepting ſome of the hotter herbs, are for that very reaſon ſo much the milder. Animals, on the other hand, have no acid in their compoſition; for all the parts of them, ſubjected to diſtillation, yield a ſubtile oil, and a volatile ſalt; and this hot oil is what principally excites an inteſtine and fermentative motion in the blood, and proves the occaſion of the penetrating and diſagreeable ſmell which is felt upon putrefaction.

The roaſted fleſh either of wild beaſts, or wild fowls, furniſh the blood with a greater ſtore of a light ſulphureous ſubſtance, than boiled fleſh, or thoſe of tame animals.

The fleſh of wild animals, and wild fowls, is undoubtedly lighter, more ſubtile and oily, but fraught with a ſmaller quantity of mucous balſamic matter, than the fleſh of tame animals; becauſe wild animals uſe more violent exerciſe, breathe a freer and purer air, and feed upon drier Aliments. Add to this, that by the very roaſting much of the humidity is evaporated, by which means the oily principle, diſentangling itſelf from the reſt of the component parts, and being exalted by the fire, enjoys its full liberty, and has the aſcendant over the other parts.

Among the Aliments which furniſh the blood with its humid parts, of animals fiſh, and of vegetables pot-herbs, the milder roots, and ſome ſummer-fruits, are reckoned the principal.

Fiſh ſubjected to diſtillation yields much phlegm, little oil, and very little volatile ſalt.

Becauſe fiſh contains only a very ſmall quantity of oil and volatile ſalt, it does not ſo eaſily turn putrid as fleſh, and for this reaſon is generally leſs hurtful in fevers than fleſh.

To the third claſs of Aliments which ſupply the blood with its fixed and earthy parts, belong all kinds of grains, as the ſeveral kinds of bread, rice, peaſe, beans, lentils, cheſnuts, almonds, cacao, cheeſe, &c.

From what has been ſaid it will appear, that all ſuch Aliments that are of a mild quality, and reſemble the chyle and blood, are fit for nouriſhment.

All ſuch Aliments therefore, as either recede from, or are quite oppoſite to the chyle and blood, are unfit for nouriſhing the parts.

All Aliments in which there is too much of an acid, are improper for nouriſhment; becauſe milk and blood will not mix with an acid, which is quite oppoſite to their natures, and induces a coagulation of the circulating juices.

Hence the reaſon is plain, why the too liberal uſe of ſallads, ſummer fruits, eſpecially whilſt crude and unripe, vinegar, ſour ale, and wines that abound with an acid, are ſo remarkably prejudicial to health.

No ſalt whatever can be mixed with the blood, chyle, and milk, for which reaſon all ſalts, and all foods too high ſalted, muſt be improper and unfit for nouriſhment.

Blood and chyle never incorporate with ſpirituous liquors, but rather ſeparate from them; whence it is eaſy to judge how detrimental the free uſe of them is, both to health and nouriſhment.

All ſweet things, as ſugar and honey, have no affinity with the blood and chyle, but rather recede from their nature, ſince they

they have an exquiſite taſte which the blood, chyle, and nutritive juices have not.

Though ſweet ſubſtances conſiſt of a temperate mixture of parts, and may on that account ſeem proper for nouriſhment, yet the ſweet particles are ſalts of a peculiar kind, which are diſſoluble in water; hence they cannot be joined to the ſubſtance of the parts, ſince they are liable to be diſſolved by the circulating fluids.

Aliments proper for preſerving health ought not only to contain a laudable juice, but ſhould likewiſe be eaſily diſſolved by the ſtomach. Hence it is plain, that all thoſe kinds of food, which on account of the cloſeneſs and compactneſs of their texture are with difficulty diſſolved, are for that very reaſon leſs conducive to health.

The fleſh of old animals, fleſh dried in the ſmoak, hard eggs, ſea fiſh almoſt of all kinds, and very coarſe bread, on account of the rigid and complicated texture of their parts, are for that very reaſon with ſome difficulty concocted by the ſtomach, and converted into juice and blood.

As theſe hard and compact foods require much warmth, abundance of fermentative and ſalival lymph, and a ſtrong ſtomach to disjoin and break their complicated textures, ſo they do not agree but with robuſt conſtitutions, and people that labour hard; for this reaſon the inhabitants of ſome northern countries, ſuch as the Swedes, the Norwegians, the Laplanders, the Finlanders, the Weſtphalians, and the Pomeranians are not eaſily injured by foods of this kind, becauſe their ſtomachs, being not only naturally vigorous, but likewiſe ſtrengthened by cuſtom, eaſily diſſolve and digeſt them.

Of vegetables, roots, fruits, and herbs, eſpecially if eat crude, and before they are ſufficiently ſoftened by boiling, are difficultly concocted by the ſtomach, becauſe their fibrous textures are hard to be diſſolved.

Aliments of the vegetable kind are for that reaſon likewiſe heavy on the ſtomach, ſince they produce many flatulences which diſturb and diſorder the primæ viæ.

To this claſs belong all unripe fruits, peaſe, beans, turnips, rape, bulbous roots, the ſeveral kinds of cabbage, garlic, onions, radiſhes, ſallads prepared of lettices and other herbs, pears, apples, prunes; honey and water, honey, muſt, and all ſweet fruits of whatever kind; for ſuch is the nature of theſe that they eaſily run into a fermentation, or even become ſour, and by reaſon of their viſcid tenacity are reſolved into fumes and vapours.

The tenacious and glutinous parts of animals, among which are the ſtomach, the inteſtines, the ſpleen, the kidnies, the beaks, the vulvæ, the ears, the ſkins, and the claws, are of hard digeſtion, and with difficulty yield to the menſtruum of the ſtomach.

Fat ſubſtances are with difficulty digeſted by the ſtomach, for, if an acid, with which vegetables principally abound, be added to them, they run into a coagulum.

Fat foods require an alcaline liquor for breaking and disjoining their complicated textures; for which reaſon a good deal of bile is requiſite to prevent their proving hurtful to the ſtomach; for, when an acid in the ſtomach attempts the ſolution of fat ſubſtances, hot ſulphureous vapours and eructations are cauſed, which are very troubleſome to the alimentary tube.

The more viſcid, rancid, and old fat ſubſtances are, they are for that reaſon ſo much the worſe. The new and recent are better, and ſooner yield to ſolution and digeſtion..

Hence the reaſon is plain, why the fat of beef is not ſo hurtful, when uſed in the preparation of food, as the fat of mutton, or that of the kid, the ſow, or the gooſe. Hence likewiſe, may a reaſon be aſſigned, why old fleſh ſuch as is hardened in the ſmoak, becauſe of the rancidity which fat contracts, and bacon which has acquired a ruſtineſs and yellow colour, are highly improper for the preſervation of health.

In order to the performance of the office of nutrition, it is neceſſary that the ſmall mouths of the internal rough coat of the inteſtines abſorb the chyle, and convey it to the blood; for which reaſon none of thoſe Aliments, which either obſtruct, or too much corrugate its mouths, can be uſed, without in ſome meaſure injuring health.

Since the effete maſs of Aliments, drained and exhauſted by the ſeparation of the chyle from it, ought by the expanſive and contractive motion of the inteſtines to be thrown off from them, it muſt of courſe follow, that all thoſe Aliments are prejudicial to health, which either paſs through the inteſtines with difficulty, ſtop their motions, or weaken their tone, and impair their ſtrength, by ſuppreſſing excretion ſo neceſſary to health.

All Aliments that are acid, aſtringent, mouldy, glutinous, viſcid, auſtere, or ſuch as eaſily run into a coagulum, are for this reaſon prejudicial to health, becauſe they weaken the tone of the inteſtines, and by that means prevent the ſuperfluous fæces from being diſcharged.

This characteriſtic of unwholeſomeneſs belongs to all unripe ſummer fruits, pears, quinces, pomegranates, medlars, the fruits of the thorn and myrtle, ſea biſcuits, the cruſt of bread; bread that is mouldy, hard, too coarſe, or taken warm from the oven; all farinaceous ſubſtances, gruels made of peaſe, beans, lentils, and millet, cakes or bread not ſufficiently fermented, cheeſe eat too freely, ſheeps milk, and in fine all milky and fat ſubſtances; all which Aliments do ſtill more remarkably hurt the conſtitution, if wine, acids, or cold liquors, are uſed along with them; for by this means they are reduced into a firm coagulum, which adheres immoveably to the coats of the inteſtines, and incruſtates the orifices of their ſmall abſorbent veſſels, whence proceed copious flatulences and ſpaſms.

The unwholeſomeneſs of Aliments is to be eſtimated from their impairing the fermentative and ſolutive powers of the ſtomach, ſince by that means crudities are generated.

The action of the fermentative juice is impaired and weakened by all fat, oily, and very ſweet ſubſtances; by honey, hydromel, or honey and wine, new grapes, ſummer fruits, green figs. All pulſes, farinaceous ſubſtances, gruels made of millet, lukewarm Aliments, the fibrous roots of pot-herbs, cheeſe, and curdled milk, all which are the more prejudicial to health, the greater quantities of them are taken into an empty ſtomach.

Every acid, and every putrefaction, are prejudicial to health; and, for that reaſon, all Aliments which eaſily grow ſour or putrid in the ſtomach, may be juſtly reckoned unwholeſome.

An acid is equally injurious to the primæ viæ and to the blood, for it deſtroys the alcaline and balſamic quality of the bile, coagulates the chyle, and retards the expulſion of the excrement. Add to this, that, when it is mixed with the blood, ſtagnations of the juices and infarctions of the viſcera are generated. And, when the firſt organs of digeſtion are affected by putrified Aliments, and the putrefaction extends itſelf towards the more internal parts, it communicates its own bad diſpoſition to the moſt wholeſome juices. Among thoſe foods which by their long continuance in the primæ viæ grow acid, may be reckoned all ſummer fruits, milk, honey, almoſt all ſorts of tarts, ſweet wines of ſeveral kinds, muſt, hydromel, and fermented bread; and thoſe Aliments which ſooneſt grow putrid by a long ſtay in the primæ viæ, are boiled fleſh; for, of all Aliments uſed by us, none have a greater tendency to putrefaction than fleſh. Wherefore it is for very valuable purpoſes, that nature in acute diſeaſes, and in habits abounding with impure juices, does of her own accord loath and abhor fleſh; and thoſe phyſicians laudably aſſiſt nature in carrying on her deſign, who in caſes of that nature forbid their patients the uſe of nouriſhing broths; for Aliments of this kind wonderfully add to the putrefaction, which is the formal cauſe of the malignity. For this reaſon, when peſtilences or other epidemical diſeaſes rage, it is adviſable to abſtain from fleſh, and uſe acidulated liquors, which ſtrongly reſiſt putrefaction, and by that means prove remarkably ſerviceable; but this is to be underſtood of thoſe conſtitutions which are infirm, weakened with fevers, or loaded with impure juices; ſo that Hippocrates was very juſt in his obſervation, that, the more bodies abounding with impure juices are nouriſhed, the more they are injured. Corrupted fiſh, putrid fleſh, or that of animals which laboured under any diſeaſe, have of all other kinds of food the ſtrongeſt and more direct tendency to produce a putrefaction in the body. *Hoffman's Medicina Rationalis Syſtemat.*

ALLIGATION *Alternate* (*Dict.*)—When two kinds of things only are given to be mixed, the rule of Alligation will give but one anſwer; for inſtance, ſuppoſe it were required to mix brandy, at 8 ſhillings per gallon, with cyder, at 1 ſhilling per gallon, ſo as to make the mixture worth 5 ſhillings per gallon? The operation would ſtand as follows:

$$5\left\{\begin{matrix}8\\1\end{matrix}\right.\left|\begin{matrix}4\\3\end{matrix}\right.$$

And the anſwer will be, 4 gallons of brandy, and 3 of cyder. Nevertheleſs, let it be obſerved, that any other two numbers, that are in the ſame proportion to each other as 4 to 3, will alſo anſwer the queſtion. Thus, 8 and 6, 12 and 9, 16 and 12, &c. are anſwers to the queſtion; for in theſe the quantity of the mixture is the double, triple, quadruple, &c. of the quantity in the former; and ſo are the parts of which it is compoſed. If three kinds of things are given to be mixed, the rule of Alligation will give but one anſwer; but then, as before, all numbers that are in the ſame proportion between themſelves as the numbers which compoſe that anſwer, will alſo ſatisfy the queſtion.

But this is not all, for, by the help of an artifice, now to be explained, innumerable other anſwers may be obtained, the numbers compoſing which are not in the ſame proportion as above.

Let it be required to mix brandy, at 8 ſhillings per gallon, with wine, at 7 ſhillings per gallon, and cyder, at 1 ſhilling per gallon, ſo that the mixture may be worth 5 ſhillings per gallon? The work, by the rule of Alligation, will ſtand as follows:

$$5\left\{\begin{matrix}8\\7\\1\end{matrix}\right.\left|\begin{matrix}4\\4\\3{,}2\end{matrix}\right.\left|\begin{matrix}4\\4\\5\end{matrix}\right.$$

Which ſhews, that 4 gallons of brandy, 4 of wine, and 5 of cyder will anſwer the queſtion.

For

For 4 galls. of brandy,	at 8 s. per gall.	are worth	32 s.
4 galls. of wine,	at 7 s. per gall.	are worth	28 s.
5 galls. of cyder,	at 1 s. per gall.	are worth	5 s.
Therefore 13 galls. of the mixture are worth		—	65 s.
And 1 gall. of the mixture is worth $\frac{65}{13}$ s. =			5 s.

Now let us suppose, that it should be determined to use 5 gallons of cyder in the mixture constantly, but to use any quantities of brandy and wine that will answer the question.

Then may the quantity of brandy be increased or diminished by 2, the difference between the prices of the wine and mixture; if, at the same time, the quantity of the wine be diminished or increased by 3, the difference of the prices of the brandy and mixture.

That is to say, to (4) the quantity of brandy, given by the above answer, add 2; and, from (4) the quantity of wine, take 3; so shall the sum 6, and difference 1, be respectively quantities of brandy and wine, which, mixed with 5 gallons of cyder, will answer the question.

For 6 galls. of brandy,	at 8 s. per gall.	are worth	48 s.
1 gall. of wine,	at 7 s. per gall.	is worth	7 s.
5 galls. of cyder,	at 1 s. per gall.	are worth	5 s.
Therefore 12 galls. of the mixture are worth		—	60 s.
And 1 gall. of the mixture is worth $\frac{60}{12}$ s. =			5 s.

Again; if, from (4) the quantity of brandy given in the first answer, 2 be subtracted; and if, to (4) the quantity of wine, 3 be added; then will 2 and 7, the remainder and sum, be respectively quantities of brandy and wine, which will answer the question.

For 2 galls. of brandy,	at 8 s. per gall.	are worth	16 s.
7 galls. of wine,	at 7 s. per gall.	are worth	49 s.
5 galls. of cyder,	at 1 s. per gall.	are worth	5 s.
Therefore 14 galls. of the mixture are worth		—	70 s.
And 1 gall. of the mixture is worth $\frac{70}{14}$ s. =			5 s.

Now, if, instead of the numbers of the first answer 4, 4, and 5, larger numbers, in the same proportion, viz. 12, 12, and 15, were taken, the following eight answers would be found, by increasing and diminishing the quantities of brandy and wine as above directed, the quantity of cyder remaining constantly 15, viz.

Brandy	18.	16.	14.	12.	10.	8.	6.	4.	2.
Wine	3.	6.	9.	12.	15.	18.	21.	24.	27.
Cyder	15.	15.	15.	15.	15.	15.	15.	15.	15.

And if, instead of these, still larger numbers in that proportion, or in proportion as any of the last found answers, be assumed, a greater number of other answers may be found.

If, instead of supposing the quantity of cyder invariable, the quantity of brandy be taken for such; then an infinite number of answers may be found, by continually increasing the quantity of wine by (4) the difference between the prices of the cyder and mixture; and the quantity of cyder by (2) the difference between the price of the wine and mixture.

Thus, assuming the second answer 6, 1, and 5, as the basis of our work, and esteeming the 6 gallons of brandy as invariable, the following system of answers will arise:

Brandy	6.	6.	6.	6.	6.	6.	6.	6.	6, &c.
Wine	1.	5.	9.	13.	17.	21.	25.	29.	33, &c.
Cyder	5.	7.	9.	11.	13.	15.	17.	19.	21, &c.

Lastly, esteeming the quantity of wine as invariable, the quantity of brandy must be increased by (4) the difference of the prices of the cyder and mixture; and the quantity of cyder must be increased by (3) the difference of the prices of the brandy and mixture.

Thus, taking the third answer 2, 7, and 5, as the basis, and making 7 invariable, these answers arise:

Brandy	2.	6.	10.	14.	18.	22.	26.	30, &c.
Wine	7.	7.	7.	7.	7.	7.	7.	7, &c.
Cyder	5.	8.	11.	14.	17.	20.	23.	26, &c.

When there are four kinds of things to be mixed, and two of them are of greater value, and the other two of lesser value than the mixture, the rule of Alligation will give three answers; with either of which, or with any numbers that are in the same proportion among themselves as those, as a basis, innumerable other answers, consisting of numbers which are in different proportions among themselves, may be found, by making any two of them invariable, and changing the rest in the manner as above.

Note. 1. That the number by which the quantity of any simple is to be varied, is always the difference between the price of the mixture, and the price of the other simple, which, in any operation, is considered as variable.

Note. 2. That if the simples, which, in any operation, are considered as variable, be both of greater, or both of less value than the mixture, then, while the one is increased, the other must be diminished; but, if the one be of greater value than the mixture, and the other lesser, then they must be both increased or both diminished.

Let it be required to mix brandy at 8 shillings, wine at 7 shillings, cyder at 1 shilling, and water at nothing per gallon together, so that the mixture may be worth 5 shillings per gallon? The three answers, by the rule of Alligation, are as follow:

5	8	5		5	8	4		5	8	5,4	9
	7	4			7	5			7	5,4	9
	1	2			1	3			1	3,2	5
	0	3			0	2			0	3,2	5

Now, taking the last answer for the basis of our operation, and making the quantities of wine and cyder invariable, we shall have

Brandy	9.	14.	19.	24.	29.	34.	39, &c.
Wine	9.	9.	9.	9.	9.	9.	9, &c.
Cyder	5.	5.	5.	5.	5.	5.	5, &c.
Water	5.	8.	11.	14.	17.	20.	23, &c.

Making the brandy and cyder invariable.

Brandy	9.	9.	9.	9.	9.	9.	9, &c.
Wine	9.	14.	19.	24.	29.	34.	39, &c.
Cyder	5.	5.	5.	5.	5.	5.	5, &c.
Water	5.	7.	9.	11.	13.	15.	17, &c.

Making the wine and water invariable.

Brandy	9.	13.	17.	21.	25.	29.	33, &c.
Wine	9.	9.	9.	9.	9.	9.	9, &c.
Cyder	5.	8.	11.	14.	17.	20.	23, &c.
Water	5.	5.	5.	5.	5.	5.	5, &c.

Making the brandy and water invariable.

Brandy	9.	9.	9.	9.	9.	9.	9, &c.
Wine	9.	13.	17.	21.	25.	29.	33, &c.
Cyder	5.	7.	9.	11.	13.	15.	17, &c.
Water	5.	5.	5.	5.	5.	5.	5, &c.

Making the brandy and wine invariable.

Brandy	9.	9.	9.
Wine	9.	9.	9.
Cyder	10.	5.	0.
Water	1.	5.	9.

Or taking 4 other numbers in the same proportion, as 9, 9, 5 and 5, viz. 36, 36, 20 and 20.

Brandy	36.	36.	36.	36.	36.	36.	36.	36.
Wine	36.	36.	36.	36.	36.	36.	36.	36.
Cyder	40.	35.	30.	25.	20.	15.	10.	5.
Water	4.	8.	12.	16.	20.	24.	28.	32.

Lastly, make the cyder and water invariable.

Brandy, &c.	44.	42.	40.	38.	36.	34.	32.	30.	28, &c.	
Wine, &c.	24.	27.	30.	33.	36.	39.	42.	45.	48, &c.	
Cyder, &c.	20.	20.	20.	20.	20.	20.	20.	20.	20, &c.	
Water, &c.	20.	20.	20.	20.	20.	20.	20.	20.	20, &c.	

Not only the sets of numbers thus found, but their sums and differences will also be answers:

	Brandy.	Wine.	Cyder.	Water.	
Thus, from or to	42	27	20	20	
Take or add	9	9	10	1	
The remainder	33	18	10	19	will be answers to the question.
And sum	51	36	30	21	

Desson.

A'LLUM, or rather ALUM (*Dict.*)—The configurations of this salt, examined by the microscope, are very beautiful and prove more or less perfect, according to the strength of the solution, and the degree of heat employed in making the experiment; to judge of which a little experience will be found needful.

The solution, however, sated with Allum, will not be found over strong after standing some days, for, in that time, it will have precipitated many crystals to the bottom, whereby the liquor is sometimes left too weak for our purpose; but then, by holding the phial over or near a fire, the crystals will again dissolve, and be taken up a-new into the fluid. It is not, however, adviseable to make use of it, as soon as this is done, unless we want to produce nothing else but crystals; for if, after this, it be employed before it has had a little time to cool and settle, it is very apt to form into crystals only; but, when it has stood about half an hour, a drop placed on a slip of glass, and heated properly, exhibits commonly, at the beginning, a dark cloud, which appears in motion somewhere near the edge, and runs pretty swiftly both to the left and right, until it is either stopped by the intervention of some regular crystals, or else proceeds onward both ways at once, and nearly of the same height; till, having surrounded the whole drop, the two ends rush together and join: the progress towards which is attempted to be shewn (*plate* III. *fig.* 2.) at *a a*.

This cloudy part of the drop, that seems violently agitated, whilst it is running round, appears, on a strict examination, to consist of salts, shot into long and very slender lines, much finer than the smallest hair, which cross one another at right angles, and form, as they go along, from their internal edges, rows of solid crystals, composed of many oblique plain sides, *b b*.

But it happens frequently, that, in some parts of the drop, many minute and circular figures are seen, rising at some little distances at the edge, whilst the abovementioned operations are performing in other places thereof; which minute figures, enlarging themselves continually, appear at last of a star-like form, or with lines radiating and diverging from its center, in the manner represented at *c c*.

After the business is over about the edges, a good deal of patience will be requisite to wait for the configurations in the middle of the drop, which seldom begin till the fluid seems almost wholly evaporated; when, on a sudden, many straight lines appear pushing forwards, whose sides or edges are jagged, and from which other similar straight lines and jagged shoot out at right angles with the first; these again have other small ones of the same kind shooting likewise from themselves, and compose, all together, a most beautiful and elegant configuration; the order of which is attempted to be shewn at D.

Each of these lines, increasing in breadth towards its end, appears somewhat club-headed, as *e e e*.

Sometimes, instead of sending branches from their sides, many of these lines rise parallel to each other, resembling a kind of pallisadoe, and having numberless minute transverse lines running between them, as at F.

But the most wonderful part of all, though not produceable without an exact degree of heat and right management, is the dark ground-work shewn at G, which consists of an almost infinity of parallel lines, having others crossing them at right angles, and producing a variety scarce conceivable from lines disposed in no other manner: the direction of the lines (which are exquisitely straight and delicate) being so frequently and differently counter-changed, that one would think it the result of long study and contrivance.

During the time this ground-work is forming, certain lucid points present themselves to view (on one side thereof most commonly) which points grow larger continually, with radiations from a center, and become star-like figures, in the manner of those before mentioned. Several of them likewise shoot out long tails, which give them the appearance of comets: and, at the end of all, a dark lineation, in various directions, darts frequently through, and occupies all or most of the spaces between them, making thereby no ill representation, when viewed by candle-light, of a night-sky illuminated with shining stars, and tailed comets, and rendering the whole scene extremely whimsical and pretty.

Nor do these configurations break away, or dissolve, soon after their being formed, as many others do; but may be preserved on the glass in good perfection for weeks or months, if care be taken neither to exclude the air wholly from them, nor put them in a moist place: for in either case they will be soon destroyed. *Baker's Employment for the Microscope.*

A'LMOND-TREE, *Amygdalus*, in botany, a beautiful tree, which produces the Almonds. See the article ALMONDS, in the dictionary.

The characters of this genus are, it hath leaves and flowers very like those of the peach-tree; but the fruit is longer, and more compressed: the outer green coat is thinner and drier, when ripe, and the shell is not so rugged.

The species are: 1. Amygdalus sativa, fructu majore. C. B. P. The common large Almond. 2. Amygdalus dulcis, putamine molliore. C. B. P. The sweet Almond, with tender shells. 3. Amygdalus amara. C. B. P. The bitter Almond. 4. Amygdalus sativa, flore albo. The white-flowering Almond.

The first, second, and third sorts are chiefly cultivated in England for the beauty of their flowers, which are produced early in the spring, when few other things appear; which renders them worthy of a place in the best gardens, where being intermixed with other flowering trees, either in wilderness quarters, or in walks, they make a very fine appearance.

They are propagated by inoculating a bud of these trees into a plum, Almond, or peach-stock, in the month of July (the manner of this operation, see under the article of GRAFTING, *Dict.* The next spring, when the buds shoot, you may train them up either for standards, or suffer them to grow for half standards (according to your own fancy) though the usual method is to bud them to the height the stems are intended to be; and the second year, after budding, they may be removed to the places where they are to remain. The best season for transplanting these trees (if for dry ground) is in October, as soon as the leaves begin to decay; but, for a wet soil, February is much preferrable; and observe always to bud upon plum-stocks, for wet ground; and Almonds or peaches, for dry.

The Almond with white flowers is a greater curiosity than either of the former, and, being intermixed with the other sorts, and a few of the cherry-plum-trees, which flower all together, add very much to the beauty of these plantations: this sort with white flowers is more difficult to increase than either of the former, and will not take upon a plum-stock, but must be either budded on a peach, or Almond.

The sort with large fruit produces almost every year large quantities with us in England, which, if eaten before they are too dry, are little inferior to those we receive from abroad; but, if kept too long, they are very apt to shrivel up, and lose their plumpness; but in other respects are very good.

The Jordan Almonds, which are annually brought to England, seem to be the same as ours with white flowers, by some plants which I have raised from the nuts, which retain the same appearance in leaf and shoot, as those with white flowers; but they have not as yet flowered with me, although the trees are grown to a large size.

The bitter and sweet Almonds are only varieties, which will come from the same seeds; but there is a manifest difference between these and the white-flowering sort, both in leaf and shoot, so as to be distinguished thereby at all seasons; yet by later botanists they are made but one species.

The white sort, coming out earlier in the spring than the other, is in greater danger of suffering from the frost in the spring, whereby few fruit are ever seen upon the trees in this country. *Miller's Dict.*

ALMOND *Furnace*, a small furnace in which the refiners of silver out of lead melt flags of the litharge left in this operation, and, with the help of charcoal, reduce them into lead again.

A'LNUS, *the alder-tree*, in botany, the name of a genus of trees, whose characters are these: the flower is of the amentaceous kind, being composed of several apices, arising from four-leaved cups; these are affixed in a clustering manner to an axis, but these are barren. The young fruit appears in a different part of the tree, and is of a squamose structure, and loaded with embryo seeds; this finally increases in size, and becomes a regular fruit, containing a number of compressed seeds. *Miller's Dict.*

There are eight species of this plant enumerated by botanical authors; but the common alder is generally meant by the name.

There is a peculiar beneficial property belonging to this plant, for no beast will crop it, be it young or old, which saves the great charge and trouble of fencing it after planting. Their propagation is the same as the poplar, and, where a place is too wet for that, the alder will flourish and become large trees, pollards, or poles for hedges; in short, there is none of the aquatic tribe will raise more money and sooner than the alder, in wet meadow hedges, and in boggy, moorish ground, nor make stronger and quicker fences, than this excellent plant.

This aquatic will thrive but poorly when raised from truncheons, nor much better from the wild set or sucker, which it produces but few of. But there is a way to do this much more to the purpose, and that is thus: first prepare a bed of well manured fine mould; then lay the full ripe seed at a due distance from the fire, or in the sun, and it will cause them to open like the fir pine-apple; then sow the seeds in the bed, and you will have abundance of young plants, that on setting out will be sure to grow, if rightly managed: at midsummer cut away the small side shoots of this tree, which will prevent their second growth; but, if they are large, you must not do it, because it will then make the sap run out too much, and damage the tree. This is of great consequence, for, by so doing, the large side arms are prevented in their growth, which often causes knobs and wens that lessen the value of their wood. *Ellis's Timber-tree improved.*

A'LOE, in botany, the name of a genus of plants, of which Mr. Tournefort has enumerated 14, and Mr. Miller 38 species. The characters of this genus are these: the flower is liliaceous, and consists of one petal, which is of a tubular form, and is divided into six segments at the edge. In some species of this genus, the cup, and in others the pistil, finally becomes a fruit, or seed-vessel, of an oblong cylindric form, divided into three cells, and containing flat and semicircular seeds. The soil in which these plants thrive best, is on half fresh light earth from a common (and if the turf is taken with it, and rotted, it is much better) the rest should be white seasand, and sifted lime-rubbish, of each of these two a fourth part; mix these together six or eight months at least before it is used, observing to turn it over often in this time.

The first species of Aloes is very hardy, in respect to cold; and has, in mild winters, endured abroad, being planted in a very dry soil, and under a south wall; but, as they are liable to be killed in hard frosts, they generally are kept in pots or tubs in a common green-house with oranges, myrtles, &c. but must have very little moisture in winter. Most of the other sorts are better preserved in an airy glass-case, in which there is a stove to make a little fire in very bad weather; to dry and warm the air in foggy, cold, or wet weather, and to prevent the frost from entering the house.

The fifth, sixth, seventh, eighteenth, thirty-fourth, and thirty-fifth sorts, require a greater share of heat to preserve them in winter, and should be set in a good stove, and kept nearly to the degree of heat marked (upon Mr. Fowler's Botanical Thermometers) temperate. Indeed, most of the other sorts may be kept in the same temperature of heat in winter; but then you must observe, that, the greater the heat is in winter in which you keep them, the more water they will require: and, if they are well managed in this heat, they will grow very much in winter; therefore, great care must be taken in the severe cold, that it doth not enter the house, nor that the heat be at that time lessened; as also how you begin to give them air in the spring; for the extreme parts of the plants will be rendered very tender, by their growing freely in winter; and the least check to their growth, at that season, is very often their destruction.

Most of the African sorts of Aloes produce flowers with us annually, when grown to a sufficient size, which is generally the

the ſecond, and ſeldom more than the third year, after planting from off-ſets; but the American Aloes (which, for the moſt part, produce their flower-ſtems immediately from the center of the plant) ſeldom flower till they are of a conſiderable age, and this but once during the life of the plant; for when the flower-ſtem begins to ſhoot from the middle of the plant (which, for the moſt part, is of a large ſize, and grows to a great height) it draws all the moiſture and nouriſhment from the leaves, ſo that, as that advances, the leaves decay; and, when the flowers are fully blown, ſcarce any of the leaves remain alive; but, whenever this happens, the old root ſends forth a numerous quantity of off-ſets for increaſe; and it is not till this time that ſome of theſe ſorts can be increaſed, eſpecially the ſecond, third, fourth, fifth, ſixth, and ſeventh ſorts, which never produce any young plants until they flower; at which time, the flower-ſtem of the ſeventh ſort is beſet with ſmall heads from bottom to top, which, being taken off, and planted, will grow as well as ſuckers from the roots.

This Aloe, which, with us, ſeldom makes a very large plant, hath yet produced flower-ſtems of a conſiderable ſize, and fifteen feet in height. The flowers are little leſs than thoſe of the large ſort. I cannot here forbear taking notice of a vulgar error relating to the large American Aloe; which is, that it never flowers till it is an hundred years old; but this is a miſtake; ſince we have had ſeveral of them flower in England, ſome of which were known not to exceed fifty years old; and others, which flowered many years ago, cannot be ſuppoſed to have been in England ſo long as to arrive at that age, ſince they were thought too tender for our climate at that time, when green-houſes were not known; as may be ſeen by looking into Gerrard's and Parkinſon's Herbals.

Thoſe who are deſirous to have this ſort of Aloe flower, may, by giving the plants large tubs for their roots to ſpread, greatly promote their growth, and, in proportion to the growing of the plants, their flowering is haſtened. For, the bud being formed in the center of the plants, when the number of leaves which enfold it are thrown off, the ſtem will advance; ſo that in Spain and Portugal, where the plants grow faſt, they produce flowers in eighteen or twenty years; and in the Weſt-Indies, where they grow faſter, in ſeven or eight.

The African Aloes, for the moſt part, afford plenty of ſuckers, by which they are increaſed; but thoſe few that do not, may be moſt of them propagated, by taking off ſome of the under-leaves, laying them to dry for a week or ten days, as was directed for the off-ſets; then plant them in the ſame ſoil as was directed for them, putting that part of the leaf which did adhere to the old plant, about an inch, or an inch and an half (according to the ſize of the leaf) into the earth, giving them a little water to ſettle the earth about them: then plunge the pots into a moderate hot-bed, obſerving to ſcreen them from the violence of the ſun, and give them gentle refreſhings with water: the beſt ſeaſon for this is in June, that they may puſh out heads before winter. See the article ALOE, in the Dictionary. *Miller's Dict.*

Lignum ALOES, a medicinal wood imported from the Eaſt-Indies, where it is called calambac, or calamba. See CALAMBAC.

ALVE'OLI, among naturaliſts, ſignifies thoſe little waxen cells in the combs of bees, wherein the honey is depoſited. See BEE, *in the Dictionary*.

A'LUM. See the article ALLUM.

ALYSSOI'DES, in botany, a genus of plants, whoſe characters are theſe: it hath a flower in form of a croſs, conſiſting of four leaves, out of whoſe flower-cup riſes the pointal, which afterwards becomes an elliptical thick fruit, divided into two cells by an intermediate partition, which is parallel to the demi-elliptical turgid valves, and filled with round flat ſeeds, having borders round them.

AMARA'NTA, a military order of knighthood, inſtituted, in 1653, by Chriſtina queen of Sweden, daughter of Guſtavus Adolphus, on the following occaſion. At Stockholm, the metropolis of Sweden, is yearly celebrated a feaſt, called wirtſchaft, or feaſt of pleaſure, conſiſting of rich dreſſes, balls, maſquerades, &c. Chriſtina, ambitious of imitating the feaſts of the gods, ordered the nobility to come magnificently apparelled, and repreſent the gods and goddeſſes at the feaſt. The queen took the name of Amaranta, *i. e.* immortal, and joining the young nobles, clad like nymphs and ſhepherds, waited upon the gods at the tables, which were covered with the moſt ſumptuous repaſts. The hall where this feaſt was made, was hung with the richeſt tapeſtry, repreſenting the delightful country of Arcadia, adorned with ſtatues, vaſes, and other ornaments, and ſcented with the moſt agreeable perfumes. Theſe pleaſures laſted a day and night; when the queen, ſuddenly changing her habit, ordered thoſe who had repreſented the gods and goddeſſes to throw away their diſguiſes, and put on their own dreſſes again; and, in memory of ſo elegant a feaſt, inſtituted the order of the Amaranta, from the name which ſhe herſelf had taken.

Aſhmole, in his Hiſtory of the Garter, and Guillim, in his Diſplay of Heraldry, erroneouſly place the inſtitution of this order in the year 1645. Aſhmole ſay that Chriſtina abdicated the crown of Sweden in 1645, in favour of her couſin Charles Guſtavus, on account of her abjuring the Lutheran for the Roman catholic religion; whereas ſhe did not reſign the crown till 1654, nor did ſhe embrace the Catholic religion till 1656; and it was a year before her abdication, that ſhe inſtituted the order of the Amaranta. *Juſtinian's Hiſt. of Military Orders, cap.* 85. 9.

The ceremony of the inveſtiture of the knights of this order is as follows: the queen being ſeated in ſtate, the perſon to be knighted kneels down before her, and, holding his hands between the queen's, takes an oath to defend her perſon from harm, and the perſons of his brother-knights; to incite juſtice, virtue, and piety, and diſcountenance its oppoſers; after which the queen puts about him a crimſon ſilk ſcarf, with the enſign of the order faſtened thereto.— To an abſent prince, or other perſonage, ſhe ſends the jewels, accompanied with her letter, which ſupplies the place of a perſonal inveſtiture.— There have been ſeveral knights and princes of this order.

The chief enſign of this order is a circle of laurel, in which is a cypher compoſed of an A and a V, or two A's, one of which is reverſed. The leaves of the laurel are wreathed about with a white ribbon, upon which is this motto, *Dolce nella memoria.* The whole incircling a gold medal, which hangs to a collar, and is alſo embroidered upon the garment. (See *plate* III. *fig.* 4.) *Trevoux. Hiſt. de Mil. Ord.*

AMARANTHOI'DES *, *globe amaranthus*, or *everlaſting flower*, a genus of plants whoſe characters are theſe: the flowers are ſmall, and cut into four ſegments, which are collected into ſquamoſe heads: from each of theſe ſcales is produced a ſingle flower; the ovary in the bottom of the flower becomes a roundiſh crooked ſeed, which is contained in a thin pellicule, or ſkin.

* The word is formed from the Greek *ἀμάϱανθος* and *εἶδος*, reſemblance.

Theſe plants are ſome of the greateſt beauties amongſt the whole annual tribe: they muſt be ſown very early in a good hot-bed, and treated as will be hereafter directed for the amaranths; with this difference only, that theſe muſt have a greater ſhare of heat, and be forwarded more in the ſpring.

If the autumn ſhould prove cold or wet, it will be very neceſſary to remove the pots, with theſe plants, into ſhelter, otherwiſe they will not perfect their ſeeds, eſpecially if they were not ſown very early in the ſpring. If theſe pots are preſerved in a good green-houſe, their flowers will make a pretty variety amongſt other plants, and will continue until the middle or latter end of November, provided the weather proves not too cold: but what flowers you intend to preſerve, ſhould be gathered ſoon after they arrive at their proper bigneſs; for, if they are ſuffered to remain very long after, the under part of their heads will change brown, and decay.

AMARA'NTHUS, in botany, the name of a genus of plants. The characters are: the flowers have ſeemingly no petals: the cup of the flower is dry and multifid: the ſeeds are included in membranaceous veſſels, which, when come to maturity, burſt open either tranſverſely or horizontally, after the manner of purſlane and pimpernel, in each of which are contained one or more roundiſh ſeeds.

There is a vaſt variety of theſe plants, both in the Eaſt and Weſt-Indies, many of which are extremely beautiful, and as much deſerve our care as any of the flowery tribe. Mr. Miller has enumerated 11, and Tournefort 36 ſpecies of this genus.

All the ſorts of Amaranthus muſt be ſown on a good hot-bed in February, or the beginning of March at fartheſt; and in about a forthnight's time (if the bed is in good temper) the plants will riſe; when you muſt prepare another hot-bed, covered with good rich light earth, about four inches thick; then raiſe up the young plants with your finger, ſo as not to break off the tender roots, and prick them into your new hot-bed about four inches diſtance every way, giving them a gentle watering to ſettle the earth to their roots: but, in doing this, be very cautious not to bear the young plants down to the ground by haſty watering, which rarely riſe again, or at leaſt ſo as to recover their former ſtrength, in a long time, but very often rot in the ſtems, and die quite away.

The Amaranthus tricolor and bicolor muſt be kept longer under the frames than the cock's combs; and, in order to have them very beautiful, it will be proper to make a freſh hot-bed in a glaſs caſe; or, where ſuch a conveniency is wanting, to erect ſome of the lights which were placed over cucumbers, round an hot-bed, and cover thoſe with the ſame lights on the top, ſo as to reſemble a glaſs-ſtove. On this hot-bed you ſhould place your Amaranths, at ſuch a diſtance from each other, as to allow them room to ſpread; obſerving to refreſh them often with water, and in warm weather let them have plenty of freſh air. With this management, the plants may be raiſed five or ſix feet high, and their leaves will come to the moſt beautiful colours; after which they may be expoſed to the open air, and removed to adorn the ſeveral parts of the garden. *Miller's Dict.*

AMBARVA'LIA, in antiquity, the feaſt of perambulation, or proceſſion they made about the plowed and ſown fields

fields in honour of the goddefs Ceres; like the proceffion of the papifts at this day, celebrated upon the feaft of St. Mark and rogation days, with larger or fhorter litanies. There were two feafts at Rome of this name, one in April, or, according to other authors, at the end of January, and the other in July.

Twelve priefts went before a public proceffion of the citizens, who had lands and vineyards without the city. The fame ceremony was practifed in the country by other priefts among the inhabitants of the villages; they went three times round the ground, every one being crowned with leaves of oak, and finging hymns in honour of Ceres, the goddefs of corn: this ceremony was called Ambervalia, ab ambiendis arvis: the facrifices which they offered, after this proceffion, they called ambarvales hoftes.

There were three forts of them, viz. a fow, a fheep, and a bull, which is the reafon that this threefold facrifice was called fuovetaurilia, which is a word compounded of Sus, Ovis, and Taurus. In the firft facrifice they prayed to the goddefs Ceres and the god Mars, that they would preferve their corn from mildew and hail, and bring it to perfect ripenefs; and, in that of the month of July, they prayed to them to blefs their harveft.

Cato has left us the form of prayer ufed on this occafion, in cap. 141. De Re Ruftica; but this prayer was made to Mars only. The fame author hath alfo left us another form of prayer, which was made in the fecond feaft of perambulation in the month of July, in which they facrificed a fow. Before they began their harveft, which they called porca precedanea, this prayer was put up to Janus, Jupiter, and Juno, and not to Ceres, any more than the former. We find likewife that this ceremony was performed by the mafter of the family, accompanied with his children and fervants, every one of them being crowned with oak leaves as well as the facrifice, which they led three times round the lanes and vineyards, finging hymns to the gods; after which they facrificed to them fweet wine, with honey and milk, as we may fee by the verfes of Virgil, Georg. lib. 1.

This manner of proceffion was always ufed in the country where they had no arval priefts, as at Rome. Virgil, Georg. lib. 1. ver. 343, defcribes, in a moft natural and lively manner, the rejoicing of the country people at this feaft. *Danet's Antiq.*

A'MBER, *Analyfis of* AMBER. Take a capacious glafs retort, with its neck cut off, fo as to leave an orifice two inches wide or more; put into it pieces of common Amber, well cleanfed from fand, duft, or other foulnefs, fo that it fill two-thirds of the cavity. Apply a large receiver, and lute the juncture with the common luting; diftil in a fand furnace, with a degree of heat a little greater than that of boiling water; thus there will come over a copious, thin, limpid oil: continue this degree of heat, fo long as any oil comes over, and keep it feparate. Then apply the receiver again, and cautioufly raife the fire, till a fecond oil begins to rife, which will be yellow, large in quantity, and ftill tranfparent: proceed patiently with the fame degree of heat, fo long as this oil comes over, which it continues to do a confiderable time; but, for the elegance of the operation, this alfo might be kept feparate. Now, again, raife the fire gradually, till a white, faline, woolly matter appears in the receiver, but particularly in the neck; then gradually raife this fire a little, and continue it increafing, till no more of this matter comes over; but the fire muft not be increafed too quick, otherwife the volatile falt would mix with the grofs oil, that fhould follow after, and thus be in a great meafure loft therein. It is beft to remove the receiver, take out the productions, and keep them feparate; but during the whole time, that this volatile falt runs, a red oil alfo comes over, ftill almoft tranfparent. The fire being now increafed to the utmoft, there comes over a grofs, vifcous, fat oil, thick like turpentine. When this is rifen, if a fire of fuppreffion be given, the whole black matter now becomes flatulent, rifes into the neck of the retort, and thus comes into the receiver, in form of a hard black mafs; fo that, if the neck of the retort be not left wide, it will be thus blocked up, and the glafs be burft in a dangerous manner, with a loud noife, and often a firing of the matter. But if, before the fire of fuppreffion was ufed, a large quantity of fand were thrown upon this laft remainder, it will divide the matter, and caufe it to come over, without danger, in a black and dry form. There remains, at the bottom of the retort, a very fmall quantity of brittle fæces, of fcarce any fignificance, fo that the whole is volatile. If the operation be carefully performed, fo many different productions are obtained, which may be purified by a new diftillation, and be rendered thin and limpid; but the volatile falt, collected by itfelf, is perfectly acid, and this is the only method, that I know, whereby a true acid is obtained in a folid faline form; for we have no inftance thereof in any other vegetable, animal, or foffil fubftance. Tartar indeed is acid, but, as it is fcarcely diffolvable in water, does not deferve the name of a falt. Oil of vitriol, brought to an extreme degree of purity, fhoots, in winter-time, into tranfparent folid cryftals; but immediately diffolves again, and appears fluid, as foon as the cold is a little diminifhed; but the falt of Amber long continues the fame.

Remarks.

Amber thus appears to be a very particular body; its oil refembles the foffil oils of petroleum, naphtha, and the like; but the remainder, after the firft and fecond are come over, nearly refembles jet, and the acid falt feems fomewhat vitriolic. But the fame thing, concreted, wonderfully differs from thofe parts, into which chymiftry refolves it. Who would think, that Amber, its powder, its liquid folution in alcohol, the powder precipitated from its tincture with water after diftillation, and then wafhed; the oils, falt, and colophony after diftillation; proceeded from the fame matter? Who could know the proper virtues of each, and who, by joining them together again, could recompofe Amber? The oils, being purified by a repeated diftillation, have a fharp, balfamic, exciting, diaphoretic, dieuritic, emmenagogic, and anti-hyfteric virtue, and when externally ufed, by way of linament, are very ferviceable in reftoring contracted, weak, paralytic, torpid limbs: the volatile falt is gratefully acid, balfamic, unctuous, penetrating, prefervative, and ftimulating to the nerves and fpirits, being a true, volatile, acid, oily falt, and therefore a capital anti-hyfteric, and diuretic, efpecially, if purified by a fecond diftillation. *Boerhaave's Chymiftry.*

The fhootings of the falt of this bitumen obferved by the microfcope are exceedingly entertaining, though its progreffions are fo very flow, that fome patience is neceffary to wait for and attend to the whole courfe of its configurations: but a curious obferver will find from it at laft a pleafure fufficient to reward his attention.—Its firft fhootings at the edge of the drop, after it has been held for a few feconds over the flame of a lamp or candle, appear irregular, as at *a a* (*plate* III. *fig.* 3.) Some figures pufh out foon after, beyond the reft, and are carved and tapering to a point, as *b b*. Very elegant figures will be feen forming themfelves in other places at the fame time, and refembling fprigs of fir or yew: numbers of thefe rife together, each having a main ftem very thickly befet with little fhootings from top to bottom, in fome on both fides, but, in others, on one fide only; which difference will be underftood by a view of the figures *c c*. The downy feathers of birds appear in the fame kind of form, when examined by the microfcope. As the progreffion goes on, branches will be found iffuing from the fides of the former fhootings, vid. *d*: and, in fome places of the drop, feveral gradations of branchings will be perceived to fucceed one another, to divide and fubdivide after a moft wonderful order, reprefenting at the laft a winter fcene of trees without leaves, a fpecimen of which is fhewn at *e*.— The laft action of this curious falt produces figures exquifitely delicate, bearing no refemblance to any thing that preceded, but appearing like the flourifhes or engravings of a mafterly hand, in the manner reprefented at *f f*. This part of the operation begins not till the water is nearly exhaled, and, whilft it is performing, the fcene appears a good deal confufed; but, after waiting till the water is intirely dried away, a thoufand beauties will prefent themfelves perfectly diftinct and clear; for the configurations of this falt do not break away, or melt in the air, as moft others do, but may be preferved on the glafs flip for a long while afterwards, if nothing is fuffered to rub them off. *Baker's Employment for the Microfcope.*

AMBRO'SIA, in botany, a genus of plants, whofe characters are: it hath male flofculous flowers, which are produced on feparate parts of the fame plant from the fruit, and have no vifible petals: the fruit, which fucceeds the female flowers, is fhaped like a club, and is prickly, containing one oblong feed in each.

The feeds of this plant fhould be fown on a moderate hot-bed in March, and, when the plants are come up two inches high, they muft be tranfplanted into another moderate hot-bed, allowing each plant three or four inches fquare; obferving to water them pretty well, and fhade them until they have taken new root; afterwards they muft have a large fhare of frefh air every day, when the weather is warm, and frequent waterings; for they are very thirfty plants. When the plants are grown pretty ftrong, they muft be taken up with balls of earth to their roots, and planted in large pots filled with rich earth; and, if they are placed on a very moderate hot-bed until they are well rooted, it will generally forward their flowering. Toward the latter end of May they fhould be placed abroad with other hardy annual plants, among which they will make a variety. *Miller's Dict.*

A'MBURY, a kind of wen, or fpongy wart, growing upon any part of a horfe's body, full of blood.

The manner of curing this excrefcence is, to tie it about hard with a thread, or rather with a horfe-hair, and in eight days it will fall off; then ftrew upon it the powder of verdigreafe to kill it at the root, and heal it up again with green ointment; but, if it be flat that nothing can be bound about it, then take it away with an incifion-knife clofe to the fkin, or elfe burn it with a fharp hot iron, cutting it round-about fo deep as to leave none of the root behind, and, after having applied turpentine and hog's-lard melted together, heal it up as before: but if this wart grows in a finewy part, where a hot iron is improper, eat out the core with oil of vitriol, or white fublimate; then ftop the hole with flax dipped in the white of an egg

egg for a day or two, and at laſt dry it up with unſlaked lime and honey. *Markham's Farriery.*

For theſe warts put three ounces of powder of copperas in a crucible, with one ounce of arſenic powdered; place the crucible in the middle of a charcoal fire, ſtirring the ſubſtance, but carefully avoiding the malignant ſteams: when the matter appears ſomewhat reddiſh, take the crucible off the fire, and, after it is cool, break and beat the matter into a very fine powder, incorporate four ounces of this powder, five ounces of album Rhaſis, and make an ointment to be applied cold to warts, anointing them lightly every day, and they will fall off like kernels of nuts, without cauſing any ſwellings in the legs, if the application be ordered ſo as only the warts be anointed, and the horſe be not worked or ridden, during the cure; and, after the warts fall off, dreſs the ſore with the common application called the counteſs's ointment. *Soll. Syſ.*

AMENTA'CEOUS, in botany, a term applied to the flowers of certain trees and plants, which are compoſed of a vaſt number of apices, or antheræ, hanging down in form of a rope; ſuch as the hazel, and the like.

A'METHYST *(Dict.)* — Amethyſts may be counterfeited with glaſs, to which the proper colour or ſtain is given. There were fine ones made in France, about the year 1690, which may even impoſe on connoiſſeurs, unleſs the ſtone be taken out of the collet.

The method of giving this colour to glaſs is as follows: take cryſtal-frit, made with the moſt perfect and fine tarſo; then prepare a mixture of manganeſe in powder, one pound; zaffer prepared, one ounce and a half; mix theſe powders well together, and add, to every pound of the frit, an ounce of this powder. Let it be put into the pots with the frit, not into the already made metal. When the whole has ſtood long enough in fuſion to be perfectly pure, work it into veſſels, and they will reſemble the colour of the Amethyſt. *Neri's Art of Glaſs*, p. 92.

AMMONI'ACUM *(Dict.)* — Some of this ſalt diſſolved in water and a drop thereof placed on a ſlip of glaſs, to be examined by the microſcope, will be found to ſhoot with a ſmall degree of heat; which muſt be very carefully obſerved, for, if more heat than juſt enough be given to it, the configurations will run into one another, and make the whole appear in great confuſion.

It begins with ſhooting from the edges great numbers of ſharp, but thick and broad ſpiculæ, from whoſe ſides are protruded, as they riſe, many others of the ſame ſhape, but very ſhort, parallel to each other, but perpendicular to their main ſtem, as at 1. *(Plate* III. *fig.* 5.) Theſe ſpiculæ arrange themſelves in all directions, but for the moſt part obliquely to the plain from whence they riſe, and many are ſeen frequently parallel to one another: which particulars the figure endeavours to expreſs at 1. 1.— As they continue to puſh forwards (which they do without increaſing much in breadth) ſome ſhoot from them the ſmall ſpiculæ only, as at 2. Others, after they are nearly come to their full growth, divide into two branches in a manner different from all other kinds of ſalt I have ever ſeen, by the ſplitting of the ſtem, longitudinally, from the top almoſt to the edges of the drop, but without any ſhootings from the inſide, as is repreſented at 3.— Other branches, beſides the ſmall ſpiculæ mentioned above, protrude longer ones of the ſame form, from whence others alſo proceed: which others ſhoot alſo ſmaller ones from them, and ſo on to many gradations, at at 4.

Before the middle of the drop begins to ſhoot, ſeveral exceedingly minute bodies may be diſcerned at the bottom of the fluid. Theſe riſe to the top in a little while, and as ſoon as their form can be diſtinguiſhed, whilſt yet extremely ſmall, they plainly wear the ſame ſhape exactly, which they afterwards appear in when grown much larger, as is ſhewn at 5.— Their growth is very quick, and pretty equal for a time, but at length ſome one branch gets as it were the maſtery, and, ſhooting farther than the reſt, forms the figure at 6. The other branches enlarge but little afterwards, all the attraction ſeeming biaſſed to this alone, from which more branches being protruded, and they again protruding others, the whole appears as at 8.

It is not uncommon to ſee in the middle of the drop ſome different configurations, where, inſtead of the ſtraight ſtems deſcribed above, there is formed a kind of zigzag, with ſpiculæ like thoſe in the other figures, as at 7.

To obtain the cryſtals of this ſalt, it is neceſſary to place a drop of a freſh ſolution (made in warm water) before the microſcope, without giving it any other heat than the warmth of the water. The regular cryſtals will then appear as repreſented at the ſide of the drop A, B, C, *fig.* 6, 7, 8. The laſt of which figures C is produced from the ſecond B, by new formations at each corner of the croſs branches, when the whole proceſs is nearly ended: but the cryſtals are rarely ſeen, unleſs the ſolution be examined, as ſoon as made. *Baker's Employment for the Microſcope.*

AMPHITHE'ATRES, in gardening, are great ornaments to a large and noble garden. If this hill, or riſing ground, is of a ſemicircular figure, it will be ſtill the better.

Theſe Amphitheatres are formed of ever-greens, as hollies, phillyrea's, lauruſtinus's, bays, &c. obſerving to plant the ſhorteſt-growing trees in the front, and the talleſt trees behind, as pines, firs, cedars of Lebanon, &c.

They are alſo formed of ſlopes on the ſide of hills, and covered with turf, and have been eſteemed great ornaments in gardens, but are now generally excluded by perſons of true taſte; for the natural eaſy ſlope of ſuch hills is infinitely more beautiful than the ſtiff angular ſlopes into which theſe Amphitheatres are commonly cut. *Miller's Dict.*

AMY'NTAS, in literature, a beautiful paſtoral comedy compoſed by Taſſo; the model of all dramatic pieces, wherein ſhepherds are actors.

ANA'NAS, the pine-apple, in botany, the name of a genus of plants, whoſe characters are theſe:

It hath a flower conſiſting of one leaf, which is divided into three parts, and is funnel-ſhaped: the embryo's are produced in the tubercles: theſe afterwards become a fleſhy fruit, full of juice: the ſeeds which are lodged in the tubercles are very ſmall, and almoſt kidney-ſhaped.

Tournefort has enumerated three, and Mr. Miller ſix ſpecies of this genus of plants.

Theſe plants are propagated by planting the crowns which grow on the fruit, or the ſuckers which are produced either from the plants, or under the fruit; either of which I have found to be equally good; although, by ſome perſons, the crown is thought preferable to the ſuckers, as ſuppoſing it will produce fruit ſooner than the ſuckers, which is certainly a miſtake; for by conſtant experience I find the ſuckers (if equally ſtrong) will fruit as ſoon, and produce as large fruit as the crowns.

The ſuckers and crowns muſt be laid to dry in a warm place, for four or five days, or more (according to the moiſture of the part which adhered to the old plant or fruit) for, if they are immediately planted, they will rot. The certain rule of judging when they are fit to plant, is by obſerving if the bottom is healed over, and become hard; for, if the ſuckers are drawn off carefully from the old plants, they will have a hard ſkin over the lower part; ſo need not lie ſo long as thoſe which by accident may have been broken. But whenever a crown is taken from the fruit, or the ſuckers from the old plants, they ſhould be immediately diveſted of their bottom-leaves, ſo high as to allow depth for their planting; ſo that they may be thoroughly dry and healed in every part, leſt, when they receive heat and moiſture, they ſhould periſh, which often happens, when this method is not purſued. If theſe ſuckers or crowns are taken off late in the autumn, or during the winter, or early in the ſpring, they ſhould be laid in a dry place in the ſtove, for a fortnight or three weeks before they are planted; but in the ſummer-ſeaſon they will be fit for planting in three or four days.

As to the earth in which theſe ſhould be planted; if you have a rich good kitchen-garden mould, not too heavy, ſo as to detain the moiſture too long, nor over-light and ſandy, it will be very proper for them without any mixture: but, where this is wanting, you ſhould procure ſome freſh earth from a good paſture, which ſhould be mixed with about a third part of rotten neats-dung, or the dung of an old melon or cucumber-bed, which is well conſumed. Theſe ſhould be mixed ſix or eight months at leaſt before they are uſed; but, if it be a year, it will be the better; and ſhould be often turned, that their parts may be the better united, as alſo the clods well broken. This earth ſhould not be ſcreened very fine; for, if you only clear it of the great ſtones, it will be better for the plants than when it is made too fine. You ſhould always avoid mixing any ſand with the earth, unleſs it be extremely ſtiff; and then it will be neceſſary to have it mixed at leaſt ſix months or a year before it is uſed; and it muſt be frequently turned, that the ſand may be incorporated in the earth, ſo as to divide its parts: but you ſhould not put more than a ſixth part of ſand; for too much ſand is very injurious to theſe plants.

In the ſummer-ſeaſon, when the weather is warm, theſe plants muſt be frequently watered; but you ſhould not give them large quantities at a time: you muſt alſo be very careful, that the moiſture is not detained in the pots, by the holes being ſtopped; for that will ſoon deſtroy the plants. If the ſeaſon is warm, they ſhould be watered every other day; but, in a cool ſeaſon, twice a week will be often enough: and, during the ſummer-ſeaſon, you ſhould once a week water them gently all over their leaves; which will waſh the filth off them, and thereby greatly promote the growth of the plants. There are ſome perſons who frequently ſhift theſe plants from pot to pot: but this is by no means to be practiſed by thoſe who propoſe to have large well-flavour'd fruit; for, unleſs the pots be filled with the roots, by the time the plants begin to ſhew their fruit, they commonly produce ſmall fruit, which have generally large crowns on them; ſo that the plants will not require to be new-potted oftener than twice in a ſeaſon: the firſt time ſhould be about the end of April, when the ſuckers and crowns of the former year's fruit (which remained all the winter in thoſe pots in which they were firſt planted) ſhould be ſhifted into larger pots; i. e. thoſe which were in half-penny or three-farthings pots, ſhould be put into penny, or, at moſt, three-half-penny-pots, according

cording to the ſize of the plants; for you muſt be very careful not to over-pot them, nothing being more prejudicial to theſe plants. The ſecond time for ſhifting them is, towards the latter end of Auguſt, or the beginning of September, when you ſhould ſhift thoſe plants which are of a proper ſize for fruiting the following ſpring, into two-penny pots, which are full large enough for any of theſe plants. At each of theſe times of ſhifting the plants, the bark-bed ſhould be ſtirred up, and ſome new bark added, to raiſe the bed up to the height it was at firſt made; and, when the pots are plunged again into the bark-bed, the plants ſhould be watered gently all over their leaves, to waſh off the filth, and to ſettle the earth to the roots of the plants. If the bark-bed be well ſtirred, and a quantity of good freſh bark added to the bed, at this latter ſhifting, it will be of great ſervice to the plants; and they may remain in the tan until the beginning of November, or ſometimes later, according to the mildneſs of the ſeaſon, and will not require any fire before that time. During the winter-ſeaſon theſe plants will not require to be watered oftener than every third or fourth day, according as you find the earth in the pots to dry: nor ſhould you give them too much at each time; for it is much better to give them a little water often, than to over-water them, eſpecially at that ſeaſon.

You muſt obſerve never to ſhift thoſe plants which ſhew their fruit, into other pots; for, if they are removed after the fruit appears, it will ſtop the growth, and thereby cauſe the fruit to be ſmaller, and retard its ripening; ſo that many times it will be October or November before the fruit is ripe: therefore, you ſhould be very careful to keep the plants in a vigorous growing ſtate, from the firſt appearance of the fruit, becauſe upon this depend the goodneſs and ſize of the fruit; for, if they receive a check after this, the fruit is generally ſmall, and ill-taſted.

The method of judging when the fruit is ripe, is by the ſmell, and from obſervation; for, as the ſeveral ſorts differ from each other in the colour of their fruit, that will not be any direction when to cut them; nor ſhould they remain ſo long as to become ſoft to the touch before they are cut; for then they become flat and dead, as they alſo do when they are cut long before they are eaten: therefore, the ſureſt way to have this fruit in perfection, is to cut it the ſame day it is eaten; but it muſt be early in the morning, before the ſun has heated the fruit, obſerving to cut the ſtalk as long to the fruit as poſſible, and lay it in a cool, but dry place, preſerving the ſtalk and crown to it, until it is eaten. *Miller's Dict.*

ANA'TTA, or ANNOTTO, a ſort of red dye brought from the Weſt-Indies. It is made of red flowers, which grow on buſhes, or ſhrubs, ſeven or eight feet high. It is thrown, like indigo, into large tubs, or ciſterns, full of water, with this difference, that nothing but the flower is uſed, the leaves of which are ſtripped off, as is done with regard to roſes. Theſe remain in the water till they are rotten; and when, by much ſtirring, they are reduced into a thick liquid ſubſtance, it is expoſed to the ſun to dry, and afterwards made into rolls, or cakes.

There are none but the Spaniards, who now cultivate this plant and prepare the dye in any quantity, the plantations thereof, which the Engliſh of Jamaica had at St. Angels, being ruined. The Engliſh dyers make more account of this drug than of Indigo; and, accordingly, the merchants of Jamaica, who have it from Porto-Rico, buy it 25 per cent. dearer; for they pay but 3 rials per pound for indigo, and 4 for Anatta. The Europeans who trade in this drug have, at preſent, the greateſt part of it from the bay of Honduras. This commodity ſells extremely, and they who buy it at the firſt hand generally get from 40 to 60 per cent. by it. *Savary's Dict.*

A'NCHOR (*Dict.*)— The parts of an Anchor are, 1, The ring *a* (*Plate* III. *fig.* 9.) to which the cable is faſtened. 2, The beam, or ſhank, *b*, *c*, which is the longeſt part of the anchor. 3, The arm *d e*, which is that which runs into the ground. 4, The flouke, or fluke, by ſome called the palm, which is that broad and peaked part, with its barbs, like the head of an arrow, which faſtens into the ground, as *e f*. 5, The ſtock, a piece of wood faſtened to the beam near the ring, ſerving to guide the fluke, ſo that it may fall right, and fix in the ground, as *g h*.

There are ſeveral kinds of Anchors. 1, The largeſt is called the ſheet-Anchor, and is never uſed but in violent ſtorms, to hinder the ſhip from being drove aſhore. 2, The two bow-Anchors, or bowers, which are leſs, and are uſed for ſhips to ride in a road, or harbour. They are alſo called the firſt and ſecond bower, or beſt and ſmall bower. 3, When a veſſel is to be brought up or down a river by the winds, though the tide be contrary to it, the ſeamen ſet their fore-ſail, foretop-ſail, and mizzen-ſail, and let her drive with the tide. If ſhe comes too near the ſhore, they have a little Anchor ready, which is called the rodger, or redgo-Anchor, with a hawſer faſtened to it from the ſhip; and this they drop in the middle of the current, by which means they wind her head about; after which they take up the Anchor again. 4, The ſtream Anchor, is a ſmall Anchor, made faſt to the ſtream-cable, for a ſhip to ride by in gentle ſtreams, and in fair weather. 5, The grapnel, is an Anchor for a ſmall ſhip, or boat.

Merchants, traders, and others, who fit out ſhips for ſea, cannot be too careful with regard to the goodneſs of Anchors, ſince upon them chiefly depends the preſervation of ſhips and cargoes, and even the lives of all thoſe who are on board.

In order to make Anchors of a good quality, it is ſometimes the practice to conjoin the brittle iron with ſoft and tough iron; and, for this reaſon, the Spaniſh or Swediſh iron ought to be preferred, and united together, the former being ſoft, and the latter brittle.

Aubin, in his Marine Dictionary, obſerves, that the Anchors of a large veſſel are made ſmaller in proportion than thoſe of a ſmall veſſel. The reaſon of which, ſays he, is, that, though the ſea exerts an equal force againſt a large ſhip as againſt a ſmall one, ſuppoſing that they both have an equal extent of wood in the water, which gives room to the water to act equally againſt an equal extent, yet the ſmall veſſel, on account of its lightneſs, has not the ſame ſtrength with the great one, to reſiſt the force of the water, which muſt be ſupplied by the weight of the Anchor.

Method of making ANCHORS.— The ſhank, arms, and flukes, are firſt forged ſeparately; then the hole is made at one end of the ſhank for the ring, which, being alſo previouſly forged, is put into the hole in the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank, one after another, and the Anchor finiſhed. But, that the reader may have an idea of the manner how an Anchor is made, we have given a view of it in *Plate* II. where *a* is the foreman, or maſter Anchor ſmith, holding one end of the ſhank of the Anchor, and guiding it under the hammers, as he would have it ſtruck. *b*, *c*, *d*, *e*, Are hammer-men, ſtriking on the Anchor. *f*, The anvil, on which the part of the Anchor to be wrought is laid. *g*, A door which defends the foreman from the prodigious heat of the fire. *h*, *h*, *h*, *h*, the crane which ſupports the Anchor, and which moves on two gudgeons at *i*, *i*. *k*, An iron collar, which may be moved to any part of the crane, as occaſion requires. *m*, The chain, having a ſwivel at the top to admit of turning the Anchor round, when it is carried from the fire to the anvil, and from the anvil to the fire. *n*, The cradle, in which the ſhank of the Anchor is placed near the center of gravity, that the foreman may be able to move it, as he ſees occaſion. Another man generally ſtands by the cradle to aſſiſt the foreman in moving the Anchor; but we have omitted him in the figure, in order to render the cradle and the manner how the Anchor is placed in it more conſpicuous. *o*, *o*, The forge. *p*, The back of the chimney. *q* 1, *q* 2, Two pair of bellows, which are blown by means of the upright piece *r*, the croſs-piece *s* (called, by workmen, the rocking-ſtaff) and the two tumblers *t*, *u*. The man at *x* takes hold of the rocking-ſtaff *s*, and walks forward and backward, by which means both bellows are alternately elevated, and conſequently the fire continually blown. For, as the rocking-ſtaff is moved to or from the back of the chimney, the two ends of the tumblers *t*, *u*, are alternately raiſed and depreſſed, by means of the chains faſtened to them, at is plain from the figure.

In the poſition repreſented in the plate, the upper board of the bellows *q* 1 is raiſed; for the chain 3, having drawn down the end 4 of the tumbler *t*, by that means has raiſed the end 5, which being faſtened by the chain 6 to the upper part of the bellows *q* 1, muſt be alſo raiſed with it. *w*, Is a man ſtanding on the bellows, to give the wind a greater velocity. He ſteps alternately from one pair of bellows to the other, as they deſcend. When a prodigious blaſt is required, ſeveral men ſtand on the bellows at the ſame time. *y*, Is an inſtrument called a tue-iron. It is put in the fire on the noſes of the bellows, which come through the back of the chimney, and not only defends them from the exceſſive heat, but alſo conveys the wind to different parts of the fire. *z*, Is a tool, called a cant-hook. Its uſe is to take hold of the fluke, when the arm is ſhut to the ſhank.

AN'CLE *luxated*, in ſurgery.— The Ancle is ſubject to be luxated, in jumping, or even in walking; and that in all four directions, either inward or outward, backward or forward. When the Ancle is luxated inward, the bottom of the foot is turned outward; and on the contrary, when it is luxated outward, the bottom of the foot is turned inward, which latter caſe indeed is much more frequent than the others. If it is diſlocated forward, the heel becomes ſhorter, and the foot longer than it ſhould be; and, if backward, the contrary ſigns to theſe will appear. The Ancle however can ſcarce poſſibly be luxated outwards, unleſs the fibula be ſeparated from the tibia, or elſe quite broken, which may happen to the external Ancle; nor is it at all uncommon for a luxation of the Ancle to be attended with very grievous ſymptoms, eſpecially when occaſioned by ſome great external violence; nor can it indeed well happen otherwiſe in this caſe, ſince the diſtortion of the foot muſt neceſſarily overſtrain the adjacent tendons, ligaments, and nerves, and thence excite very violent pains, and other bad ſymptoms; or the veins and arteries may alſo be very eaſily lacerated, which will occaſion

PLATE II. Engraved for the Supplement. Facing Anchor.

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casion a large extravasation of blood about the whole foot, which too often gives rise to a gangrene.

It is however necessary to observe, that the Ancle is not always luxated, after it has been violently strained by leaping or turning the foot on one side; for it sometimes happens, that the Ancle is not dislocated on these occasions, but only the parts are violently contused and strained. The Ancle, when truly luxated, is more or less difficult to be reduced, according to the violence of the force by which the accident was occasioned. The most ready way, however, of reducing a luxation of the Ancle, is, to place the patient upon a bed, seat, or table, letting the leg and foot be extended in opposite directions by two assistants, while the surgeon replaces the bones with his hands and fingers in their proper situation. When the foot is by this means restored to its proper position, it is to be well bathed with oxycrate and salt, and then carefully bound up with a proper bandage. The patient must be enjoined to keep his bed for a considerable time, till the bad symptoms are gone, and the Ancle has recovered its strength so far, as to bear the weight of the body, without any uneasiness or danger. *Heister. Surg.* p. 173.

ANCYLOGLO'SSUM (*Dict.*) ——That operation by which the membrane under the tongue, commonly called the fremulum by physicians, is divided or cut; it is styled untying the tongue. This operation is most generally performed upon infants, and that with two different intentions; first, in very tender infants, when the fore part of their tongue, from the moment of this birth, is so closely joined to the subjacent parts, by means of their membrane, that they cannot move their tongues sufficiently, or thrust them so far out of their mouths as to be able to suck. This operation is also performed on children somewhat farther advanced, when, by this membrane's being too strait or short, they cannot pronounce articularly, at an age when it might be expected of them. For both these reasons, it is absolutely necessary; but it must be remembered, that it is not to be performed promiscuously, and at random, upon all new-born children, as most midwives, women, and even some men, idly imagine. We have reason rather to be assured, that it is scarce necessary in one of a thousand infants; for experience has shewed both myself and a great many more skilful physicians, that this case occurs far less frequent than hair-lips; for, when a child can thrust its tongue without its lips, there is nothing amiss about the fremulum; and it will learn, in process of time, both to suck and speak, unless there be some other defect in the organs necessary for these purposes. On the other hand, if the infant can scarce move its tongue, and cannot thrust it beyond its teeth; or if, in some other respect, this membrane should fetter the tongue, then a skilful incision becomes very proper: but because this operation is not to be rashly performed, lest, as has frequently been the case, the most terrible evils, and sometimes death itself, should ensue, it will not be amiss to direct to the safest and most accurate method of performing it.

The point of the tongue, then, ought to be a little elevated with the left hand, using either a linnen cloth, that it may not slip through the fingers, (see *plate* III. *fig.* 10.) or even with a small fork made for that purpose (*fig.* 11.) then as much of the fremulum, as is necessary for speech and sucking, is to be cut with the common blunt-pointed scissars, or an incision-knife, betwixt the venæ raninæ and the lower salivatory ducts: but this is to be done with a great deal of caution, lest either the salivary ducts, the venæ raninæ, or the nerves of the tongue, should happen to be cut at the same time; for, when they are injured, very terrible consequences ensue. Thus Dionis, in his Surgery, makes mention of an infant, who, by an excessive hæmorrhage, in consequence of the venæ raninæ being cut died very soon after the operation. But if a vein should be unluckily cut, which may very readily happen in a fremulum that is too thick and short, a compress, soaked in vinegar, is to be held a little while under the tongue, till the blood stops; but if, at the first incision, the tongue is not sufficiently untied, a few days, or even a few weeks after as circumstances shall require, the remaining part of the fremulum is very cautiously to be cut with scissars, or an incision-knife: then after the operation is over, the finger dipped in honey of roses, or syrup of violets, is very frequently to be rubbed up and down under the tongue, and the wound is to be anointed with it, lest the cut fremulum should again unite.

From what has been said, it appears that disorders of this kind are not only less frequent, but of more difficult and hazardous cure, than is generally thought. Upon this account, those midwives are miserably mistaken, who, concluding with the ignorant multitude, that no infant is born without this defect, thrust their whole fingers into the infant's mouth, and with their nails destroy the fremulum; for it must necessarily happen, that such a rash and fool-hardy laceration, by the nails, must bring an inflammation of that membrane, convulsions, and often the death of the little patient; for this reason, midwives and foolish women are not only to be cautioned against such practices, but Hildanus is to be carefully consulted; for he (in Cent. 3. Obs. 28.) hath very accurately laid down, not only the nature and cure of the disorder itself, but also the several bad consequences that possibly may, and generally ensue, from performing this operation at an unseasonable time, or in an uncautious manner. But, when the cutting this fremulum is absolutely necessary, it may be done with much more safety, and with much less pain to the patient, by the scissars referred to, than by the long nails of a simple old woman. *Heister's Surgery.*

ANDRA'CHNE, *bastard orpine*, in botany, the name of a genus of plants, of which there is but one species, and called by Tournefort and others telephoides. The characters of this genus are these:

There are male and female flowers on the same plant: the empalement of the male flower is divided into five parts: the flower consists of five leaves, having five small stamina in the center: the female flower hath no leaves, but three styles, which reach upon the pointal; which afterwards becomes a capsule with three cells, filled with small seeds.

A'NDREW (St.) an order of knights in Muscovy, founded by Peter Alexiowitz, emperor of Russia, to recompense the merits of some of his officers, who had distinguished themselves in the war against the Turks, in the year 1698. The badge of this order is a golden medal, on one side of which is represented the cross of St. Andrew, and on the other are wrote these words, Czar Pierre Monarque de tout la Russie. This medal is fastened to a blue ribbon, which is worn across the right shoulder. This order has since been conferred on such noblemen as have distinguished themselves in the war against the Swedes, as also on foreign princes, ministers, or ambassadors. See *plate* III. *fig.* 12.

ANDRO'MEDA, in astronomy, the name of a constellation of the nothern hemisphere, representing a woman chained.

The number of stars in this constellation in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, and in Mr. Flamsteed's 84.

ANE'MONE (*Dict.*)— A soil, proper for the blowing these flowers to great advantage, may be made as follows:

Take a quantity of fresh untried earth (from a common or some other pasture-land) that is of a light sandy loam, or hazel mould; observing not to take it above ten inches deep below the surface; and, if the turf be taken with it, the better, provided it hath time to rot thoroughly before it is used; mix this with a third part of cow-dung, and lay in an heap, keeping it turned over at least once a month for eight or ten months, the better to mix it, and rot the dung and turf, and to let it have the advantages of the free air: in doing this work, be careful to rake out all great stones, and break the clods (but I would by no means approve of sifting or screening the earth, which I have found very hurtful to many sorts of roots); for, when earth is very fine, upon the first great rains of winter or spring, the smallest particles thereof join closely together, and form one solid mass, so that the roots often perish for want of some small stones to keep the particles asunder, and make way for the tender fibres, to draw nourishment for the support of the root.

The earth should be mixed twelve months before it is used, if possible; but, if you are constrained to use it sooner, you must turn it over the oftener, to mellow and break the clods; and observe to rake out all the parts of the green sward, that are not quite rotten, before you use it, which would be prejudicial to your roots, if suffered to remain. The beginning of September is a proper season to prepare the beds for planting (which, if in a wet soil should be raised with this sort of earth six or eight inches above the surface of the ground, laying at the bottom some of the rakings of your heap to drain off the moisture; but, in a dry soil, three inches above the surface will be sufficient): this soil should be laid at least two feet and an half thick, and in the bottom there should be about four or five inches of rotten neats-dung, or the rotten-dung of an old melon or cucumber-bed, so that you must take out the former soil of the beds to make room for it.

The best season for planting these roots, is about the latter end of September; and, for those of a middle season, any time in October; but observe to perform this work, if possible, at or near the time of some gentle showers; for, if you should plant them when the ground is perfectly dry, and there should no rain fall for three weeks or a month after, the roots will be very apt to grow mouldy upon the crown; and, if they once get this distemper, they seldom come to good after.

In the beginning of April your first-planted roots will begin to flower, which continue for three weeks, or more, according to the heat of the weather, or management in covering them, during the heat of the day, with matts or cloths; then the second-planted sort will come to succeed them, and these will be followed by those planted in the spring, so that you may have these beauties continued for near two months together, or sometimes longer, if the season be favourable.

Towards the middle or latter end of May, the leaves of your first-blown roots will decay; at which time you must take them out of the ground, clearing them from decayed stalks, and washing them, to take the earth clear from the roots; then spread them with a matt in a dry shady place, till they are perfectly dried, when you may put them up in bags and

and hang them out of the reach of mice, or other vermin, which will destroy many of the roots, if they come at them.

Observe also to take up the latter-planted roots, as soon as their leaves decay; for, if they are suffered to remain long after in the ground, and there should fall some showers of rain, they would soon put forth fresh fibres, and make new shoots, when it would be too late to remove them: at the time when you take up the roots, is the proper season for breaking or parting them, which may be done by separating those that you would chuse to make all possible increase from, into as many parts as you can conveniently, provided each of them have a good eye or bud; but those you intend to blow strong, should by no means be parted too small, which greatly weakens their flowering. *Miller's Dict.*

ANE'MOSCOPE.— Under this article in the Dictionary, we have mentioned the Anemoscope invented by Otto Gueric; we shall here give a description of a very curious machine of this kind, invented by the learned Mr. Pickering.

The Anemoscope is a machine four feet and a quarter high, consisting of a broad and weighty pedestal, a pillar fastened into it, and an iron axis, of about half an inch diameter, fastened into the pillar. Upon this axis turns a wooden tube, at the top of which is placed a vane, of the same materials, 21 inches long, consisting of a quadrant, graduated and shod with an iron rim, notched to each degree; and a counterpoise of wood, as in the figure, on the other. Through the center of the quadrant runs an iron pin, upon which are fastened two small round pieces of wood, which serve as moveable radii to describe the degrees upon the quadrant, and as handles to a velum or sail, whose plane is one foot square, made of canvas stretched upon four battens, and painted. On the upper batten, next to the shod rim of the quadrant, is a small spring, which catches at every notch corresponding to each degree, as the wind shall, by pressing against the sail, raise it up; and prevents the falling back of the sail, upon the lessening of the force of the wind. At the bottom of the wooden tube is an iron index, which moves round a circular piece of wood fastened to the top of the pillar on the pedestal, on which are described the thirty-two points of the compass. The figure of this machine may be seen *plate* III. *fig.* 13. where *a* Is the pedestal. *b*, The pillar, in which the iron axis is fitted. *c*, The circle of wood, on which are described the 32 points of the compass. *e*, The wooden tube upon its axis. *f*, The velum. *g*, The graduated quadrant. *h*, The counterpoise of the vane.

Fig. 14. The velum taken off. *a*, The plane of the velum. *b*, The spring. *c*, *c*, The wooden radii. *d*, *d*, The holes through which the pin in the center of the quadrant goes. Its uses are the following.

1. Having a circular motion round the iron axis, and being furnished with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, described on the round piece of wood on the pillar, to the same quarters of the heavens, it gives a faithful account of that quarter from which the wind blows.

2. By having a velum or sail elevated by the wind along the arch of the quadrant, to an height proportionable to the power of the column of wind pressing against it, the relative force of the wind, and its comparative power, at any two times of examination, may accurately be taken.

3. By having a spring fitted to the notches of the iron with which the quadrant is shod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the highest blast, since the last time of examination, without the trouble of watching it.

I have carefully examined the dependence that may be had upon the machine, during the late storms in February 1743-4, by comparing the height, to which the wind then forced the velum, with the Deal letter. The 19th of February, Sabbath. 8 a. m. the Anemoscope was at 75: the Deal letter for that day called it a storm. The Saturday following, being the 25th at 8. p m. the machine was at 79: the Deal letter called that a violent storm. The Wednesday following, the last of February it was 84: the Deal letter called that a violent storm. So that it appears, that, in such as the sailors allow to be violent storms, the machine has hitherto answered well, and has had six degrees to spare for a more violent gust, before it comes to an horizontal position.

It is certainly to be depended upon in ordinary weather, the velum being hung so tender, as to feel the gentlest breeze. But, after all, I must freely own, that I fear the exposing this machine to all winds, for a continuance, must soon disorder it; and that irregular blasts and squalls cannot fail in a short time to impair it. It may not therefore be amiss, to prevent this, for gentlemen to take the machine in, in violent weather; and, by taking the tube of the iron axis, to make their observations with the tube, vane, and velum, in their hands; which, as it is very light, and far from cumbersome, is easy to do, as I have often experienced. *Philos. Trans. Numb.* 473.

A'NGEL *(Dict.)* — St. Hilary remarks that the word Angel does not so much denote their nature, as their office, signifying as much as nuncius, a messenger, or person employed to carry orders, or declare one's will. Thus it is St. Paul represents Angels, Heb. i. 14. where he calls them ministring spirits. And for the same reason the name is given in the prophet Malachi to priests. Jesus Christ himself is called, by the Septuagint, the Angel of the mighty council, a name, says Tertullian, which shews his office, not his nature. So the Hebrew word Angel, used in scripture, is also a name of office, signifying legate, envoy, minister. Yet custom has prevailed, and the name Angel is commonly interpreted to shew their nature.

Nothing is more frequent, in scripture, than the missions and apparitions of good and bad Angels: God sends them to declare his will, to correct, teach, reprove, and comfort: God gave the law to Moses, and appeared to the old patriarchs by the mediation of Angels, who represented him and spoke in his name. The existence of Angels is supposed in all religions.

Though the Jews in general believed the existence of Angels, there was a sect among them (the Sadduces) who denied the existence of all spirits whatever, God only excepted: and yet the Samaritans and Caraites, whom the Jews represent as Sadduces, acknowledged such beings. Before the Babylonish captivity the Hebrews seem not to have known the name of any Angel: the Talmudists say they brought them from Babylon: it is true, we find many of them, called by their names in the book of Enoch; but this we know is spurious, and was written after the captivity we are speaking of. Tobit, who is thought to have lived at Nineveh, some time before the captivity, is the first who has called an Angel by his proper name; he mentions Raphael, who conducted Tobias into Media, and Daniel, who lived at Babylon some time after Tobit, has taught us the names Michael and Gabriel. In the New Testament we find only the two latter Angels mentioned by name. It has been questioned, whether the antient Hebrews paid divine homage to Angels or not. The form of benediction, which Jacob used in blessing the sons of Joseph, (the Angel which redeemed me from all evil bless the lads) may seem to imply that they did. The Rabbins in glossing upon this text observe, that the prayers of their ancestors were not directly addressed to Angels, but it was really God they invoked, when they prayed to them; they only go to them as to the king by his ministers, and as one that presents his petition to the first officer of the crown, yet still looks to the king, as the source and spring of his happiness and favour that he has received. But this exposition is refuted by others, who remark that, Jacob, after he had directly applied himself to God, and begged of him both temporal and eternal blessings on his two grand-sons, then addressed himself to the Angel, to obtain of him, that he would keep them from all evil; from whence they conclude, that Jacob addressed his prayers directly to the Angel, to whom he ascribed the power of preserving from evil, whilst he left to God the privilege of bestowing all that was good; and if the prayer of the patriarch was implicitly addressed to God, as the fountain of goodness, yet he certainly prayed explicitly to the Angel. But, notwithstanding this dispute, the best christian expositors deny that this invocation of Jacob implies any thing like a prayer to the Angel. Some indeed conceive, that the Angel in this place is the second person in the trinity; an opinion refuted by others, who more justly say, that Jacob intended no more than a desire that his children might enjoy the angelic protection, by the special favour of God to them; for it is such an expression as that of David to a contrary purpose, Let the Angel of the Lord persecute them, where no one will say he prays to an Angel, though his words are exactly like those of Jacob.

There are divers opinions concerning the time when Angels were created. Some think they were created at the same time as the heavens; and that Moses included them under this name, saying, In the beginning God created the heavens. Others have conjectured, that he inclined to represent them under the name of light, which God created the first day; of this opinion is St. Cyril. Others again have asserted, that they were created before the sensible world, which opinion Job seems to favour, when he says, Where wast thou when I laid the foundation of the earth, — and all the sons of God shouted for joy? The Hebrews think they were created on the second day of the world, and that God consulted with the Angels when he said, Let us make man in our own image. Others are of opinion, that Angels were created on the fifth day. Origen, and other Greek and Latin fathers, think they existed before the world; and Dr. Hyde thinks a very long time before the world. See Basnage's Hist. des Juiffs, lib. 4. cap. 9. The philosophers of the Peripatetic sect believed they were coæval with God, and, consequently, that they existed from all eternity. The Greek fathers of the Christian church were generally inclined to believe they were created before the world. Some few indeed were of different opinions, among whom is Epiphanius.

Though it is an universal opinion, that Angels are of a spiritual, incorporeal nature, yet many of the old fathers, misled by a passage in Genesis, where it is said, that the sons of God (or the Angels) saw the daughters of men, that they were fair, and they took them wives of all which they chose, imagined them to be corporeal and capable of sensible plea-

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pleasures. Other fathers indeed, and those in great number, have asserted Angels to be purely spiritual, and this at present is the common opinion of the schools.

There have been a great many disputes and varieties of fancy, concerning the number, order, nature, and power of Angels; most of which are not to be resolved by scripture or tradition. The author of the books De Hierarchia cœlesti, who wrote about the beginning of the sixth century, is the first who ventures to range the Angels into three hierarchies, and nine orders. The Jews likewise distinguish them into several orders, and set, as it were, a general at the head of them; they call him Metatron, the same with the Christian St. Michael.

As to the office or employment of Angels, some are said to preside over empires, nations, provinces, cities, and particular persons. These latter are stiled guardian Angels. Thus St. Michael is acknowledged to be the protector of the people of Israel; and the Angel Gabriel speaks of the Angel who was protector of Persia, according to the generality of interpreters, when he says that the prince of the kingdom of Persia withstood him one and twenty days. St. John wrote his Revelations to the Angels of the seven Christian churches in Asia minor, whereby he does not mean only the bishops of those churches, but, in the judgment of many of the fathers, the Angels likewise who were appointed for their protection. The learned Dr. Prideaux observes, that the minister of the synagogue, who officiated in offering up the public prayers, being the mouth of the congregation, delegated by them, as their representative, messenger, or Angel, to speak to God in prayer for them, was therefore, in the Hebrew language, called the Angel of the church; and from thence the bishops of the seven churches of Asia are, by a name borrowed from synagogue, called the Angels of those churches. As to guardian Angels, they are very clearly described in the Old Testament. Jacob speaks of the Angel who had been his guide in all his journies, and had delivered him out of all his dangers. The psalmist, in several places, mentions Angels as the protectors of the righteous. In the New Testament, we hear of St. Peter's Angel, who set him at liberty; and Jesus Christ enjoins us not to despise little ones, because their Angels continually behold the face of God. The Jews, and the very Heathens, believed that particular Angels were commissioned to attend us, and had the care of our conduct. Hesiod, the most antient, or, at least, one of the most antient Greek authors, says, that there are good Angels upon earth, sent by Jupiter, for the protection of mankind, and to observe the good or evil, which they practise. Plato says, that every one of us has two dæmons, or two genius's, one inclining us to evil, the other directing us to good; though Apuleius says, that Plato assigned but one dæmon to every man. The antient Christians, as Origen and St. Augustine, ascribe to Angels the office of presenting our prayers to God; and the Christians, in general, agree with the Platonists, that God makes use of the ministry of Angels, to carry his orders, to work miracles, and to foretel future events.

A'NGLING, is an excellent art, which, as it pleads great antiquity, so the knowledge thereof is not without great difficulty to be obtained; but some observations concerning it will not be amiss. And, first, the angler must remember by no means to fish in light and dazzling apparel, but his cloathing must be of a dark sky colour; and, at the places where he uses to angle, he should once in four or five days, or oftener, if for carp or tench, cast in corn boiled soft: he may also cast in garbage, beasts livers, worms chopped in pieces, or grains steeped in blood and dried, which will attract the fish thither: and, in fishing, to keep them together, throw in half a handful of grains of ground malt, which must be done in still water; but in a stream you must cast your grains above your hook, and not about it; for, as they float from the hook, so will they draw the fish after them. If you would bait a stream, get some tin boxes made full of holes, no bigger than just fit for a worm to creep through, which fill therewith; and, having fastened a plummet to sink them, cast them into the stream, with a string fastened thereto, that they may be drawn out at pleasure; by the smallness of the holes, the worms can crawl out but very leisurely, and, as they crawl, the fish will resort about the boxes.

If in a stream you would bait for salmon, trout, umber, or the like, take some blood, and incorporate therewith fine clay, barley and malt, ground, adding some water thereunto; all which make into a paste with ivy gum, then form it into cakes, and cast them into the stream: if you find your bait take no effect in attracting the fish, you may then conclude some pike or perch lurk there to seize their prey, for fear of which the fish dare not venture thereabout; take therefore your troll, made either of brandlings or lob-worms, or you may use gentles or minows, which they will greedily snap at. As for your rod, it must be kept neither too dry nor too moist, lest the former make it brittle, and the latter rotten; and, if it be sultry dry weather, wet your rod a little before you angle, and, having struck a good fish, keep your rod bent, and that will hinder him from running to the end of the line, whereby he will either break his hold or hook. And if you would know what bait the fish loves best, at the time of your fishing, when you have taken one, slit the gill, and take out the stomach, opening it without bruising, and there you will find what he fed on last, and had a fancy to, whereby you may bait your hook accordingly. When you fish, shelter yourself under some bush or tree, so far from the brink of the river, that you can only discern your float; for fish are timorous, and very easy to be affrighted: and you will experimentally find the best way of Angling with a fly is down the river, and not up; neither need you ever make above six trials in a place, either with fly or ground bait, when you angle for trout, for by that time he will either offer or take, or refuse the bait, and not stir at all; but if you would have fish bite eagerly, and without suspicion, you may present them with such baits as they are naturally inclined to, and in such manner as they are accustomed to receive; and, if you use paste for baits, you must add flax or wool, with which mix a little butter to preserve it from washing off the hook: and, lastly, Note,

That the eyes of such fishes as you kill, are most excellent baits on the hook for almost all sorts of fish.

Cautions to be observed in ANGLING, *as to the seasons of the weather, the time of the day and year, &c.*

In Angling you ought so to place yourself, that your shadow do not at any time lie upon the water, if shallow; but in deep waters that is not so necessary to be observed; yet, that you may be exact, you should make use of all the advantages that the place will afford.

In a pond it is best to angle near the ford where the cattle go to drink, and in rivers in those places where such sort of fish as you intend to angle for, usually frequent; as for breams, in the deepest and quietest part of the river; for eels under hangings over banks; for chub, in deep shaded holes; for perch, in scowrs; for roach, in the same places as perch; for trouts, in quick streams, and with a fly upon the stream on the top of the water.

And, if you fish in such places where you can discern the gravelly bottom, then be sure you conceal yourself as much as possible.

In such waters as are pestered with weeds, roots of trees, and such-like, fish lie close and warm, and resort thither in great shoals, and there they will bite freely; but take great care how you cast in the hook, and how you strike a bite, for the least rashness loses hook and line.

And, if the hook happens to be entangled, you should be provided with a ring of lead, about six inches round, fastened to a small pack-thread; this ring you must put over the rod, letting it go into the water, holding fast by the other end of the pack-thread, and work it gently up and down, and it will soon disengage the hook.

It is good Angling in whirlpools, under bridges, at the falls of mills, and in any place where the water is deep and clear, and not disturbed with wind or weather.

The best times are from April to October, for, in cold, stormy, and windy weather, the fish will not bite; and the best times in the day are from three till nine in the morning, and from three in the afternoon till sun-set.

If the wind be easterly, it will be in vain to go to angle; but you may angle well enough if it blow from any other point, provided it do not blow hard; but it is best in a southerly wind, and a close, lowering, warm day, with a gentle wind, and after a sudden shower to disturb the water, at which time they will best rise at the fly, and bite eagerly; and, the cooler the weather is in the hottest months, the better it is.

In winter, all weathers and all times are much a like, only the warmest are the best.

It is very good Angling a little before the fish spawn, for then, their bellies being full, they frequent sandy fords, to rub and loosen their bellies, at which time they will bite freely.

It is also very good Angling in a dull, cloudy day, after a clear, moon-shiny night, for in such nights they are fearful to stir to get food, lying close, so that, being hungry the next day, they will bite boldly and eagerly.

At the opening of sluices and mill-dams, if you go with the course of the water, you can hardly miss of fish that swim up the stream to seek for what food the water brings down with it.

It is best Angling at the ebb, in waters that ebb and flow; but yet the flood is to be preferred, if the tide is not strong. *Sportman's Dict.*

A'NGLO-SA'XON *Language*, that spoken by the Angles or Saxons settled in England. This language is properly the original of our present English, being that spoken by our Saxon ancestors first established in this island. It is now called Anglo-Saxon, to distinguish it from the modern or present English.

A'NIL, in botany, the indigo-plant, the name of a genus of plants, of which there are three species. The characters are: It hath pinnated leaves, which are terminated by a simple lobe at the extremity; the flowers consist of five leaves, of the papilionaceous kind, the uppermost petal being larger than the others, rounded, and lightly furrowed on the side:

the lower petals are ſhort, and terminate in a point: in the middle of the flower is ſituated the ſtyle, which afterwards becomes a jointed pod, containing one cylindrical ſeed in each partition.

Under the article INDIGO in the Dictionary, we have given a ſhort account of the method of making indigo; but as this is an article of great importance in commerce, dying, &c. we ſhall here, from Father Labat, give a full account of the whole proceſs, with the manner of cultivating this plant.

There was formerly a great deal of indigo made in the pariſh of Macauba: there is not a ſtream nor river in it, where one does not meet with indigo-works, that is, backs or vats of ſtone-work, in which the plant that yields the dye is put to digeſt: there are uſually three of theſe vats one above another, in the manner of a caſcade (See *Plate* III. *fig.* 18.) ſo that the ſecond, which is lower than the bottom of the firſt, may receive the liquor contained in the firſt, when the holes, which are made in the bottom of the firſt, are unſtopped; and that the third may in its turn receive what was in the ſecond.

The firſt, largeſt, and higheſt of theſe vats (as *a*) is called the ſteeper or rot; it is uſually made twenty feet long, twelve or fifteen feet wide, and three or four feet deep: the ſecond (as *b*) is called the battery: it is almoſt half as ſmall again as the firſt; and the third (as *c*) which is much leſs than the ſecond, is called the deviling.

The names of the two firſt perfectly agree with their uſes; for the plant is laid to ſteep in the firſt, where it ferments, is macerated, and becomes like rotten dung: after the ſalts and ſubſtance of the leaves and rind are diffuſed in the water by the fermentation, which the heat and ripeneſs of the plant have excited in it. It is in the ſecond that they agitate and beat this water, impregnated and loaded with the ſalts of the plant, till, having collected, reunited, and as it were, coagulated them with one another, they form the particles which form the dye. As for the name of the third, I do not ſee how it agrees with it, unleſs it be becauſe this vat is deeper coloured than the others; for the indigo already formed, remaining in it, conſequently dyes and colours much deeper than the others.

To which I ſhould add, that it is only at St. Domingo that they make uſe of this name. In the windward iſlands they call this laſt vat the ſettler, and this name ſuits it perfectly well; becauſe it is in this that the indigo, begun in the ſteeper, and perfected in the battery, unites, grows into a maſs, ſeparates itſelf from the particles of water which remained in it, leaves them at top, and ſettles at the bottom of the vat, whence it is taken out to be put into little bags, and then into the boxes, as I ſhall mention hereafter.

Nothing ought to be omitted in the building and making theſe vats ſubſtantial: the ſtrength of the fermentation is ſo great, that unleſs the ſtone-work and plaiſter be done very well, and the mortar carefully choſen and wrought, they crack; and a very moderate crack is ſufficient to let out a vat of indigo, and cauſe a conſiderable loſs to the owner.

When this misfortune happens, the following is an eaſy and infallible remedy, which I can anſwer for, having experienced it: take ſome ſea-ſhells, of any kind whatever; pound them without burning them, and ſift them through a fine ſieve. Take an equal quantity of quick-lime, and ſift it; mix theſe together with water enough to make a ſtiff mortar, and, as quick as you can, ſtop the cracks of your vats with it. This mixture incorporates, ſticks, and dries in a moment, and immediately prevents the matter's running out of the vat.

Every-body does, or ſhould know, that indigo is a dye uſed to dye wool, ſilk, cloths, and ſtuffs, blue: the Spaniards call it anilo: the fineſt they make, i. e. in New-Spain, comes from Guatimala; which makes a great many people call it barely guatimala. It is made alſo in the Eaſt-Indies, particularly in the dominions of the great Mogul, the kingdom of Golconda, and other places thereabouts, as Mr. Tavernier relates in his voyages. This ſort is in Europe oftener called India than Indigo or Anil, people taking, for its proper name, the name of the place it was made at.

Indigo is compoſed of the ſalt and ſubſtance of the leaves and rind of a plant of the ſame name; ſo that one may ſay, it is a diſſolution or digeſtion of the plant, cauſed by the fermentation it has excited in the water it was laid to ſteep in. I know ſome writers pretend, that the ſubſtance of the leaves does not produce the indigo, which (as they would have it) is only a viſcous tincture, or colour, which the fermentation of the plant diffuſes in the water; but, before I take their words for it, I deſire they would tell me what becomes of the ſubſtance of the plant; for, when it is taken out of the ſteeper, it is certain, that it has no longer the ſame weight, conſiſtence, nor colour it had before. The leaves which were very plump, and very full of juice, are light, flabby, and withered, and look more like dung than any thing elſe; which makes them frequently give the name of rot to the ſteeper. If then we no longer find in the leaves, and the reſt of the plant, the ſame ſubſtance that was obſervable in it before it was laid in ſteep, is it not moſt natural to believe, that it is the ſame ſubſtance and ſalts, which, being freed from incloſures, and diffuſed in the water, have thickened it, and by their union or coagulation have formed that blue maſs which they call indigo, ſo uſeful in painting and dying.

Method of cultivating the ANIL.——This plant requires a good rich level ſoil, not too dry; it greatly robs and impoveriſhes the ground where it grows, and muſt be alone. There cannot be too much care taken to keep it clean, and to hinder herbs of any kind whatever from growing near it. They weed and cleanſe the ground where they intend to plant the indigo ſeed, five times over. I ſhould think they ſhould call it ſowing; but the term of planting is conſecrated in our iſles, and I do not think I ought for the ſake of a word to fall out with our planters, who deſerve our eſteem upon a thouſand accounts, though they have got an habit of murdering the French language. They ſometimes carry their neatneſs to ſuch a pitch, that they ſweep the piece of ground as they do a room. After that, they make the holes or pits, wherein the ſeeds are to be put: for this purpoſe, the ſlaves, or others, who are to work at it, range themſelves in the ſame line, at the top of the piece of ground; and, going backwards, they make little pits of the breadth of their hoe, of the depth of three or four inches, at about a foot diſtance every way, and as much as poſſible in a ſtraight line. When they are come to the end of the ground, each furniſhes himſelf with a little bag of ſeeds, and, returning that way they came, they put eleven or thirteen ſeeds into each of the holes they have made. This work is the moſt toilſome of any in the manufacture of indigo; for thoſe who plant it, muſt be always ſtooping, without riſing up, till the planting of the whole length of the piece of ground is ended; ſo that, when that is large, which almoſt always happens, they are obliged to remain two hours, and often more, in this poſture.

When they come to the top of the piece, they go back again, and cover the holes they have put the ſeeds in, by thruſting in with their feet the earth they had taken out of them; and ſo the ſeed is covered with about two inches of earth.

Though all ſeaſons are good for the planting of indigo, yet care muſt be taken not to put it in the ground in a dry time: it is true, the ſeed may keep a whole month in the ground, without being ſpoiled: but, when it is planted ſo, one runs the riſk of having it eaten up by vermin, or carried away by the wind, or choaked by the weeds which ſpring up with it; ſo that the prudent planters never run the riſk of planting it dry; i. e. at a time, when they do not probably expect rain in two or three days after the planting is ended: they chuſe therefore, uſually, a moiſt ſeaſon, which promiſes rain; and then they are ſure of ſeeing the plant ſpring up in three or four days after its being planted.

Notwithſtanding all the care that has been taken in clearing the ground, where the ſeeds have been planted, the planter muſt not be careleſs when the indigo is got above-ground; becauſe the goodneſs of the ſoil, joined to the moiſture and warmth of the climate, and the plentiful dews that fall every night, makes a prodigious quantity of weeds ſpring up, which would choak and abſolutely ſpoil the indigo, if extreme care was not taken to weed them up as ſoon as they appear, and to keep the plant extraordinary neat; and very often the weeds are partly the cauſe of the breeding of a kind of caterpillars, which devour all the leaves in a trice.

From the time of the plant's riſing above-ground, to its perfect maturity, is but two months, and then it is fit to cut: if one was to ſtay longer, it would bloſſom; its leaves would grow drier and harder, and conſequently they would yield leſs ſubſtance, and the colour would not be near ſo beautiful.

After this firſt cutting, the new branches and leaves, which the plant produces, may be cut about every ſix weeks, provided the ſeaſon be rainy, and that care be taken not to cut it in a time of drought, becauſe we ſhould then infallibly loſe the plant, or, as they call it there, the choupues, and be obliged to plant again; but, all things being rightly managed, the plant may laſt two years; after which, it muſt be plucked up, and new ones planted.

When the plant is ripe, which is known by the leaves, which grow brittler, and leſs ſupple, they cut it ſome inches from the ground. They uſe for the cutting of it great crooked knives made like ſickles. Some planters make it into bundles like double bottles of hay, that a negro may eaſily carry them to the ſteeper: but moſt people put it into large pieces of coarſe cloth, which they tie by the four corners; and this is more convenient, for the plant is leſs handled and ſqueezed, and the ſmall is carried away as ſafely as the great; and, beſides, the work goes on quicker this way, than in making bottles; and as time is precious every-where, and eſpecially in America, there cannot be too much care taken not to loſe any.

Eighteen or twenty packets of plants, each about the ſize of two bottles of hay, are ſufficient to fill a ſteeper of the aforementioned ſize. When it is filled with water, ſo that it covers the plants, they put pieces of wood on the top, that the plants may not riſe above the water (much as they do upon the grapes that are put into the preſs) and let all ferment.

According as the heat is greater or leſs, or the plant more or leſs ripe, the fermentation is raiſed ſooner or later, ſometimes in six, eight, or ten hours; and sometimes one is obliged to wait eighteen or twenty hours, but very seldom longer. Then the effect of the fermentation visibly appears, the water heats, and boils up on all sides, as the grapes do in the vat: and the water, which at first was clear, insensibly grows thick, and becomes of a blue, inclining to a violet colour. Then, without meddling at all with the plants, they open the cocks which are at the bottom of the steeper, and let all this water, loaded with the salts and substance of the plants, which were freed by the fermentation, run into the battery; and while they throw away, as useless, and almost rotten, the plants that were in the steeper, and clean it, that it may be filled with fresh, they beat the water, which they have let out of the steeper, into the battery.

They formerly used, for this purpose, a battle-door wheel, whose axle was placed on the middle of the vat, and which they turned by two handles, that were at the end of the same axle. Since that, in the room of battle-doors, they have put little bottomless boxes, and afterwards others, whose bottoms were bored full of holes: at present they use a kind of pretty large pails, fastened to strong poles, placed upon chandeliers, by means of which, the negroes violently and continually raise, beat, and stir the water, till the salts and other parts of the substance of the plants are united, and sufficiently, as it were, coagulated to incorporate.

The hitting this minute exactly shews the skill of him who oversees the making of the indigo: for, if he makes them leave off beating a little too soon, the grain, not yet formed, remains dispersed in the water, without sinking and gathering together at the bottom of the vat, and is lost with the water, when they are obliged to let it out; which is a great loss to the owner: or if, when it is formed, they continue to beat, they dissolve it, and the same inconveniency follows. This minute then must be observed, and, when it is found, must leave off beating, and let the matter rest.

To find this minute, they make use of a little silver cup, designed for this use alone: they fill it with this water, while the negroes beat it; and, according as they observe that the fæces sink to the bottom of the cup, or remain dispersed in the water, they cease, or continue beating.

When they have left off beating, they let the matter rest: the fæces sink to the bottom of the vat, and gather together like a kind of mud; and the water, freed from all the salts it was impregnated with, swims above it, and grows clear. Then they open the cocks, which are placed in the battery at different distances from the bottom, and let this water run away; and, when they come to the surface of the fæces, they open the cocks of the bottom, that the fæces may all fall into the deviling or settler. There they let it settle a little while longer, after which they put it into linnen-bags, fifteen or eighteen inches long, made with a point, where it perfectly purges itself of the rest of the water, which remained among its particles. When that is done, they spread it in little boxes, three or four feet long, two feet broad, and about three inches deep, and expose it to the air to dry it perfectly. They observe not to expose it to the sun, because it would starve the colour in drying it; and they take a great deal of care to keep it from the rain, because that would dissolve and utterly spoil it. It sometimes happens, that the caterpillars get among the indigo; and, if they are let alone ever so little a while, they eat all the leaves, and often the very rind and ends of the branches, and kill the stocks; it is but lost time to endeavour to destroy them, or hinder them from ravaging a whole piece, by stopping them with a ditch. The surest way is to cut down the indigo with all speed, let its age be what it will, and to throw both plants and caterpillars pell-mell together into the steeper; they there burst, and part with what they had devoured, and the indigo is not the less beautiful for it. It is true, when the plant is not come to its full maturity, it yields much less: but many experiments have taught us, that the colour it yields is much more beautiful; so that what is lost one way, is gained another. I would not wait for so perfect a ripeness, before I cut the plant. Perhaps all the secret of those, whose indigo is so much extolled beyond ours, lies only in cutting the plant, when it yields the liveliest colour. I have experienced, that in leaving some cochineal-flies upon some Indian figs, which were too ripe, instead of being red, they grew of a filemot colour, like the fruit they fed upon. The same thing might happen in indigo; and what I here propose, is not a groundless doubt, since it is backed by the experiment just now related; which plainly proves, that the same plant, cut at different ages, produces colours of different beauty. I would not venture to give this advice to men wedded to their interest, who value the quantity rather than the quality of their commodity; but I believe I have nothing to fear from our islanders, who are generous and magnificent, sometimes even beyond their abilities: I advise them therefore to make different trials, as to the soil, the season, the age of the plant, the water they steep it in, the point of dissolution, &c. And I am sure, that, with a little time, labour, and patience, they will make indigo that will equal, and even excel, the most boasted indigo of foreign countries. The planters of St. Domingo know, that, in 1701, their coarse sugar was very bad, and was not made without infinite trouble; and at present every-body allows, that by their labour, assiduity, and inquiries, it is grown much more esteemed than that of the windward islands: why may not the same be hoped for in indigo?

Mr. Pomet, author of the general history of drugs, says in his first part, chap. 10, that the Indians of the village of Sarquesse, near Amadabat, use only the leaves of the indigo, and throw away the plant and branches; and that it is from thence the most esteemed indigo comes. I am pretty much of his opinion; for we see, that those who take the pains to strip off the grapes from the branches, before they put them into the vat, and throw away the stalks intirely, make much the best wine; because the stalks always contain an acid, which mixes with the juice of the grape with the treading and pressing them both together; and, for the same reason, the indigo plant must contain a liquid much less perfect in colour than that of the leaves: but one ought to have the leisure and patience of the Indians to undertake such a work, and have work-men as cheap as they are in that country, supposing the fact true, as Mr. Pomet delivers it from the relation of Tavernier.

Though I am a great friend to those experiments which may carry our manufactures to a greater perfection, yet I dare not propose this, because of the expence they must be at, who would try it; and because the profit arising from it would not, perhaps, quit cost: however, I have here given the method of the Indians of Sarquesse, that I may have no reason to reproach myself with having omitted a thing, which may be of some use to my country.

Good indigo ought to be so light, as to swim upon water; the more it sinks, the more it is suspected to be mixed with earth, ashes, or powdered slate. Its colour ought to be a deep blue, inclining to a violet, brilliant, lively, and bright: it ought to be more beautiful within than without, and look shining, and as it were silvered.

If it is too heavy in proportion to its bulk, it ought to be suspected, and its quality examined into; for, as it often bears a considerable price, it is fit that those who buy it, should be acquainted with the frauds that may be committed in it.

The first is the beating the plant too much in the steeper, that the leaves and rind of it may be intirely consumed. It is certain, that the quantity of the matter is very considerably increased by this dissolution; but the indigo is a great deal the less beautiful for it; it is blackish, thick, heavy, and fitter to be thrown away than used.

The second is the mixing ashes, earth, or a certain brown shining sand (which is pretty commonly found in the bays by the sea-side) and especially powdered slate, with the fæces, as they fall into the deviling, and stirring all well together, that it may incorporate, and the fraud not appear; and this fraud is much more easily committed in the powdered indigo, than in that which is in cakes; because it is very difficult for those heterogeneous bodies to unite so well together, as not to make, in many places, as it were beds of a different matter; and then, breaking the piece of indigo, they are easily perceived.

The two following expedients may be made use of, in order to know the goodness or badness of indigo.

The first is to dissolve a bit of it in a glass of water. If it is pure, and well made, it will entirely dissolve; but, if it be adulterated, the foreign matter will sink to the bottom of the glass.

The second is to burn it. The good indigo will burn all away, whereas the ashes, earth, sand, and slate, remain after the true indigo is consumed. *Labat's Travels.*

A'NIMA *Saturni*, the soul of lead, a name given to a preparation of that metal, used by enamellers, for various purposes. The method of making it is this:

Put litharge finely powdered into a glazed earthen vessel, and pour distilled vinegar upon it to the height of four fingers; let it stand till the vinegar has acquired a white or milky colour: pour off this vinegar, and put on fresh, and continue to do so till the vinegar will no longer be coloured by the litharge; then set these vinegars together in open glazed earthen vessels, that the white powder may subside, and the vinegar be poured off clear. This white substance is the Anima saturni. Sometimes this white matter will not precipitate without the addition of water; and sometimes it is necessary to evaporate the liquors; but by that means it is always prepared. *Neri's Art of Glass.*

A'NIMAL *(Dict.)*— An Animal, respect being only had to the body, not the soul, may be defined with Boerhaave to be an organical body, consisting of vessels and juices, and taking in the matter of its nutriment, by a part called a mouth; whence it is conveyed into another called the intestines, into which it has roots implanted, whereby it draws in its nourishment, after the manner of plants.

According to this definition, an Animal is distinguished from a fossile, in that it is an organical body; and from a vegetable by this, that it has its roots within itself, and a plant without itself.

In effect, the intestines of an Animal are, in reality, no more than its earth, or the body it adheres to; into which

which it sends forth its roots, that is, the lacteal vessels, which thence draw the matter of its life and increase.

An Animal is better defined from its mouth than its heart, since we do not know whether the whole tribe have such a part; for as several have sixteen hearts, particularly the silk-worm, and some even sixty: so it is possible others may have none at all.

Nor can any general character of an Animal be taken from the brains, the lungs, or the like, since we know of many quite destitute thereof.

The genuine characteristic, then, of an Animal, is to be free and at large with respect to the subject it derives its nourishment from: for every thing is taken in by the mouth; and the mouth does not adhere to any thing: whereas all plants are connected, in some manner or other, to the body which furnishes them food.

Hence it follows, that a fœtus, while it remains in the mother's womb, is a real plant; as being connected by the funiculus umbilicalis to the placenta, and by the placenta to the uterus, from whence it receives its nutriment.— If it did not derive its food by the said funiculus, but by its mouth, it were an Animal; and, if it drew it by both, a zoophyte, or plant-Animal.

Some have defined Animals from their loco-motion, as being capable of shifting from place to place; and plants, from their sticking fast to the same subject: but, on this principle, oisters, mussels, cockles, &c. are excluded from the class of Animals, inasmuch as they adhere, or grow to rocks, &c. yet it is certain, that those creatures are real Animals, as they have mouths and stomachs to take in their food, and lacteals and mesenteric veins to receive it.— Indeed, mussels seem an exception from the former definition. That anomalous creature breathes, and receives its nourishment, not at the mouth, but by the anus: the part which we account its head, though without either eyes, ears, or tongue, or any other apparatus, save a hole, which we may call its mouth, is an immoveable part; being fastened to one of the shells, so that it cannot seek for food, but the food must come to seek it. This food is water, which, as the shells open, enters in at the anus of the mussel, which opens at the same time; and passing thence into certain canals between the inner surface of the shell, and the outer surface of the Animal, is conveyed thence into its mouth, by a certain motion, which the Animal can produce at pleasure.

We chuse therefore, with Dr. Tyson, to fix the criterion of an Animal in a ductus alimentalis, i. e. a gula, stomach, and intestines: all which make but one continued canal.

But there is no difference absolutely essential and general between animals and vegetables; but nature descends by certain steps and imperceptible gradations, from a more perfect to a less perfect Animal, and from thence to a vegetable. Let us suppose the fresh water polypus to be the last of the Animal and first of the vegetable creation.

After having examined the difference, if we consider the similitude between Animals and vegetables, we shall find it, at first view, very essential and general: you will find in both a common power of producing themselves; such a power implies a greater analogy and similitude in their nature, than appears at first sight; and gives us reason to believe that Animals and vegetables are beings nearly of the same class.

A second similitude between them may be drawn from the unfolding and opening their parts, a property common to both; for vegetables as well as Animals have a power of growing, and, though the manner be different, it is not totally and essentially so, because there are in Animals many different parts, as bones, hair, hoof, horns, &c. the unfolding of which is a true vegetation, and the fœtus, in its first formation, vegetates before it lives.

They have this third resemblance, that some Animals are produced like plants, and by the same means, as, for example, the green lice found on trees, which multiply without copulation, is like increasing plants by sowing their seed; and increasing the polypus, by cutting him in pieces, resembles propagating trees by slips. We may therefore assert on stronger terms, that Animals and vegetables are beings of the same class, and that nature seems to have made a transition from one to the other, by insensible gradations; because it is certain they have many essential and general likenesses, but no difference that can be looked upon as such.

Now, if we compare Animals and vegetables in other respects, as number, magnitude, form, &c. we shall draw new inferences from these considerations.

The number of the species of Animals is much greater than that of plants; for, in the genus of insects only, there is perhaps a great number of species invisible to the naked eye, than there are plants visible upon the face of the earth. Animals resemble each other much less than plants, and in the similarity of plants consists the difficulty of ranging and classing them properly. This gave birth to the art of botany, a more difficult study than zoology; because Animals are much more sensibly different from one another than plants, and are therefore more easy to be distinguished, named, and described. Besides, here is another advantage we have in distinguishing the species of Animals; we ought to look on that as the same species which propagates and preserves itself by the copulation of the male and female of the same species, and consider that as a different species, which by the same means can produce nothing. So that the fox will be a different species from the dog, if nothing proceeds from the copulation of a male and female of these two species; and, even though a creature half dog half fox should proceed from this copulation, yet it would not class the fox properly in the canine species; because this production would be a mule, and nature proceed no farther; whereas, to constitute a species, it is necessary the production should be continued invariable fit for the propagation of its own species, in a word, like other Animals.

In plants we have not the same advantage, for though some pretend to have discovered sexes in plants, and have settled distinctions of male and female from the parts of fecundation, yet this is neither so certain nor apparent in plants as Animals: besides, the production of plants is effected in many cases, where the sex is not concerned, nor the parts of generation necessary; and the notion of sexes in plants is not sufficiently understood, to be a proper method for us, whereby to distinguish plants into their different species.

The number of the species of Animals is therefore greater than that of plants; but it is not the same thing with regard to the number of individuals contained in each species. As, in plants, the number of individuals is much greater in the less than larger species, so, in animals, the species of flies is perhaps a hundred thousand millions of times more numerous than that of the elephant; in like manner there are more herbs than trees. But if we compare the quantity of individuals in plants and Animals, species to species, we shall see, that each species of the plant is more fruitful than each species of the Animal. As for instance: quadrupeds produce but a small number of young, and those at considerable distances of time; trees on the other hand every year produce a great number of their own species.

M. de Buffon objects against the justice of this comparison; and to render it a parallel case, he says, we must first be able to compare the quantity of generative particles in the semen of an Animal with the number of seeds growing on a tree, and then perhaps we should find the generative powers to abound most in Animals. But if, says he, by way of answer, it were possible, by carefully gathering all the acorns of an oak, and sowing them, to raise 100,000 trees, the production of one year, which is by no means impracticable, and, though we took care to help a horse to all the mares he could cover in a season, the produce would be vastly inferior to that of the vegetable. I do not therefore, says M. de Buffon, examine into the quantity of generative particles, first, because in Animals we do not know it; secondly, because the acorn is not a generative principle, but a production as perfect as the fœtus of an Animal, and wants nothing but a proper nudus to display itself.

M. de Buffon mentions the prodigious increase of some kind of insects; the female bee produces thirty or forty thousand; but he declares, that he relates this in general, comparing Animals and vegetables; and that this instance of bees, which is the greatest we know in the Animal world, is yet no proof; for out of this number of thirty or forty thousand, which the mother bee produces, he observes there is but a very small number of females, and about 1500 or 2000 males, the rest being mules, or of no sex, being incapable of generation.

It must be owned that in insects, fishes, and shell fish, there are species which seem to be extremely fruitful; oisters, herrings, lice, &c. are perhaps as numerous as mosses and other common plants. But, if we consider and take a view of the whole, we shall easily discover that the greatest part of the species of Animals are less fruitful of individuals than the species of plants. Farther we may observe, that, by comparing the increase of the species of plants with each other, there is not so wide a difference in the number of individuals, as in the species of Animals; some of which produce a great number, others a very small one, instead of which, the number of productions in plants is always very great, in every species. It follows from what we have said, that the least and lowest species are always the most fruitful in individuals, both in the Animal and vegetable world. In proportion as the species of Animals grow more perfect, we see them reduced to a less number of individuals. Can one imagine it would cost nature more trouble to construct in bodies of a certain figure, as that of quadrupeds, with certain organs for the perfection of sense, than to produce a living creature, and organize it in a manner that appears so difficult to us to conceive? No, it cannot be imagined; to account for this phænomenon we must have recourse to the first order of things, and suppose the production of the larger Animals equal to that of insects. We see, at first sight, that this monstrous species would soon have swallowed up all others, nay, would have devoured even itself, would alone have overspread the face of the whole earth, and that nothing would have been left on the continent but elephants, birds, and insects; in the ocean nothing but whales, and fishes which by the smallness of their size could escape being devoured by the former. An order of things not to be compared with that which exists at present. Thus we see, that the works of providence are regulated by the highest wisdom.

Let

Let us now with M. de Buffon proceed to the compariſon of Animals with vegetables, in point of ſituation, magnitude, and form; the earth is the only place where vegetables can ſubſiſt; the greateſt number riſe above the ſurface of the ground, and are held by roots which penetrate into the earth. Some, as truffels, grow intirely under the ſurface, ſome ſmall number grow under water; but all, to preſerve their exiſtence, muſt be placed in a ſtratum of earth. Animals, on the other hand, are more univerſally diffuſed: ſome inhabit the ſurface, others the bowels of the earth; ſome live at the bottom of the ſea, others in its waters; they are found in the air, the internal parts of plants, in the bodies of men and other Animals, in liquors, nay, even in ſtones.

By the help of the microſcope prodigious diſcoveries have been made of Animals of different ſpecies. But it may ſeem ſomething ſingular, that not above one or two ſpecies of plants have been diſcovered by the application of this inſtrument. The little moſs, produced by mouldineſs, is the only microſcopical plant we have heard of. From this we might be induced to think that nature, which is ſo fruitful in producing animalcula, is very ſparing of her productions in plantulæ or little plants; but we may be led into an error by adopting ſuch an opinion too haſtily, and the error might perhaps take its riſe, from the greater ſimilarity there is between plants than Animals, which renders it more difficult to diſtinguiſh their ſpecies; ſo that this mould which we take for an infinitely ſmall moſs, might be a garden or wood, filled with a vaſt number of plants really very different from each other, and yet that difference imperceptible to our eye.

It is true, if we compare the magnitude of Animals with reſpect to each other and plants in the ſame light, there will appear a great diſparity; for there is a much greater diſproportion between the whale and one of theſe pretended microſcopical Animals, than there is between the talleſt oak and the infinitely minute moſs we have mentioned: and, tho' magnitude be only a relative attribute, yet it is proper to conſider the extreme bounds which nature ſeems to have preſcribed to herſelf. The larger ſpecies in Animals and plants have ſome parity, a vaſt oak and a great whale have ſome correſponding proportion in magnitude; but in the leſſer ſpecies there is no analogy, if it be true that a thouſand microſcopical Animals united are not equal to the microſcopical plant in magnitude.

Farther, the moſt ſenſible and general difference between Animals and vegetables is their formation. That of Animals, though it admits of infinite variety, has no ſimilarity with that of plants, and though the polypus which is propagated in the manner of a plant, may be looked upon as making the continual gradation between the Animal and vegetable, yet we may ſay the figure of any Animal whatever is of ſo different an exterior formation from that of a plant, as to leave no difficulty in diſtinguiſhing one from the other. Animals may indeed perform operations which reſemble plants or flowers; but plants will never produce any thing ſimilar to an Animal. If an ill-grounded prejudice had not ranked the coral among the vegetables, thoſe wonderful inſects that work and produce it had never been miſtaken for flowers. Thus it appears, the errors we are liable to fall into by comparing the formation of Animals with that of vegetables, can only be in a ſmall number of ſubjects which make the gradation between both; and a nicer obſervation will convince us that the Creator has fixed no certain bounds between the Animal and vegetable; that theſe two kinds of organized beings have many common properties, no real difference; that the production of an Animal coſt nature no more trouble than the production of a plant, perhaps leſs; that the production of organized beings in general is nothing extraordinary, and that, in ſhort, the living and animated being, inſtead of being ranked in a degree of præternatural entities, is only actuated by the phyſical property of matter.

After having ſettled one very difficult and important point by the help of M. de Buffon's profound knowledge in metaphyſics, let us proceed to the ſecond, which we owe to M. de Aubenton, his illuſtrious partner, in their natural hiſtory.

Animals, ſays M. d'Aubenton, have the firſt place in the general diviſion of natural hiſtory. All the objects comprehended in this ſcience are diſtributed into three claſſes which they call kingdoms; the firſt is the Animal kingdom: we have put this firſt, becauſe Animals have a nearer connection with us than vegetables, which make the ſecond kingdom, and minerals, having ſtill a more diſtant one, make the third kingdom. In ſome works of natural hiſtory, however, the order is inverted, the mineral kingdom placed firſt, and the animal laſt. Theſe authors were of opinion we ought to begin with contemplating the moſt ſimple objects, ſuch as are minerals, and from thence paſſing through the vegetable world, ſhould gradually proceed to the conſideration of the moſt compounded objects, which are Animals.

The ancients divided Animals into two claſſes; the firſt contains ſuch as have blood, the ſecond thoſe which have none; this diſtinction was made in Ariſtotle's time, and perhaps long before that great philoſopher; and this diſtinction has been generally admitted till of late. Several objections have been raiſed againſt this diſtinction, that all Animals have blood, becauſe all Animals have a fluid, the circulation of which all over the body is neceſſary for a continuance of life, that the eſſence of blood does not conſiſt in its being of a red colour, &c. but theſe objections prove nothing againſt the propriety of the diſtinction we are ſpeaking of: for whether we ſuppoſe all Animals to have a blood or a part only, whether the name of blood may properly be aſſigned to the fluid which circulates in the bodies of ſome, is no part of the queſtion; it is ſufficient to make a diſtinct claſs of Animals, that in theſe the circulating fluid is red, in thoſe not ſo. But there is one objection to this method of claſſing Animals, which admits of no reply. Among the Animals ſaid to have no blood, or, at leaſt, no red blood, ſome are found to have blood, and very red blood too; theſe are earth-worms. This is a fact which ſhews a defect in this method of diſtinction, and yet, perhaps, upon the whole it is the better, and leſs liable to objection than many others.

For a general account of Animals, we ſhall here ſubjoin Mr. Ray's ſcheme.

Animals are either

- Sanguineous, that is, ſuch as have blood, which breathe either by
  - Lungs, having either
    - Two ventricles in their heart, and thoſe either
      - Viviparous.
        - Aquatic, as the whale-kind.
        - Terreſtrial, as quadrupeds.
      - Oviparous, as birds.
    - But one ventricle in the heart, as frogs, tortoiſes, and ſerpents.
  - Gills, as all ſanguineous fiſhes, except the whale-kind.
- Exſanguineous, or without blood, which may be divided into
  - Greater, and thoſe either
    - Naked,
      - Terreſtrial, as naked ſnails,
      - Aquatic, as the poulp, cuttle-fiſh, &c.
    - Covered with a tegument, either
      - Cruſtaceous, as lobſters and crab-fiſh.
      - Teſtaceous, either
        - Univalve, as limpets,
        - Bivalve, as oyſters, muſcles, cockles.
        - Turbinate, as periwinkles, ſnails, &c.
  - Leſſer, as inſects of all ſorts.

Viviparous hairy Animals or quadrupeds, are either

- Hoofed, which are either
  - Whole-footed or hoofed, as the horſe and aſs.
  - Cloven-footed, having the hoof divided into
    - Two principal parts, called biſulca, either
      - Such as chew not the cud, as ſwine.
      - Ruminant, or ſuch as chew the cud, divided into
        - Such as have perpetual and hollow horns.
          - Beef-kind.
          - Sheep-kind.
          - Goat-kind.
        - Such as have ſolid, branched, and deciduous horns, as the deer-kind.
    - Four parts, or quadriſulca, as the rhinoceros and hippopotamus.
- Clawed or digitate, having the foot divided into
  - Two parts, or toes, having two nails, as the camel-kind.
  - Many toes or claws; either
    - Undivided, as the elephant.
    - Divided, which have either
      - Broad nails, and an human ſhape, as apes.
      - Narrower, and more pointed nails, which, in reſpect of their teeth, are divided into ſuch as have
        - Many fore-teeth, or cutters in each jaw;
          - The greater, which have
            - A ſhorter ſnout and rounder head, as the cat-kind.
            - A longer ſnout and head, as the dog-kind.
          - The leſſer, the vermin or weazel-kind.
        - Only two large and remarkable fore-teeth, all which are phytivorous, and are called the hare-kind.

Animals make the principal part of heraldry, both as bearings, and as ſupporters, &c.

It is an eſtabliſhed rule among heralds, that, in blazoning, Animals are always to be interpreted in the beſt ſenſe, that is, according to their moſt noble and generous qualities, and ſo as may redound moſt to the honour of the bearers.

Thus the fox being reputed witty, and withal given to filching for his prey; if this be the charge of an eſcutcheon, we are to ſuppoſe the quality repreſented to be his wit and cunning, not his theft.

Guillim adds, that all ſavage beaſts are figured in their fierceſt action, as a lion erected, his mouth wide open, his claws extended, and in this poſture he is to be rampant.—— A leopard, or wolf, is to be portrayed going, as it were, pedententim; which form of action, ſays Chaſſanæus, fits their natural diſpoſition, and is termed paſſant.

The gentleſt kind are to be ſet forth in their nobleſt and moſt advantageous actions; as a horſe running or vaulting, a greyhound courſing, a deer tripping, a lamb going with a ſmooth and eaſy pace.

Every Animal is to be moving, or looking to the right side of the shield; and it is a general rule that the right foot be placed foremost, because the right side is reckoned the beginning of motion: add, that the upper part is nobler than the lower; so that things, constrained either to look up or down, ought rather to be designed looking upwards.

However, notwithstanding these precepts of Guillim, &c. the other masters of armory, we find by experience, that there are lions passant, couchant, and dormant, as well as rampant, and that most Animals look down and not up. *Guillim's Heraldry.*

Wheel-ANIMAL, a name given by the writers on microscopical discoveries to a species of minute animalcule, which appears in a sort of sheath or case, the end of which it fastens to the roots of water-plants, or whatever else is in its way, *See plate* III. *fig.* 15, 16, 17.

This little creature has two seeming wheels, with a great many teeth or notches coming from its head, and turning round, as it were, upon an axis. This little creature, on the least touch, draws in its wheel into its body, and its body into the sheath; but, as soon as all is quiet, it throws them out, and works them again.

In order to find these animalcules, chuse such roots of duckweed as are long, and proceed from strong old plants, for the young roots seldom afford any; they should not be covered with that rough matter which is frequently found about them, nor any way tending to decay, as they will often be.

In the water found remaining in the leaden pipes, or gutters, on the tops of houses, there are also found great numbers of Wheel-Animals. These are of a different species from the former; and, when the water dries away, they contract their bodies into a globular or oval figure, and are then of a reddish colour, and remain mixed with the dirt, growing together into a lump as hard as clay. This, whenever it is put into water, in half an hour's time, discovers the Animals living again, and as brisk as ever; and they have been found to be living in this manner, after the matter had been kept dry for twenty months.

It should seem from this, that, as the water dries up, their pores become shut in the manner of such Animals as remain torpid for the winter, and that, when they find water come on again from rain, they then unfold themselves, and live and feed as long as it lasts. *Baker on the Microscope.*

A'NKER, a liquid measure, chiefly used at Amsterdam. The Anker is the fourth part of the aem, and contains two stekans; each stekan consists of sixteen mingles, the mingle being equal to the Paris pint.

ANIMA'LCULA (*Dict.*)— Under this term in a philosophical sense are comprehended those animals which are not visible without the help of a microscope; since the invention of this instrument many little animals have been perceived, which had before escaped our notice: we have seen bodies moving in several different liquors, chiefly in the semen of animals, and infusions of the grains of plants. Hartsoeker and Lewenhoeck were the first authors of these discoveries, and have told us these moving bodies were really living creatures; and several others, who have pursued the same study, have found new moving bodies. All have agreed in this opinion, that these bodies were animals; from whence have arose different hypotheses concerning generation, the spermatic Animalcula of the male, and the ova of the female, &c. At last, M. de Buffon has destroyed this false opinion; he has demonstrated by undeniable experiments, in the second volume of his Natural History, that the moving bodies, discovered by the microscope, are not really animals, but moleculæ or little masses of a certain organization, alive, and proper to compose a new body of the same organization with that from whence they were extracted. M. de Buffon has found these moving bodies in the semen of females as well as males: he shews that the moving bodies which he has observed with the microscope in infusions of the seeds of plants, as well as in the semen of animals, are also organized moleculæ of vegetables. M. de Buffon had communicated to Mr. Needham of the Royal Society at London, the observations he had made on the semen of animals, and infusions of the seeds of plants, with his discoveries before the publication of the first volume of his Natural History. I myself, says M. d'Aubenton, with Mr. Needham, was present at the first experiments made in the Royal Gardens, with a microscope Mr. Needham had brought from London with him. It was after having seen the first experiments on infusions of the seed of plants, that Mr Needham entertained a design of pursuing these experiments on vegetables; he communicated this intention to M. de Buffon in my presence, as to the author of a discovery, whose hints he designed to follow. Mr. Needham, in consequence of this resolution, made a number of experiments, and published a work under the title of New Microscopical Observations 1750, and the author has promised to give the public a particular account of all the observations he has made on this head; Mr. Needham has communicated some to me from which I have received great satisfaction.

A number of these Animalcula have been discovered on various substances, as, for example, on a grain of sand pressed through a sieve a little Animal has been found, with a great number of feet, and a back covered with shells; in the liquor of a pustule caused by the itch Animalcula have been found resembling tortoises. See ITCH in the Dictionary.

You may see, in common water some time exposed to the air, a number of little moving bodies of different magnitudes and figures, the generality of which are round or oval. Lewenhoeck says that a thousand millions of those bodies which float in common water, are not so big as an ordinary grain of sand. *Diderot's Encyclop.*

A'NIME (*Dict.*)—The Anime of the shops is of the number of those dry resins which are very improperly called gums, what is called gum Anime being a friable substance, inflammable, and soluble in oil, which are characters of a genuine resin, and such as no gum can possess. We are to observe also, that there is another very frequent error with regard to this drug, which is, that many call it copal, and confound it with another resin, improperly called also a gum, and known by that name. Copal is, indeed, a term used by the Indians in a very large sense, and sometimes, as a generical name for all the scented resins; but with us it is never used so, nor has any good author used it, as a term synonymous with Anime: it is the name of a distinct resin to be treated of in its place.

The Spaniards, according to Hernandez, used the term copal to distinguish all the white, or whitish sweet-scented resins; and the term Anime, which they also made generical, to express all the brown ones: after this, the name Anime became attributed to a peculiar resin, of a sweet scent, and of a brownish yellow colour, brought from the east, or rather from Ethiopia, on the confines of Arabia; and finally, after this, the Portuguese gave it also to certain sweet resins which they found in the Brasils, and esteemed somewhat of the same nature with the Ethiopian Anime.

On this distinction has been founded the name of oriental and that of occidental Anime, long known in the shops, and distinguishing two different resins at this time found there, though neither very frequently.

The oriental or Ethiopian Anime, called by the Portuguese animum and aniimum, and in the shops gum Anime, is a dry and solid resin, brought to us in large cakes or masses, of an irregular figure, and of a very uncertain colour; some of them are greenish, some reddish, some brown, and some of the colour of myrrh; they all agree in this, however, that they are moderately pellucid, of a tolerably compact texture, light and easily powdered, of a fragrant smell, very inflammable, and of a resinous and somewhat bitter taste. This which is the genuine and true Anime is now very rare in the shops. It is brought, as Garcias informs us, only from Ethiopia, but the occidental kind, or resin of the courbaril, is what is universally received in its place. It has been supposed by many, that this Ethiopian or true Anime was known to the ancient Greeks. Some have supposed that Dioscorides meant this resin by the name of myrrha minia, and many arguments have been advanced in favour of the opinion; but the resins themselves are so like one another, and the descriptions the Greeks have left us of them is so short and imperfect, that it is impossible to affirm any thing on this head with any tolerable degree of certainty. We are not yet informed what the tree is that produces the Ethiopian Anime. Herman is of opinion, that it is the same that yields the occidental kind, only growing in a different climate; but this is no more than a conjecture.

The occidental Anime is a whitish, dry, and solid resin, somewhat resembling frankincense in colour. It is often of a fine yellowish white, between that of frankincense and mastich, and in the purest pieces is very clean and transparent; in general, however, it is much inferior to the oriental in these respects. It is moderately heavy, friable, and somewhat oleaginous to the touch. It is extremely fragrant, especially when burnt, and is of a resinous, acrid, and somewhat bitterish taste. It is brought to us from many parts of America, particularly from new Spain and the Brasils. The natives call it jotieacica and jetaicica. Our people from their name of the tree vulgarly call it resin of courbaril.

Whatever might be the case in regard to the Ethiopian Anime, we may be very well assured, that this was not known to the Greeks. The tree which produces it is one of the arbores siliquosæ of Mr. Ray. It is described by Caspar Bauhine under the name of arbor siliquosa ex Virginia lobo fusco scabro, and by Plumier, under that of courbaril bifolia flore pyramidato. It grows to a very great height; its wood is solid, and of a fine grain, of a reddish colour, and very durable, and serves them for many of their better works. The leaves are like those of our bay-tree, but thicker, and they grow constantly two together on every stalk; they are of a shining green, and, if held up to the light, seem to be perforated with innumerable little holes in the manner of the leaves of St. John's-wort. The flowers stand in clusters or tufts towards the tops of the branches; they are of the papilionaceous kind, like those of our vetches, and of a purplish colour: these are succeeded by a kind of pods six inches long, and an inch and a half broad, compressed sideways, and raised into two ridges on the back.

This

This fruit, when ripe, does not open lengthwise into two valves, as the generality of pods of this shape do; it remains intire, and contains in it, among a multitude of irregular fibres, four or five seeds larger than the common pine-kernels, otherwise like them. This tree is common in most parts of America, and the fruit ripens in May and June, when it falls from the trees, and is picked up by the natives, who are fond of the farinaceous substance that is among the fibres within it. The trunk of the tree exsudates the resin here described in very considerable quantities without being wounded for it; the finest lumps of it are white or of a pale yellow, and much resemble amber.

The American Anime, analysed by distillation in a retort, yields first a small quantity of a limpid phlegm of a subacid taste, and of a smell not disagreeable, but much resembling that of oil of Juniper; after this a small quantity also of a reddish liquor more acid than the former, and then of a brown liquor of an empyreumatic smell; after these there comes over a moderate portion of a fine yellow pellucid oil, and then a thick and brown one like butter, in so large a quantity as nearly that of two thirds of the weight of the whole. The remainder in the retort is but in a very small quantity, and, after lixiviation, yields, with the utmost care, only about four grains of a fixed salt, and that of the sal salsus, not the alkaline kind, from the pound.

The natives of America use this resin in fumigations for the head-ach, and for diseases of the breast and lungs. They are also externally dissolved in oil as a liniment, and in spirit of wine as an embrocation for pains in the limbs.

ANIME, in heraldry, is where the eyes, &c. of a rapacious creature, are borne of a different colour from the rest of the creature.

ANNA'LIS *Actio*, in the civil law, signifies an action which may be put in practice any time within the year.

ANNALIS *Clavus*, in antiquity, the nail which the prætor, consul, or dictator, fixed every year in the wall of Jupiter's temple, upon the ides of September, to shew the number of years. But this custom was afterwards changed, and the years were reckoned by the consuls.

ANNA'TES, a tax levied on Christian clergy, and paid to the Pope: it was a year's revenue, or tax upon the revenue of the first year of a vacant benefice, ever since the twelfth century. Some bishops or abbots had, either by customs, or particular privileges, received Annates, or first fruits of the benefices belonging to their patronage or jurisdiction. Thus, in the year 1726, Peter, bishop of Beauvois, gave the canons of the church of St. Quintin the Annates of all the prebends of this cathedral. The court of Rome, which was always incroaching upon the liberties of the church, soon found means to get the Annates into its hands. John XXIII. secured the Annates of all vacant benefices (bishoprics and abbies excepted) for three years. His successors improved the advantage, and took in the bishops and abbots; but the payment of this tax was always grudged, and was warmly contested in the council of Constance, an. 1414. The council of Basil, in 1431, forbad the payment of Annates; and the council of Bourges, in 1438, approved the decree of the synod of Basil; to which we may add its being forbidden by several edicts of the French king's. Matthew Paris, in his History of England, for the year 746, relates that the archbishop of Canterbury, by virtue of a grant or concession of the Pope, received Annates of all the benefices that became vacant in England. Clement V, predecessor of John XXII, was the first, according to Matthew of Westminster, who exacted Annates of all the vacant benefices in the kingdom, for the space of two years; or, according to Walsingham, for three. John XXII. introduced the like in France; yet Polydore Virgil, and some others, take the Annates to be of much older standing, and to have prevailed long before they were paid to the Pope. It is certain, at least, that, from the 12th century, there were bishops and abbots, who, by some peculiar custom or privilege, took Annates of the benefices depending on their diocese or abbey. This burden was laid at first only on such benefices as the Pope himself collated to; and this he did, says Polydore Virgil, before he had such large possessions. Boniface VIII, in the time of Edward I, first started the doctrine of the Pope's universal and absolute dominion in beneficiary matters; but he was vehemently opposed at the reformation. They were taken from the Pope, and vested in the king, or on the crown of England, where they continue to this day, except what alterations have been made since, in relation to small livings.

ANNO'TA. See ANATTA.

ANNU'ITIES. Under this article in the Dictionary, we have shewn the method of finding the value of Annuities; and, under the article *Compound* INTEREST, we have given a short table for computing the value of Annuities on lives; we shall here give a fuller account of that doctrine, according to the observations made by Dr. Halley on the Breslaw bills of mortality.

Breslaw is the capital city of the province of Silesia. It is situated on the eastern bank of the river Oder, near the confines of Germany and Poland, and very nigh the latitude of London. It is very far from the sea, and as much a mediterranean place as can be desired; whence the confluence of strangers is but small, and the manufacture of linen employs chiefly the poor people of the place, as well as of the country round about; whence comes that sort of linen we usually call Silesia linen, which is the chief, if not the only, merchandize of the place. For these reasons the degrees of mortality in the city seem most proper for a standard, and the rather, for that the births do a small matter exceed the funerals: the only thing wanting is the number of the whole people, which in some measure I have endeavoured to supply, says the doctor, by comparison of the mortality of the people of all ages; which is traced out from the curious tables of the births and funerals drawn up monthly by Dr. Newman of that city.

Dr. Halley's Table of observations, exhibiting the probabilities of life.

Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age	Persons
1	1000	8	680	15	628	22	586	29	539	36	481	7	5547
2	855	9	670	16	622	23	579	30	531	37	472	14	4584
3	798	10	661	17	616	24	573	31	523	38	463	21	4270
4	760	11	653	18	610	25	567	32	515	39	454	28	3964
5	732	12	646	19	604	26	560	33	507	40	445	35	3604
6	710	13	640	20	598	27	553	34	499	41	436	42	3178
7	692	14	634	21	592	28	546	35	490	42	427	49	2709
Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	Age cur.	Persons.	56	2194
43	417	50	346	57	272	64	202	71	131	78	58	63	1694
44	407	51	335	58	262	65	192	72	120	79	49	70	1204
45	397	52	324	59	252	66	182	73	109	80	41	77	692
46	387	53	313	60	242	67	172	74	98	81	34	84	253
47	377	54	302	61	232	68	162	75	88	82	28	100	107
48	367	55	292	62	222	69	152	76	78	83	23	Sum total	34000
49	357	56	282	63	212	70	142	77	68	84	20		

M. de Moivre has largely explained the use of the foregoing table, in the following manner:

Suppose that by this table we would know what the probabilities are for a man of 30 to live 1, 2, 3, 4, 5, &c. years. Look for the number 30 in one of the columns of age, and under it you will find 31, 32, 33, &c. and opposite the number 30, in the next adjoining column on the right hand, you find 531, under which are written 523, 515, 507, &c. corresponding in order to the numbers in the column of ages; the meaning whereof, is that, out of 531 persons living of 30 years old, there remain but 523, 515, 507, 499, &c. that attain the respective ages of 31, 32, 33, &c. and who, consequently, from that term of 30, do live 1, 2, 3, 4, &c. years respectively.

In order to compute the value of an Annuity upon a life of a given age, let the quantities A, B, C, D, E, F, &c. represent respectively the person living at the age given, and the subsequent years.

Now it is obvious, that there being A, persons of the age given, and one year after B, persons remaining, the probability which the person of the given age has to continue in life, for one year at least, is represented by the fraction $\frac{B}{A}$, and that the probability which it has to continue in life, for two years at least, is represented by the fraction $\frac{C}{A}$, &c. and that therefore, if money bore no interest, it would be only necessary to multiply those probabilities by the sum to be received

received annually, which is ſuppoſed here to be = 1, and the ſum of the product would expreſs the preſent value of the Annuity. But, as money bears intereſt, let r repreſent the amount of 1 l. with its intereſt at the year's end, and then the preſent values of the ſums to be received would be reſpectively $\frac{1}{r}$, $\frac{1}{rr}$, $\frac{1}{r^3}$, $\frac{1}{r^4}$, &c. and therefore, multiplying theſe ſums by the probabilities of obtaining them, we ſhall have the value of the Annuity expreſſed by the ſeries $\frac{A}{r} + \frac{B}{rr} + \frac{C}{r^3}$ $\frac{D}{r^4} + \frac{E}{r^5} + \frac{F}{r^6} + \frac{G}{r^7} + \frac{H}{r^8}$, &c. which muſt be continued to the end of the tables.

But let us ſuppoſe, that, inſtead of an Annuity upon a life whoſe age is given, there ſhould be the expectation of a ſum, which we will call (1) payable once for all, whenever it happens, that the life ceaſes within a limited time. It is plain that the probability of the life's ceaſing after one year is $\frac{A-B}{A}$, and that the probability of its continuing one year, and dropping the next, will be $\frac{B}{A} \times \frac{B-C}{B}$, or barely $\frac{B-C}{A}$, and that, again, the probability of its continuing two years, and dropping the third, will be $\frac{C-D}{A}$, and ſo on; and that therefore the value of the expectation founded on the contingency of the life's falling within a limited time would be $\frac{A-B}{Ar} + \frac{B-C}{Arr} + \frac{C-D}{Ar^3} + \frac{D-E}{Ar^4} + \frac{E-F}{Ar^5} + \frac{F-G}{Ar^6}$, &c.

Let it now be ſuppoſed, for inſtance, that the party on whoſe life this expectation depends is 10 years of age, and that the age limited, as a condition of obtaining the ſum (1) is 21; hence it is plain, that, the difference between 21 and 10 being 11, we ought to limit ourſelves to 11 terms of the foregoing ſeries, and then, conſulting Dr. Halley's table, we ſhall find the numbers A, B, C, D, E, &c. to be reſpectively 661, 653, 646, 640, 634, 628, &c. and that, therefore A — B, B — C, C — D, D — E, E — F, &c. will reſpectively be 8, 7, 6, 6, 6, &c. and that, conſequently the preſent value of the expectation will be $\frac{8}{661r} + \frac{7}{661rr} + \frac{6}{661r^3} + \frac{6}{661r^4} + \frac{6}{661r^5} + \frac{6}{661r^6} + \frac{6}{661r^7} + \frac{6}{661r^8} + \frac{6}{661r^9} + \frac{6}{661r^{10}} + \frac{6}{661r^{11}}$.

Let it be further ſuppoſed, that this expectation is not given, but ſold to a purchaſer who intends to make 5 per cent of his money, then r ſtands for 1,05, and therefore the ſum, which purchaſers ought in juſtice to pay for their expectations, is the ſum of the numbers here annexed, which is about $\frac{2}{25}$; and therefore if the ſum, called (1) before, ſtands for an eſtate whoſe preſent real value is 20 years purchaſe, the adventurer ought to pay no more for the conſideration of his chance than 1 $\frac{3}{5}$ years purchaſe.

0.0115260 —	1
0.0096054 —	2
0.0078412 —	3
0.0074678 —	4
0.0071122 —	5
0.0067735 —	6
0.0064510 —	7
0.0061438 —	8
0.0058512 —	9
0.0055726 —	10
0.0053072 —	11
0.0796599	

It is not intended here to calculate other intervening chances which might defeat this expectation, ſuch as that of an heir-male, which might live to the age of twenty-one; for, there being not any tables * of obſervations concerning a man's marrying and getting an heir-male between ſixteen and twenty-one, what could be added on that ſubject, would be barely conjectural, which would not be of a-piece with what has been ſaid; however, it is eaſy to conceive, that this muſt conſiderably diminiſh the value of the expectation.

* If any tables of that kind ſhould be calculated, there cannot, perhaps, be a better foundation to proceed on than that of Dr. Arbuthnot, concerning the regularity in the births of both ſexes, publiſhed in the *Philoſophical Tranſactions*, No. 328.

Problem II.

Suppoſing the probabilities of life to decreaſe in arithmetic progreſſion, when conſidered from a term given, to find the value of an Annuity on a life of a given age.

Solution.

Let P repreſent the value of an Annuity certain of 1 l. for as many years as are intercepted between the age given, and the extremity of old age, ſuppoſed at 86, and let that interval of life be called n, then the value of an Annuity upon ſuch a life would be expreſſed by $\frac{1 - \frac{r}{n}P}{r-1}$, ſuppoſing, as before, that r ſtands for the amount of the principal and intereſt of 1 l. in one year.

Thus, ſuppoſing an age of 50, and that intereſt of money be eſtimated at 4 per cent. then n will repreſent 36, and r for 1.04, for which reaſons looking into the tables of 4 per cent. which ſhew the worth of an Annuity certain for 36 years, being 17.9083, this being multiplied by r, that is, by 1,04, the product will be 18.624632; and this being divided by n, that is, by 36, the quotient will be .0.517351. Then this being ſubtracted from unity, and the remainder 0.482649 being divided by $r-1$, that is, by 0.04, the quotient will be found 12.0661, which is very little more than 12 years purchaſe for the value of an Annuity on a life of 50.

But, for the ſake of thoſe who are not ſo well verſed in decimal fractions, it may be proper to expreſs the rule as follows: multiply the Annuity certain as found in the tables by the amount of 100 l. joined with its intereſt for one year, that is, in this caſe, by 104, and let the product be divided by 100; then let the quotient be ſubtracted from 25, which ſhews how many years purchaſe a perpetuity of 100 l. is worth, and the remainder will ſhew how many years purchaſe the Annuity upon the age given is worth in ready money.

Problem III.

Suppoſing a fictitious life, whoſe number of chances to continue yearly are conſtantly equal to a, and the number of chances to fail conſtantly equal to b, ſo that the odds of its continuing, during the ſpace of any one year, be to its failing in that ſame interval of time conſtantly as a to b, to find the value of an Annuity upon ſuch a life.

Solution.

Let 1 be the Annuity, r the amount of 1 l. joined to its intereſt in one year, make $a + b = s$.

It is plain from what has been ſaid already, that the preſent value of the 1ſt year's rent is $\frac{a}{sr}$, of the 2d $\frac{aa}{ssrr}$, of the 3d $\frac{a^3}{s^3r^3}$, &c. which terms conſtituting a geometrical progreſſion, the ſum of them all will be $\frac{a}{rs-a}$; thus, if a repreſented 21, and b 1, then s would repreſent 22; ſuppoſing alſo that $r = 1.05$, then the denominator $rs-a$ would be 23.1—21 or 2.1, and, dividing the numerator 21 by the denominator 2.1, the quotient will be 10, which ſhews that the life would be worth 10 years purchaſe.

Corollary I.

An Annuity upon a fictitious life being given, the probability of its continuing one year is alſo given; for let the value of it be — M, then $\frac{a}{rs-a} = M$, therefore $\frac{a}{s} = \frac{Mr}{M+1}$.

Corollary II.

If a life whoſe value, as reduced from the tables of obſervation, or from the preceding problem, be worth 10 years purchaſe, then ſuch a life is equivalent to a fictitious life, whoſe chances for continuing one year are to the chances of its failing in that year as 21 to 1.

Corollary III.

Wherefore, having calculated a life from the tables of obſervations, or from the ſecond problem, we may transfer the value of that life to that of a fictitious life, and find the number of chances it would have to continue or to fail yearly.

Corollary IV.

And the combination of two or more real lives will be very near the ſame as the combination of ſo many correſponding fictitious lives; and, therefore, an Annuity granted upon ſo many correſponding fictitious lives, and the values of the reverſions granted upon the real lives, will be very near the ſame, as thoſe granted upon the fictitious lives.

Problem IV.

The values of two ſingle fictitious lives being given, to find the value of an Annuity granted for the time of their joint continuance.

Solution.

Let the values be reſpectively M and P, r the rate of intereſt; then the value of an Annuity upon the two joint lives will be expreſſed by $\frac{MPr}{\overline{M+1} \times \overline{P+1} - MPr}$.

Demonſtration.

Let x and y repreſent the reſpective probabilities of the lives continuing one year together, then xy will expreſs the probability of their joint continuance for that year; and x^2y^2 the probability of their joint continuance for two years; and x^3y^3 the probability of their joint continuance for three years, &c. wherefore the value of an Annuity, for all the time, will be expreſſible by the following geometric progreſſion, viz. $\frac{xy}{r} + \frac{x^2y^2}{rr} + \frac{x^3y^3}{r^3} + \frac{x^4y^4}{r^4}$, &c. where the ſum is $\frac{xy}{r-xy}$; but, by the firſt corollary of problem the third, $x = \frac{Mr}{M+1}$, and, for the ſame reaſon, $y = \frac{Pr}{P+1}$, and, therefore, the value of the two joint lives, is $\frac{MPr}{\overline{M+1} \times \overline{P+1} - MPr}$.

Problem V.

The values of two ſingle lives being given, to find the value of an Annuity upon the longeſt of them; that is, to continue ſo long as either of them is in being.

Solution.

Solution.

From the sum of the values of the single lives, subtract the value of the two joint lives found by the foregoing problem, and the remainder will be the value of the Annuity required.

Demonstration.

It will be sufficient to shew what will be the value of the first year, since the values of all the subsequent years are found in the same manner.

Let, therefore, x and y be the respective probabilities of the lives continuing one year together, then $1-x$ and $1-y$ are the respective probabilities of their dropping in that year, and, consequently, the product of $1-x$ by $1-y$, viz. $1-x-y+xy$ is the probability of their both dropping in that year; and, this being subtracted from unity, the remainder $x+y-xy$ will express the probability that either one or the other, or both, out-live the year; which is sufficient for the purchaser of the Annuity to establish his right of receiving the first year's rent, whose present value is, therefore, $\frac{x}{y}+\frac{y}{r}-\frac{xy}{r}$.

And, therefore, one may see at sight, that, the expectation of the other years being founded on the same principle, the value of an Annuity upon the longest of two lives will be the sum of the values of the single lives, wanting the value of the joint lives.

Problem VI.

The value of the three single lives being given, to find the value of an Annuity upon their joint lives.

Solution.

Let x, y, z, respectively, represent the probabilities of the lives continuing one year, then the probabilities of their continuing all three together for one year will be xyz, and the probability of their continuing together for two years is $xxyyzz$, &c. and, therefore, the value of an Annuity upon the three joint lives will be $\frac{xyz}{r}+\frac{x^2y^2z^2}{r^2}+\frac{x^3y^3z^3}{r^3}+\frac{x^4y^4z^4}{r^4}$, &c. which constitutes a geometric progression, whose sum is $\frac{xyz}{r-xyz}$: now in the room of x, y, z, writing their respective values $\frac{M+1}{r}$, $\frac{P+1}{r}$, $\frac{Q+1}{r}$, the sum of the 3 joint lives will be expressed by $\frac{MrPQrr}{\overline{M+1}\times\overline{P+1}\times\overline{Q+1}-MPQrr}$, supposing, as we have done in the preceding problem, that M, P, Q, represent respectively the values of Annuities upon each single life.

Problem VII.

The value of three single lives being given, to find the value of an Annuity upon the longest of them.

Let x, y, z, represent the respective probabilities of the life's continuing one year; then the product of $1-x$ by $1-y$, and of that again by $1-z$, that is, $1-x+xy-y+xz-z+yz-xyz$, will express the probability of their all failing the first year; and, this being subtracted from unity, the remainder will express the probability that either they will all subsist one year, or, at least, that they will not all fail in the year: which being the foundation of receiving the first year's rent, and the other years following the same law, we may draw this conclusion, that, if from the sum of the values of the single lives we subtract the sum of the values of the joint lives taken two and two, and to the remainder add the value of the three joint lives, we shall have the value of the Annuity upon the longest of the three joint lives.

Problem VIII.

To find the value of one life after another.

By the value of one life after another, is meant what a man must pay in present money to purchase the expectation of an Annuity for his life, after the failing of another, with this restriction, that, if the expectant dies before the present possessor, no consideration is to be given to the heirs of the said expectant.

Solution.

Since the expectation of the purchaser is grounded on the failing of the life in possession, and of the continuation of his own life, it follows, that, if we suppose x and y to be the respective probabilities of the lives continuing one year, then $\overline{1-x}\times y$ or $y-xy$ will express the probability of the first life's dropping in the year, and of the second's out-living the year; from whence we may draw this consequence, that, if from the present value of the expectant's life be subtracted the value of the two joint lives, there will remain the value of the expectation.

This may be made plain another way; for, suppose I were the purchaser, I might begin to pay the proprietor of the Annuity the full value of my life, but then I would expect back the value of the two joint lives of the present possessor and myself, since I am to receive nothing, whilst we are both living. To this may be added, that, supposing that the proprietor is to be paid for the longest of the two lives of the present possessor and myself, my share of the purchase ought to be only that part of it which would remain if the life of the present possessor was deducted out of it, which will give the same conclusion as before.

But, if the expectant were to have the reversion absolute for himself and his heirs after the decease of the present possessor, it is plain, that there being nothing interposed between his present circumstances and the possession of the estate, but the life of the present possessor, then, from the value of the perpetuity, ought barely to be subtracted the life of the possessor, and the remainder will be the value of the expectation.

Problem IX.

To find the value of one life after two.

Solution.

From the value of the longest of the three lives, subtract the value of the longest of the two first lives, and there will remain the value of the expectation of the third life.

But, if the expectation be above the absolute reversion, then from the perpetuity subtract the value of the longest of the two first lives, and there will remain the value of the third.

And the same rule may be extended to as many lives as may be assigned. Though these questions may, at first sight, seem to have a great degree of difficulty, yet there is reason to believe that the steps taken, to come at their solution, will easily be followed by those who have a competent skill in algebra, and that the chief method of proceeding therein will be understood by those who are barely acquainted with the elements of that art.

For those, however, who may not be acquainted with this method of reasoning, I shall subjoin what may be more generally intelligible, and, therefore, more generally acceptable. The common method of purchasing Annuities is at a certain number of years purchase; for which reason, the following tables may be useful to shew how long the annuitant must live, to be reimbursed his principal money, with interest, at any given rate.

The table is very plain, as appears by this example: Suppose 11 years purchase is given for an Annuity.

	years	days			
Then, if the Annuitant lives	12	200	he will be reimbursed his principal, with interest, at the rate of	2	per cent per ann.
	13	9		2½	
	13	200		3	
	14	48		3½	
	14	286		4	
	15	190		4½	
	16	134		5	
	18	188		6	
	21	264		7	
	27	201		8	
	53	160		9	

The fractions of the year are made in days, for the greater exactness, though it is common for Annuities to be paid either half-yearly or quarterly.

A table to calculate the value of Annuities upon lives, at 4 l. and 5 l. per cent. Continuance of the lives to reimburse the annuitants their purchase money.

years purchase given for a life.	At 4 per cent.		At 5 per cent.	
	years.	days.	years.	days.
1	1	15	1	19
2	2	46	2	58
3	3	95	3	121
4	4	163	4	209
5	5	252	5	327
6	6	364	7	113
7	8	137	8	303
8	9	304	10	172
9	11	138	12	92
10	13	9	14	75
11	14	286	16	134
12	16	246	18	285
13	18	261	21	189
14	20	340	24	247
15	23	132	28	151
16	26	18	32	360
17	29	19	38	322
18	32	167	47	71

The ingenious Mr. Dodson has defended the above hypothesis of Dr. Halley, in the Philosophical Transactions, Vol. 47. Pag. 333. And also laid down a method for improving the bills of mortality.

ANNUNCIATION, *(Dict.)*— We celebrate the memory of this mystery on the 25th of March; and St. Augustin says, that the church, upon the authority of some old tradition, believed that the Saviour of the world was conceived upon this day. Not only the Greek and Latin churches have chosen the 25th of March, to celebrate this mystery; but likewise the Syrians, Chaldeans and Coptics, do the same. This opinion seems to be founded principally, upon the supposition of Christ's being born upon the 25th of December: as a consequence of this opinion, it was believed that he was conceived upon the 25th of March, because, generally, there are nine months between the birth and conception of children. In the place where the virgin was saluted by the angel, there was a church built. It is certain, this festival was observed before the time of the council of Trullo, in which there is a canon forbidding the celebration of all festivals in Lent, excepting the Lord's day, and the feast of the Annunciation, so that we may date its original from the 7th century. However, among the sermons of St. Augustine, who died in 430, there are two on the Annunciation, viz. the seventeenth and the eighteenth de Sanctis: and in the Greek church we find still earlier testimonies of it. Thus Basil of Seleucia, who died 455, and Proclus, who died 446, and John Chysostom, in 407, and Gregory Thaumaturgus, in 395, have all of them discourses on the Annunciation; some writers indeed question the authenticity of these sermons.

ANO'MALOUS (*Dict.*)—There are Anomalous verbs, or irregular inflexions of words, in all languages.—In the English, all the irregularity in our Anomalous verbs lies in the formation of the preter tense and passive participle; though this only holds of the native Teutonic or Saxon words, and not of the foreign words, borrowed from the Latin, Welch, French, &c.

The principal irregularity arises from the quickness of our pronunciation, whereby we change the consonant *d* into *t*, cutting off the regular ending *ed*.

Thus for mixed, we write mixt or mix'd, for dwelled, dwelt or dwell'd; for snatched, snatcht, &c.— But this is rather of the nature of a contraction than an irregularity; and is complained of by some of our politer writers, as an abuse much to the disadvantage of our language, tending to disfigure it, and turn a tenth part of our smoothest words into clusters of consonants: which is the more inexcusable, in that our want of vowels has been the general complaint of the best writers.

Another irregularity relates to the preter tense and passive participle. - Thus give, if it were regular, or formed according to the rule, would make gived in the preter tense and the passive participle; whereas it makes gave in the preter tense, and given in the passive participle.

ANO'MALY, in grammar, denotes an irregularity in the accidents of a word, whereby it deviates from the common rules or paradigms, whereby other words of the like kind are governed.

ANAMORHOMBOI'DIA *, in natural history, the name of a genus of spars.

* The word is formed from the Greek ἀνώμαλος, irregular, and ῥομβοειδὴς, a rhomboidal figure.

The bodies of this genus are pellucid crystalline spars, of no determinate or regular external form, but all breaking into regular rhomboidal masses; easily fissile, and composed of plates running both horizontally and perpendicularly through the masses, but cleaving more readily and evenly in a horizontal, than in a perpendicular direction: the plates being ever composed of irregular arrangements of rhomboidal concretions.

There are five known species of this genus, all which have, in some degree, the double refraction of the island crystal. *Hill's History of Fossils.*

ANO'NA, in botany, the name of a genus of plants, some species of which Plumier has described under the name guanabanus. The characters of this genus are as follows:

The flower consists of six heart-shaped petals, the inner three of which are smaller than the others; there are scarce any filaments to serve by way of stamina, but the antheræ are very numerous, and seem to adhere to the sides of the germen. The germen is roundish, and stands upon the cup; there are no styles, but several obtuse stigmata. The fruit is an extremely large berry of an oval and rounded figure, containing one cell, and covered with a scaly punctated bark; the seeds are numerous, and of an oblong oval figure, and placed circularly. *Linnæi Gen. Plant.*

ANO'REXY (*Dict.*)—If an Anorexy, or want of appetite, be constant, it is reputed dangerous, in proportion to its increase, rather than its continuance. When it proceeds from viscid humours lodged in the stomach, it is not reputed so dangerous as when from hard drinking, which often ends in an incurable icterus, dropsy, or consumption. If it happen on account of the summer heat, it is not thought dangerous; but, coming upon the palsy, bad. Corpulent bodies are thought better able to bear it, than such as are lean or emaciated. When, from a relaxation of the fibres of the stomach, it is not esteemed dangerous, if taken in time; but, when it proceeds from other distempers, is to be judged of from them. If it continues after those are gone off, it may be looked upon as original. Relishing sauces are here allowable, if not overdosed with unctuous ingredients. All acids are here accounted good. The night-meal should be very easy of digestion, and made an hour or two before bed-time. Riding is thought excellent: the sleep should be moderate, and the air clear. If the patient be plethoric, or the disorders proceed from a stoppage of evacuations, bleeding is good; and in case of sour eructations, pain in the head, sickness at the stomach, dulness, heaviness, or if crapula's, or the use of narcotics, have preceded, an emetic, and afterwards a paregoric, are proper. In the next place, purging, especially if the menses are suppressed, and that with calomel. The tinctura sacra is also good, being taken in the quantity of an ounce at a time. When the indisposition proceeds from any passion, blistering, emetics, the cold-bath, a free air, and diversions are of service, together with proper stomachics. If it comes from a suppression of any evacuations, promote them, and use stomachics. Proceed in the same manner, when this case is a symptom in other distempers. If it was caused by too liberal a use of tea, it should be left off by degrees, and a glass of red wine be drank in its stead, or an infusion of cortex in red wine. And, lastly, let the cold-bath be tried. The chewing of rhubarb is good in most of these cases, especially if they are attended with great costiveness. *Shaw's New Practice of Physic.*

ANT, *formica*, in natural history, an insect famous in natural history, of which we have five species common in England. 1, A small blackish Ant. 2, A small reddish brown Ant. 3, A middle-sized black Ant. 4, A middle-sized reddish Ant; and, 5, The common great hippomyrex, or horse-Ant.

The Ant, examined by the microscope, appears to be a creature of a very singular structure. The head is large, adorned with two pretty horns, each having twelve joints. Its eyes are protuberant and pearled; it has jaws saw-like or indented, with seven little teeth that exactly tally, opening side-ways, and able to gape very wide asunder; by the help whereof it is often seen grasping and transporting bodies of three or four times its own bulk and weight. It is naturally divided into the head, the breast, and the belly or tail: each of these parts joining to the other by a very slender ligament. From the breast-part, three legs come forth on either side. The tail is armed with a sting, which the animal uses only, when provoked: but then a poisonous liquor is conveyed by it into the wound, occasioning pain and swelling. The whole body is cased over with a sort of armour, so hard, as not to be penetrated by a lancet, and thick set with shining whitish bristles. The legs, &c. are also covered with hairs, but much smaller and of a darker colour. *Baker's Microscope made easy.*

The sight of Ants is really very instructive. They are a little people united, like the bees, in a republic governed by its own laws and politics. They have a kind of oblong city, divided into various streets, that terminate at different magazines. Some of the Ants consolidate the earth, and prevent its falling in, by a surface of glue with which they incrust it. Those which we commonly see, amass several splinters of wood, which they draw over the tops of their streets, and use them as rafters to sustain the roof; and across these they lay another rank of splinters, and cover them with a heap of dry rushes, grass, and straw, which they raise with a double slope, to turn the current of the water from their magazines; some of which are appropriated to receive their provisions, and in the others they deposit their eggs, and the worms that proceed from them.

As to their provisions, they take up with every thing eatable, and are indefatigable in bringing home their supplies. You may see one loaded with the kernel of some fruit, another bends under the weight of a dead gnat. Sometimes several of them are at work on the carcase of a May-fly, or some other insect. What cannot be removed they eat on the spot, and carry home all that is capable of being preserved. The whole society is not permitted to make excursions at random: some are detached, as scouts, to get intelligence; and, according to the tidings they bring, all the community are upon the march, either to attack a ripe pear, a cake of sugar, or a jar of sweet-meats; and in order to come to this jar, they leave the garden, and ascend the house; there they find this mine of sugar, this rich Peru of sweets, that opens all its treasures to their view. But their march to it, as well as their return from it, is under some regulation: the whole band is ordered to assemble, and move in the same track; but the injunction is not executed with much severity, and they have liberty to expatiate, when they have an opportunity to spring any game in the country. The green vermin that make an infinite waste among flowers, and cockle the leaves of the peach and pear trees, are surrounded with a glue, or kind of honey, which is sought for by the Ants with great avidity; but they are not sollicitous either for the flesh of these creatures, or for any part of the plant. These are the vermin who are the authors of all that destruction to our trees, which is falsly imputed to the Ants, and draws upon them a very unjust and cruel persecution.

Their next prevailing passion is, to amass a store of corn, or other grain that will keep; and, lest the humidity of the cells should make the corn shoot up, we are told, for a certainty, that they gnaw off the buds which grow at the point of the grain.

I have seen Ants carry, and sometimes push before them, grains of barley and wheat, much larger than themselves; but I never could find out their granary. All the ancients mention

mention it, and Aldrovandus assures us he had seen it. Their labours, as well as their inclinations, may vary according to their species. It is likewise probable that their aurelia's, which are sometimes yellow, have been taken for grains of corn without buds, and swelled by moisture.

The Ants, after they have passed the summer in a constant employment and fatigue, shut themselves up in the winter, and enjoy the fruits of their labour in peace; however, it is very probable, they eat but little in that season, and are either benumbed, or buried in sleep, like a multitude of other insects. And therefore, their industry in storing up provisions is not so much intended to guard against the winter, as to provide, during the harvest, a necessary sustenance for their young. They nourish them, as soon as they leave the egg, with an assiduity that employs the whole nation; and the care of their little progeny is esteemed a matter of importance to all the state.

When the young quit the egg, they are little worms, no longer than common grains of sand, and after they have for some time received their aliment, which is brought to them in common, and distributed in equal proportions, they spin a thread, and wrap themselves up in a white web, and sometimes in one that is yellow; at which period they cease to eat, and become aurelia's. In this state, some people fancy they are the eggs of Ants, when, in reality, they are the nymphs, out of whose ruins the new pismires are to rise. Though the young discontinue their eating, their nurture still proves very fatiguing to their parents. These have generally several apartments, and remove their young, from the nursery, to some other mansion they intend to people. They either raise the aurelia's toward the surface of the earth, or sink them to a distance from it, in proportion as the season is either warm or cold, rainy or dry. They raise them when the weather proves serene, or when a long drought is succeeded by gentle dews; but, at the approach of night and cold, or the appearance of showers, they clasp their beloved charge in their arms, and descend with them to such a depth, that one must then dig above a foot into the earth, before those aurelia's can be discovered.

We might enlarge on many other particulars of their conduct, such as their dispersing themselves over the country, their custom of removing the dead from their habitations, their promptitude in assisting each other to carry their burdens, or invade their enemies. A long description might likewise be given of the small sting they carry in the extremity of their bodies, with a bag of corroding water that causes little tumors. Much might be also said of their wings, that are acquired by the males at a certain age, to facilitate their acquisition of food, and which are refused to the females, that they may be more sedentary, and better devoted to domestic cares. *Spectacle de la Nature.*

In the memoirs of the Royal Academy, there is a curious account of Ants; the writer tells us, that he found a nest of Ants in a box of earth, standing out from a window two stories high; whence they made excursions both upwards, to the top of the house, where some corn lay in a garret, and downwards, into a garden, which the window overlooked. The situation of this nest obliged them to go up or down a great way before they could possibly meet with any thing; but he found, notwithstanding, that none of them ever returned empty, but every one brought a grain of wheat, rye, or oats, a small seed, or even a particle of dry earth, if nothing else could be got. Some travelled to the farther end of the garden, and, with prodigious labour, brought heavy loads from thence. It required four hours, as he learned by frequent observation, to carry a pretty large grain or seed from the middle of the garden to the nest: and he computed therefrom, that an Ant works as hard as a man who should carry a heavy load twelve miles a day.

The pains these Ants took, to carry grains of corn up a wall to the second story, climbing all the way with their heads downward, must be exceeding great. Their weariness was shewn, by their frequent stops at the most convenient places; and some appeared so fatigued and spent they could not reach their journey's end: in which case it was common to see the strongest Ants, which had carried home their load, come down again and help them. Sometimes they were so unfortunate as to fall down with their burdens, when just in sight of home: but, when this happened, they seldom lost their corn, but carried it up again.— He saw one, he says, of the smallest Ants carrying a large grain of wheat with incredible pains. When she came to the box where the nest was, she and her load together tumbled back to the ground. Going down to look for her, he found she had recovered the grain, and was ready to climb up again. The same misfortune befel her three times; but she never let go her hold, nor was discouraged; till at last, her strength failing, she was forced to stop, and another Ant assisted her to carry home her load to the public stock.

How wonderful is the sagacity of these insects! How commendable their care, diligence, and labour! How generous their assistance of one another, for the service of the community! How noble their public virtue, which is never neglected for the sake of private interest! In all these things they deserve our notice and imitation.— A contemplative mind will naturally turn its thoughts from the condition and government of Ant-hills to that of nations; and reflect, that superior beings may possibly consider human kind and all their sollicitudes and toils, pride, vanity, and ambition, with no more regard than we do the concerns of these little creatures.

ANT-HILLS, are little hillocks of earth, which the Ants throw up for their habitation and the breeding of their young. They are a very great mischief to dry pastures, not only by wasting so much land as they cover, but by hindering the scythe in mowing the grass, and yielding a poor hungry food pernicious to cattle.

The manner of destroying them is to cut them into four parts from the top, and then dig into them so deep as to take out the core below, so deep that, when the turf is laid down again, it may lie somewhat lower than the level of the rest of the land, and this will prevent the Ants from returning to the same place, which, otherwise, they would certainly do. The earth that is taken out must be scattered to as great a distance as may be, otherwise they will collect it together and make another hill just by.

The proper time for doing this is winter, and, if the places be left open, the frost and rains of that time of the year will destroy the rest; but in this case care must be taken, that they are covered up early enough in the spring, otherwise they will be less fertile in grass than the other places.

In Hertfordshire they use a particular kind of spade, to this purpose. It is very sharp, and formed at the top into the shape of a crescent, so that the whole edge makes up more than three fourths of a circle; this cuts in every part, and does the business very quickly and effectually; others use the same instruments that they do for mole-hills.

Human dung is a better remedy than all these, as is proved by experiment, for it will kill great numbers of them, and drive all the rest away, if only a small quantity of it be put into their hills.

Some put honey mixed with powder of rats-bane into little boxes pierced full of holes, such as will just admit this creature, and this never fails to destroy them in great numbers; care is to be taken, however, that these holes are not too large, for, if they would admit a bee, those creatures would as surely come in as the Ants, and would not only be destroyed themselves, but might chance to carry this poisoned honey to the hive, and deposit it in the combs among the rest, before they died by it, which would render the whole stock of honey poisonous. A bottle filled half up with any sweet liquor, and hung upon the trees, will destroy great numbers by their getting in, and being drowned in it; but, if they are troublesome to the walks and allies in the pleasure-gardens, the watering these at times will send them away. *Mortimer's Husbandry.*

ANTAPO'CA, in the civil law, implies one's acknowledgment in money paid, by way of rent, interest, or such-like incumbrance. Such an instrument, or Antapocha, the debtor gives upon making payment to the creditor, to serve as a proof of the charge or incumbrance for futurity, and exclude any claim of prescription against the payment of it.

ANTECE'DENT (*Dict.*)—

ANTECEDENT *will*, or *desire*, is that which precedes some other will or desire, or some knowledge or provision.— Thus we say, God by a sincere, but Antecedent desire, wills all men to be saved: that is, this sincere desire of God precedes, and does not suppose, the knowledge of their faith and repentance.

By the way it must be noted, that the term Antecedent is only applied to God in respect of the order of nature, not of an order of succession; for that God, by reason of his infinite perfections, sees and foresees at the same time: after the same manner he also wills, and not successively, one thing after another.— Yet does not this hinder, but that God may will one thing on occasion of another, or have such a desire on occasion of such a provision; which divines call the order of nature, in contradistinction to that of time.

ANTECE'SSORS, in the art of war, is an appellation given to a party of horse, dispatched before the agmen or body of an army, partly by way of intelligence, and partly to chuse a proper place for encamping on, as well as the most convenient roads for the soldiery to travel in. *Aquin. Lex. Milit.*

ANTECESSO'RES, in the antient military art, parties sent before to mark out a camp, procure provision, or even reconnoitre the enemy. *Aquin. Lex. Milit.*

ANTEJUSTINIA'NEAN, an appellation sometimes given to the antient Roman law, as it stood before the time of the emperor Justinian.

A'NTEDATE, a falsified date, a date set down before the true one. Antedates are of a very dangerous consequence in matters of trade.

To ANTEDATE, in commerce, is to set down a false date, to date, from a day prior to that on which the business is transacted, the note, or bill, drawn, or letters written, &c.

In France it was formerly the ill custom to leave blank orders on the back of bills of exchange; that is to say, to endorse them by writing only one's name, so that they could easily

be

be Antedated, which might occasion very great abuses, especially from those who happened to break: for they who fell under that misfortune, and had bills of exchange drawn at two usances, or payable in the payment of Lyons, which were to order, in blank, might Antedate the order, and make them thus be received under borrowed names, or give them in payment to such of their creditors as they wanted to favour, to the prejudice of others; by which means those bills could not be demanded to be added to the bankrupt's effects, because, the date of their order seeming to be prior to the time of the failure, it could not be urged that they were negotiated within the time wherein the person became a bankrupt.

The regulation for commerce in France, made in the year 1673, has provided, that it is not now so easy to Antedate orders on the back of bills of exchange: for, in the 22d article of Tit. V, it is ordered, that the signature, or name signed, on the back of bills of exchange, shall serve only as an endorsement, and not as an order, unless it be dated, and contain the name of the person who should have paid the value in money, merchandize, or otherwise: and, by the 26th article of the same title, it is ordered, that whoever Antedates orders, shall be punished as guilty of forgery.

ANTEDILU'VIAN *Philosophy*, or the state of philosophy before the flood. Some who have traced philosophy back, to its origin, do not stop at the first man, who was formed in the image and likeness of God; but, as if the earth were unworthy to give birth to such a science, soar to the skies, and seek it among angels, where they shew it us brilliant in a glare of brightness. This opinion seems founded on what the scripture says of the nature and wisdom of angels. It is natural to think, that, being of a nature very much superior to our's, they must consequently have a better knowledge of things, and be better philosophers than men. Some learned men have carried things farther yet; in order to prove that angels excelled in natural knowledge, they have asserted that God made use of their service in the creation of the world, and in the formation of the different animals that inhabit it. This opinion it is easy to see flows from the doctrines of the Pythagorean and Platonic philosophy. Pythagoras and Plato, puzzled at the infinite space between God and man, thought proper to fill up the interval with genii or angels, but, as M. Fontenelle judiciously observes in his Hist. des Oracles, with what shall we fill the infinite space between God and these genii or angels; for the distance between God and any creature whatever is infinite? Now, if the action of God must traverse an infinite vacuum, if I may be permitted the expression, to descend to angels, it might have descended to men as they are removed only some degrees lower, which bears no proportion to the distance of angels from the first cause. When God speaks to man by the means of an angel, it is not because, as Plato has asserted, angels are necessary for such a communication; no, God employs them for reasons that philosophy never will find out, and can be perfectly known only by himself.

Plato imagined spirits to form a scale of beings, so that, by ascending from a less perfect to a more perfect Being, we might at last arrive at a creature inferior to the Deity, only by some degrees of perfection: but, as it is certain, all beings are infinitely imperfect, compared to him, because they are infinitely removed from him, the different degrees of perfection which are between them, disappear, when we compare them with God; what raises them one above another, does by no means bring them near to him. Thus, without any higher aid than human reason supplies, it is plain, there is no occasion for spirits, or any intermediate beings between God and us, to render our approaches towards the divine Being more proportional.

But if good angels, ministers of the will of God, and his messengers to men, are excellent in the philosophical sciences, why should we refuse this power and capacity to the fallen angels? Their fall did not change the excellency of their nature, nor perfection of their knowledge. One may see a proof of this in astrology and augury. The devil who tempted our first parents, owed his victory over them to artful and subtle reasonings. None have been so weak as to advance, that the fallen angels have revealed to men whom they had commerce with, and had inchanted, several secrets, as the nature of metals, the virtues of herbs, magic, and the art of reading men's destinies in the skies, except some fathers of the church, whose heads were infatuated with the dreams of the Platonic philosophy.

It will be needless to shew the weakness and absurdity of their arguments, who assert that angels or dæmons are philosophers, and great philosophers too: let us leave this philosophy to these invisible philosophers, and come to that which is more suitable to the nature of man, and within our own sphere.

Was Adam, the first man, a philosopher? This several make no doubt of. Hornius, in short, tells us, that, in in his opinion, Adam, before his fall, was not only perfect in all knowledge, but also retained some vestigia or traces of this perfection after his fall. The remembrance of what he had lost, being always in his mind, kindled in his heart a passionate desire of recovering the knowledge sin had robbed him of, and dissipating the darkness which had thrown a veil over it. To satisfy this thirst of knowledge, he dedicated his whole life to the contemplation of nature, and, carrying science to the highest pitch, left most of his discoveries to his children; because he lived long enough to communicate them. Such are the reasonings of Dr. Hornius, to which we might add what the Jewish rabbins have wrote, if their fables merited our attention. But Hornius offers some farther arguments, to prove Adam a philosopher, and even of the first rank. Had he not been a naturalist, says Hornius, could he have given the animals names so expressive of their nature? Eusebius has brought a proof of Adam's logic. As to the mathematics, he must have certainly understood them, or he could never have made cloaths out of the skins of wild beasts, have built him an house, observed the motions of the stars, and regulated the year by the course of the sun. But the highest of all these convincing arguments, brought in favour of Adam's philosophy, is this, that he wrote books, that these books contained all the sublime sciences which he had made himself master of with incredible labour. It is true, indeed, these books are apocryphal, or lost; but that signifies nothing; because tradition has preserved the titles of the authentic books whereof he was the real author.

Nothing is more easy than to refute all these arguments; first, if we speak of Adam's wisdom before the fall, it has no relation to philosophy in the sense we accept it; for that wisdom consisted in the knowledge of God and himself, but, particularly, in that practical knowledge which might lead him to the happiness for which he was created. It is true, Adam possessed this kind of wisdom, but what connection has this with a philosophy which admiration and curiosity, the daughters of ignorance, produce, which is not acquired without the toil of reflection, nor brought to perfection without the conflict of different opinions? The wisdom with which Adam was created, was that divine wisdom which is the fruit of grace, which God pours forth even on the weakest minds. This is, no doubt, a true philosophy, but it is very different from that philosophy which the rational mind first conceived, and all ages have concurred to produce and carry to its present maturity. If Adam, in his state of innocence, had no philosophy, what will become of that they attribute to him after his fall, which was but a faint glimmering of what he had before? Would they persuade us that Adam, whose sin continually followed him, and who could think on nothing but the means of reconciling himself to God, and resisting the evils that surrounded him, had a mind sufficiently at ease to apply himself to the barren speculations of vain philosophy? He gave names to animals; but does this prove him well acquainted with their nature and properties? He reasoned with Eve, our common mother, and his children; from thence shall we conclude he understood the art of logic? By such reasoning as this we may make every man a logician. He built himself a poor cottage, governed his family prudently, instructed them in their duty, taught them religious worship; but are these sufficient reasons to prove Adam an architect, a politician, and divine? How can any one maintain Adam to have been the first inventor of letters, when it is evident, that, mankind, long after the flood, made use of hieroglyphics, the most imperfect of all kinds of writing, to convey their ideas to each other; and that this was the first attempt made of the kind. The wonders of nature are exposed to our view in the most glaring light, a long time before we have reason, opportunity, or penetration enough to enquire into them. If we came into the world with the same degree of reason with which we go to a playhouse the first time, struck, on the sudden drawing of the curtain, with the magnificence of the scenes and decorations of the play, we could not possibly forbear admiring its beauty, and examining its structure; but who is surprized at what he has seen for a course of fifty years? Among men, the wants of some take up all their time to supply their necessities, they have none to apply themselves to metaphysical speculations; the rising sun calls them to their labour, and the finest night that ever shone on the bespangled sky, speaks no language to them, or only says this, 'Go, weary labourer, " to rest." Many, of more leisure, either have not had opportunity to interrogate nature, or wanted capacity to understand her answers. The philosophical genius, whose sagacity, shaking off the yoke of custom, first gazed with admiration on the prodigies of nature which surrounded him, descended into himself, asked himself questions, and gave himself answers concerning all the objects which he saw, must have been a long time in suspence, might even have died without having credited his own opinions, says the author of the essay on Merit and Virtue, page 92.

If Adam had no philosophy, there can be no inconsistence in denying it to his children Abel and Cain: no body but Hornius has discovered that Cain was the founder of a set of philosophers. A man would scarce think Cain had sown the first seeds of the Epicurean doctrine, and been an atheist. The reason Hornius brings to prove this is very singular: Cain, says he, was a philosopher, but a wicked and atheistical philosopher; because he loved pleasures and diversion, and

and his children have but too well followed the lessons he gave them of voluptuousness. If every man must necessarily be an Epicurean philosopher who listens to the blandishments of pleasure, and takes refuge in atheism for impunity of the crimes he commits, the garden of Epicurus would not be large enough to contain so great a number of philosophers. As to what he says about the city Cain built, and the tools he made use of in tilling the earth, these by no means prove him a philosopher; for what necessity and experience made men discover, in this early age of the creation, required no precepts of philosophy; necessity and experience only taught them. Besides, it may be supposed God taught the first man agriculture, and other arts, and he instructed his children in them.

Jealous Cain having murthered his brother Abel, God revived Abel in the person of Seth. The sacred traditions which concerned religion, were, therefore, preserved in this family. The espousers of the Antediluvian philosophy, not contented with asserting Seth was a great philosopher, would persuade us he was also a great Astronomer. Josephus, speaking mightily in praise of the learning which the Children of Seth had acquired before the deluge, relates, that they erected two columns, one of brick, the other of stone; that they spared no pains nor cost to build them in the strongest manner, in order to resist the conflagration and the flood, the world was threatened with; and on these they inscribed their learning, and all the discoveries they had made. Josephus adds, that the column built of brick remained even to his time. I know not whether we ought to lay any great stress on this passage. Hyperboles and exaggerations cost Josephus little, when the point is to aggrandize his own nation. The main scope of this historian is to shew the superiority of the Jews over the Gentiles in arts and sciences; this probably may have given birth to the fiction of two columns being built by the children of Seth. What probability is there that such a column could have resisted the devastations of the deluge? Besides, can it be imagined that Moses, who has mentioned the arts invented by the children of Cain, as music, metallurgy, the art of working in iron and brass, &c. should be silent about the great knowledge Seth had acquired in astronomy, in writing of which they pretend him the inventor, that nothing should have been said in his writings concerning the names he gave to the constellations, and the division he made of the year into months and weeks?

We are not to imagine Jubal and Tubal-Cain were great philosophers, one for having invented music, the other for having possessed the secret of working in iron and brass: these two men, perhaps, only carried to a greater perfection what others had found out before them. But, supposing them to have been the inventors of these arts, does it follow as a necessary conclusion they must have been philosophers? Every one knows that many of the arts most useful to society owe their invention to chance; it is the part of philosophy to reason on the genius she discovers in them after they are found out. It is a blessing chance has prevented our wants, and left philosophy almost nothing to do. Thus you see there is no philosophy either in the branch of Cain or Seth. We find honest laborious men, before the flood, who applied themselves to agriculture, preserved their primitive traditions, tended their flocks, and retained a true knowledge of God, but were no philosophers; wherefore it is in vain to seek the origin and rise of philosophy in the time preceding the flood.

ANTEDILUVIAN *World.* — Dr. Burnet and Dr. Woodward differ very widely about the Antediluvian world; the former imagines its face and appearance to have been smooth, equable, and in all respects different from what we now find it to be.

The latter, on the contrary, endeavours to prove, that the face of the terraqueous globe, before the deluge, was the same as it is now, viz. unequal, distinguished into mountains and dales, and having, likewise, a sea, lakes, and rivers; that this sea was salt as ours is; was subject to tides, and possessed nearly the same space and extent that it now does, and that the Antediluvian world was stocked with animals, vegetables, metals, minerals, &c. that it had the same position, in respect of the sun, which ours now hath, its axis not being parallel, but inclined, as at present, to the place of the ecliptic; consequently, that there were then the same succession of weather, and the same vicissitudes of seasons, as now.

A'NTELOPE, *gazella*, in zoology, the name of an animal of the goat kind, of which there are three known species.

1. The gazella Africana strepsicheros Plinii. This is the species we usually see under the name of the Antelope; it is called the addace in Africa, and is the dorcas Lybica of Ælian. Its horns are slender and erect; they are black, transversly radiated, and twisted into the appearance of spiral lines; though these are, in reality, so many annular circles, they are towards the middle bent a little outwards, and thence they turn in again, so that they, in some measure, represent the antient lyre.

2. The gazella Indica, or Indian Antelope, with very long straight horns, which are annulated only in that part near the head. The horns of this creature are sometimes three feet long, and are perfectly smooth and glossy, except near the head and back. The creature is of the size of our common deer, and is of a greyish colour; its tail is a foot long, and has longer hairs on it than those of the rest of the body. The horns of this species are very common in the musæum's of the curious. This creature seems to be the animal which produces the bezoar stone so much valued in medicine.

3. The African kind, which has flat horns annulated to the very top, and crooked near the middle; this has been seen alive, sometimes, in England. It was much smaller than our deer, and of a sandy colour; its belly white, and its sides, where the white and sand-colour meet, of a dusky appearance. Its horns grow out of the middle of the forehead near the eyes, and are very long, sharpening at the ends, and all the way marked with transverse striæ or furrows, and a little bent upwards. Its ears are large, and its legs very slender.

ANTEPENU'LTIMA, in grammar, is either taken substantively or adjectively, to agree with a syllable understood. Words of many syllables have the two last thus distinguished, the ultima or last, the penultima or last but one; which is a contraction of pene almost, and ultima the last. The syllable preceding the penultima is called the Antepenultima, Ante, before, being added to penultima: thus, in the word amaveram, ram is the ultima, or last syllable, ve, the penultima, and ma the Antepenultima.

In Greek, the acute-accent is placed over the last syllable, as Θεὸς, God; over the penultima, as λόγος, discourse; over the Antepenultima, as ἄνθρωπος, man; but it is never carried farther back.

In Latin, if accents be made to direct the reader in his pronunciation, if the penultima be short, the accent must be placed over the Antepenultima, though that be short also, as *dóminus*, a lord.

ANTEPREDI'CAMENTS, *antepradicamenta*, in logic, certain previous matters, requisite to a more easy and clear apprehension of the doctrine of predicaments or categories.

Such are definitions of common terms, as equivocals, univocals, &c.

They are thus called, because treated by Aristotle, before the predicaments, that the thread of the discourse might not afterwards be interrupted.

ANTHESTE'RIA *, in antiquity, was a festival celebrated by the Athenians in honour of Bacchus.

* Some think it takes its name from the month Anthesterion, on which it was celebrated: others, as Apollodorus, quoted by Aristophanes, imagine, it was not the name of any particular feast, but that all the feasts of Bacchus were called Anthesteria; but the most natural derivation of the word Anthesteria is from ἄνθος, a flower, because they then offered garlands of flowers to Bacchus.

The Anthesteria lasted three days, the eleventh, twelfth, and thirteenth days of the month, each of which days had a name suited to its proper office. The first day of the feast, or eleventh of the month, was called πιθοίγια, that is, opening of the vessels, in regard on this day they opened the vessels and tasted the wine.—The second day of the feast, or twelfth of the month, they called χόες, congius, the name of a measure, containing the weight of about ten pounds: on this day they drank the wine prepared the evening before. The third day of the feast, or thirteenth day of the month, they called χύτροι, kettles: on this day they boiled all sorts of pulse in kettles, which, however, they were not allowed to touch, because they were offered to the god Mercury. At these festivals the servants had the same liberty as at the Roman feriata. *Meursii Græca Saturnalia.*

ANTHOLO'GIA, in polite literature, signifies a collection of Greek epigrams.

Meleager, a native of Gadara, a city of Syria, who lived in the reign of Seleucus, the last king of that realm, made the first collection of Greek epigrams, which he called Anthologia, because, as he had the brighest and most florid epigrams of forty-six antient poets, he considered his collection as a nosegay, and denominated each of those poets after some flower, Anytus the lilly, Sappho the rose, &c. After him Philip of Thessalonica made a second collection, in the time of the emperor Augustus, out of only fourteen poets. Agathias made a third, about five hundred years after, in the reign of the emperor Justinian. Planudes, a monk of Constantinople, who lived in the year 1380, made the fourth and last, which he divided into seven books, in each of which the epigrams are disposed, in an alphabetical order, according to their subjects. This is the Anthologia that have reached our hands. He retrenched abundance of obscene epigrams, for which some of the learned are not a little angry with him.

There are a great many epigrams in this collection, that abound with wit and sense, but more of a different character. *Rollin.*

ANTHO'CEROS, in botany, the name of a genus of mosses. The name was given by Micheli, and the generical character established, in that it has a monopetalous flower, which is corniculated and divided into two carinated parts,

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the division running to the center, where there stands a dusty stamen or filament; this, he says, is barren, and arises from the tubular cup of the flower; the fruits being, sometimes, on the same plants with these flowers, and sometimes on others, and being of a radiated form, each of the several rays containing two, three, or four seeds.

Dillenius, however, observes, that what this author calls the monopetalous flower of the Anthoceros, is properly the capsule, containing a fine dust, which is like that of the capsules of all other mosses, and is, by him, supposed to be the farina or male part of the fructification; the filament in the middle of this capsule is surrounded with yellow dust, and the whole capsule, viewed by the microscope, appears of the nature of the common unicapsular and bivalve seed-vessels of the larger plants, as the pods of mustard, and the like. And this author further observes, that he could not accurately perceive the seed-vessels described by Micheli.

There are only five known species of this genus.

1. The common Anthoceros, with smaller and more divided leaves; this grows most frequently in damp shady places.

2. The Anthoceros, with larger and less divided leaves, the heads, in this kind, standing on very short pedicles; it is found in many parts of Germany. 3. The narrow-leaved Anthoceros with a short flower; this is found in Italy by waysides. 4. The five-cut leaved Anthoceros; the leaves of this are of a purple green; it grows on clayey ground. 5. The mushroom-headed moss, or small leafless moss, with thick bivalve heads; this is frequent in Muscovy. *Dillen. Hist. Musc.*

A'NTHRAX, in the natural history of the antients, was a word used by the most early writers, for the substance we now call pit-coal and lithanthrax. Theophrastus plainly tells us, that the substance strictly and properly called Anthrax (for they also knew a gem by the same name used in a metaphorical sense) was an earthy fossil substance, which was broken in pieces to be used, and kindled well, and burnt almost like wood-coals, and was used by the smiths.

ANTHROME'TRICA *Machina*, a name given by Sanctorius to his weighing chair, contrived for measuring the quantity of insensible perspiration.

ANTHROPOGRA'PHIA *, a description of man; more particularly, of the structure of his body, and the parts thereof.

* The word is formed from the Greek ἄνθρωπος, a man, and γράφω, to describe.

ANTHROPO'LOGY, is particularly used in theology for a way of speaking of God, after the manner of men; but by attributing human parts to him, as eyes, hands, ears, anger, joy, &c.

We have frequent instances of Anthropology in holy scripture, by which we are only to understand the effect, or the thing which God does, as if he had hands, &c.

ANTHROPO'PATHY, a figure, expression or discourse, whereby some passion is attributed to God, which properly belongs only to man.

Anthropopathy is frequently used promiscuously with anthropology; yet, in strictness, they ought to be distinguished as the genus from the species.— Anthropology may be understood of any thing human attributed to God: but Anthropopathy, only of human affections, passions, sensations, &c.

ANTHROPOPHA'GIA, the act of eating human flesh. Some authors trace the original of this barbarous custom as high as the deluge, attributing it to the giants. It is pretended that the land of Canaan itself was inhabited by giants, who were naturally so fierce and cruel, that they ordinarily fed on human flesh. Some historians, particularly Pliny. lib. 4. cap. 12, say, the Scythians and Sauromatans practised this horrid custom: the same author also says, there were Anthropophagi in Ethiopia: and Juvenal mentions the barbarity of certain people of Egypt, who, after the manner of tygers, devoured human bodies. Titus Livy says, that Hannibal obliged his soldiers to eat human flesh, to make them more fierce and intrepid in battle. In the southern parts of Africa, and in some parts of America, this horrid practice still obtains. Vespusius relates, that he has seen the men and women naked eat indifferently each other's flesh; the children fed greedily upon their father's dead body, and gloried in having eat a great number of men.

ANTHOSPE'RMUM, in botany, the amber-tree. The characters of this genus are:

It is male and female in different plants, and some are hermaphrodite: the empalement is divided into four parts; the flower is of one leaf; there are two pointals, which are accompanied by four stamina: the flower sits upon the ovarium.

We have but one sort of this plant in the English gardens at present, viz.

Anthospermum mas. Lin. The male Anthospermum.

It has been long known, in the curious gardens, under the title of frutex Africanus, ambram spirans, or amber-tree; by some ambergrease, from the scent of this plant being supposed to be like that of ambergrease.

This is preserved in most curious gardens, which have collections of tender plants. It is easily propagated by planting cuttings, during any of the summer months, in a border of light earth; which will take root in six weeks time, provided they are watered and shaded, as the season may require; or, if these cuttings are planted in pots, and plunged into a very moderate hot-bed, they will take root sooner, and there will be a great certainty of their growing: then they should be taken up, with a ball of earth to their roots, and planted into pots filled with light sandy earth, and may be exposed to the open air until October; at which time they should be removed into the conservatory, where they should be placed as far as possible from being over-hung with other plants: and, during the winter-season, they must be refreshed with water, but should not have too much given them each time. You may let them have as much air as the weather will permit; for, if they are kept too close, they will be subject to grow mouldy, and generally decay soon after; so that, if the green-house is damp, it will be difficult to preserve these plants through the winter. *Miller's Gardener's Dict.*

ANTICA'RDIUM, in anatomy, &c. that hollow part under the breast, just against the heart, commonly called the pit of the stomach: called also scrobiculus cordis.

ANTICHRE'SIS, in the civil law, a covenant or convention, whereby a person, borrowing money of another, engages or makes over his lands or goods to the creditor, with the use and occupation thereof, for the interest of the money lent. This covenant was allowed of by the Romans, among whom usury was prohibited: it was afterwards called mortgage, to distinguish it from a simple engagement, where the fruits of the ground were not alienated, which was called vif gage.

ANTICHTHO'NES, is used, in antient writers, to denote the inhabitants of contrary hemispheres.

In which sense Antichthones differ from antœci and antipodes. The ancients considered the earth, as divided by the equator into two hemispheres, the northern and southern; and all those who inhabited one of these hemispheres were reputed Antichthones to those of the other.

A'NTI-CHRIST (*Dict.*)— As to the time when Anti-Christ will make his appearance, it is far from being agreed on. We know, in general, that he will precede the second coming of Christ. But all those who have attempted to fix the year of his appearance have only discovered their ignorance and rashness. There have been impostors ever since St. Paul's time, who have terrified believers, by persuading them that the day of the Lord was at hand. St. Paul warns the Thessalonians against any deceit of this kind. The heretics of that time were true signs of Anti-Christ, but this still shews that the Christians of that time expected the coming of the Messiah.

The same opinions and dispositions are observable in the generality of the fathers of the first ages. The churches of Vienna and Lyons in Gaul, seeing the violence of the persecution, which was set a-foot by Marcus Aurelius, believed they then beheld the preludes to the persecution of Anti-Christ. Judas Syrus, in the reign of the emperor Severus, asserted that Anti-Christ would soon appear, because the persecution was then carrying on with great heat against the church. Tertullian, who lived about the same time, and St. Cyprian, who flourished soon after, believed the coming of Anti-Christ was very near. St. Hilary was of opinion, that the progress of Arianism was a forerunner of Anti-Christ. St. Basil the great, St. Ambrose, St. Jerom, St. Martin, St. Crysostom, and Gregory the great were of opinion, that the end of the world was at hand, and that the coming of Anti-Christ would not be far off.

After the tenth age, which concluded the sixth millenary, according to their opinion, who reckoned the birth of Jesus Christ to have happened in the year of the world 4500; people began to get the better of that apprehension, they had been under, of the appearance of Anti-Christ, and conclusion of the world, which was to be, according to the tradition of the ancients, after the duration of 6000 years. They then began to build larger churches and edifices. St. Jerom's translation of the scriptures, which allowed the world to have existed not above 4000 years before Jesus Christ, contributed likewise to persuade men that the last period of the world, and the coming of Anti-Christ, were not so near. Notwithstanding this, it did not hinder some from attempting once more to fix the year of Anti-Christ's appearance. The council of Florence, assembled in 1105, condemned Fluentius, bishop of that city, for maintaining that Anti-Christ was then already born; Abbot Joachim, who lived in the twelfth age, pretended that Anti-Christ was to appear in the 60th year of his time. Arnaud de Villeneuve said, he would come, in 1326: Peter Daille, in 1789: Cardinal de Cusa, in 1730: John Picus, of Mirandola, in 1994: Jerom Cardan, in 1800: and Vincent Ferrier, who lived in the 15th century, wrote to Pope Benedict XIII, that Anti-Christ would appear in a very short time; and that an holy hermit had informed him, nine years before, that this enemy of God was born. The event has already confuted the generality of these predictions; and we may safely venture to affirm, that the rest are no better grounded, nor at all more certain, than the preceding ones.

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Our Saviour, in his gospel, describes the times that shall precede his coming, as times of war, famine, and rebellion; and says, that all this is but the beginning of sorrows. Then the just shall be given up into the hands of the wicked, and put to death by them; many good men shall be offended, and the abomination of desolation shall be seen in the holy places. The calamities which will then happen, will be also so extreme, that, if they were not to be shortened, no one would be saved: but, for the elect's sake, they will be shortened. Then shall arise false Christs, and false prophets, and shall shew great signs and wonders, insomuch that (if it were possible) they would deceive the very elect. After all this, the son of man shall appear in the brightness of his majesty.

There is likewise a difference among authors, as to the manner of the birth of Anti-Christ. Some say, he will be begot by a devil upon some very corrupt woman: others tell us, that Anti-Christ will be a devil incarnate, and not a man; that, as Jesus Christ was born of a pure virgin, Anti-Christ will pretend to the same: but, whereas the son of God assumed real flesh, Anti-Christ will take only the phantom and appearance of flesh. But St. Crysostom, Theodoret, Theophylact, and some others, with more reason, imagine that Anti-Christ will be a real man, and an agent of the devil in exercising all his cruelty and malice against the faithful. There was a tradition received among the ancients, that he should be born of a Jewish family, and proceed from the tribe of Dan. In which sense these words of Jeremiah are explained, the snorting of his horses are heard from Dan: The whole land trembled at the sound of the neighing of his strong ones; for they are come, and have drowned the land and all that is in it. The most ancient commentators upon the Revelations, such as Aretas, Bede, Primasius, Rupert, Hiacino, and many others, are of opinion, that St. John's omission of the name of Dan, in his enumeration of the tribes of Israel, proceeds from the knowledge he had, that Anti-Christ should be born of this tribe.

As to the dominion, or kingdom of Anti-Christ, as it is supposed that he will be born in Babylonia, it is said that he will there lay the foundation of his empire, and that the Jews will be the first to declare for him, acknowledge his dominion, and enjoy the principal employments in his government. He will begin with attacking the Roman empire, which will then be divided among ten kings, according to the prophecy of Daniel. After he has subdued Egypt, Ethiopia, and Lybia, he will conquer Jerusalem, and there fix the seat of his empire. Then, finding himself master of the eastern and western empires, he will apply himself to the destruction of Christ's kingdom. Some of the ancients believe he will be seated in the churches of Christians, and there receive the adoration of great numbers of apostates from the Christian faith.

The scripture does not particularly tell us what the duration of Anti-Christ's kingdom will be; but, in several places, it seems to allow three years and an half for the continuance of his persecutions; at least three years and an half for the persecutions of those who were looked upon as figures of Anti-Christ.

The righteous, under the persecution of Anti-Christ, will retire to the mount of Olives, where they will soon be attacked by this enemy of God. Then will they cry unto the Lord, and he will send Jesus Christ to deliver them. He will descend from heaven, attended by his angels, and preceded by by a flame, which nothing will be able to extinguish. The angels will make such a slaughter of the Anti-Christ, that their blood shall flow like a torrent in the valley. Anti-Christ himself will come to the top of mount Olivet, where he will be put to death in his own tent, and upon his own throne, without receiving the least assistance from any one.

The Mussulmen, as well as the Jews and Christians, expect an Anti-Christ. The Mussulmen call him Daggial, or Deggial, from a name which signifies properly an impostor, or a lyar; and they hold that their prophet Mahomet taught one of his disciples, whose name was Tamini al Dari, every thing relating to Anti-Christ; and upon the faith of this man they tell us, that Anti-Christ must come at the end of the world, that he will make his entry into Jerusalem like Jesus Christ, who, as they will have it, is not yet dead, but will come, at his second advent, to encounter him, and that, after having conquered him, he will then die.

A'NTIC, in sculpture and painting, denotes a fantastical composure of figures of different natures, sexes, &c. as men, beasts, birds, flowers, fishes, and even things merely imaginary, or which have no existence in the nature of things. *Build. Dict.*

ANTIHE'CTICUM *Poterii (Dict.)*— This medicine is prepared in the following manner:

Take equal quantities of tin and martial regulus of antimony, melt them in a large crucible; then put to them, by little and little, three times the quantity of nitre; after the detonation and noise is over, wash the whole with warm water, till no saltness remain.

This is accounted a forcing penetrating medicine, insomuch as to make way through the minutest passages, and search even the nervous cells; whence, in all disorders of that original, it is reckoned very effectual. In those heavinesses of the head, giddiness, and dimness of sight, whence proceed apoplexies and epilepsies, it does great service. And, in all affections and foulnesses of the viscera of the lower belly, it is reckoned inferior to nothing in cleansing away and discharging their impurities. Thus it obtains in the jaundice, dropsies, and all kinds of cachexies. It is likewise esteemed of great service, even in obstinate venereal cases, in clearing the blood from all impressions of contagion, and cleansing the glands from those corrosive recrements, which such distempers frequently lodge upon them, and occasion blotches and ulcerous deformities. In short, there is hardly a preparation, in the chymical pharmacy, of greater efficacy in most chronic distempers; but it is not often met with in prescription, although constantly kept in the shops. The dose is from six grains to a scruple in grown persons; for it is seldom given to children, their tender vessels not well bearing the force of such medicines. *Quincy's Dispensatory.*]

ANTIME'RIA, in grammar, a figure whereby one part of speech is used for another. e. gr. velle suum cuique est, for voluntas sua cuique est; also, populus late rex, for populus late regnans.

Antimerica, in a more restrained sense, is a figure whereby the noun is repeated instead of the pronoun. *Ludovic. Hebraism.*

The Antimeria is frequent in the Hebrew, and is sometimes retained in our version of the Old Testament accordingly. Thus in *Gen.* cap. iv. Hear my voice, ye wives of Lamech, for my wives. *Gen.* c. iv. 23.

ANTIMETA'BOLE *, ἀντιμεταβολὴ, in rhetoric, a figure which set two things in opposition to each other.

* The word is Greek, compounded of ἀντὶ, against, and μεταβολὴ, from, μεταβάλλω, to shift or transfer.

This figure is twice exemplified in an apophthegm of Musonius; which, on account of its excellence, is called aureum monitum, the golden maxim or precept. This apophthegm, translated into English, is as follows:

Allowing the performance of an honourable action to be attended with labour, the labour, is soon over, but the honour immortal; whereas, should even pleasure wait on the commission of what is dishonourable, the pleasure is soon gone, but the dishonour eternal.

A'NTIMONY, *antimonium (Dict.)*—A considerable heavy semi-metal, naturally running into masses composed of an infinite number of striæ or filaments. It is softer than any other of the bodies of this class; it breaks easily with a small blow, and is very readily reducible to powder, by only rubbing it in a mortar. It has not the least degree of ductility, but it is naturally very bright and glossy, and not much susceptible of rust. It is not at all sonorous in itself, yet, like tin, which has not that quality in itself, it is capable of heightening it in other metallic bodies that are possessed of it. It is easily fused by fire; a small degree of heat answers this purpose: it flows the thinnest of all the known mineral bodies, and, when urged by a violent fire, proves totally volatile. It bubbles up in the manner of lead, when the degree of fire is a little greater than what is barely necessary to melt it. It is not only volatile in itself, but it renders all other substances volatile by mixture, gold alone excepted. It leaves this metal infusion clearer and purer than it can be made by any other means, but carries off every thing else in vapour with it. Antimony very easily runs into a glass, like that of lead, which is of the same use with the glass of lead in the vitrifying earth and stones; but is even preferable to it, as it attenuates them more, and in a strong fire carries them off with it in vapour. It would therefore be very useful in the fusion of ores, by the vitrifying and separating the stony matter, but that it carries the metal itself also, except that be gold, away with it. This glass is very easily prepared by only fusing Antimony with a mineral substance, commonly known by the name of calk, and very frequent in our leadmines: a lump of this, the bigness of a walnut, thrown into a pound of Antimony in fusion, vitrifies it almost instantly, and receives no visible change itself in the operation.

The glass, produced by this process, is of a dusky brownish red, and semi-pellucid; wherever calk is to be had, there is no way so ready as, by this means, to make the glass of Antimony: where it is not at hand, it is easily vitrified alone, by calcining it in coarse powder to a grey mass, stirring it that it may not run into lumps, and then putting this calx into a crucible in a strong fire: the Antimony is thus converted into a glass, like that of the former process, but of a clearer red.

Where bodies very difficult of vitrification are mixed among the matters to be putrified by Antimony, as is the case in the more refractory ores of many kinds, the Antimony is apt to evaporate away before it has done its office: this however is easily prevented by only throwing a little piece of suet or tallow into the matter, which keeps it from flying off a long time. The regulus of Antimony mixes very readily with the several metals; most freely of all with iron, and, next to that, with copper. It consists of a large quantity of of a true fossil sulphur, and a matter very much resembling the nature of the metals, and which, if art could arrive at any method of rendering it ductile under the hammer, would be a true metal. Mr. Boyle tells us, he knew a secret process, by which a true fluid mercury might be obtained from it; and others, since his time, have pretended the same thing, but we have never seen any of them do it. It would therefore have been a great satisfaction if Mr. Boyle had given us the process. It renders all metals brittle with which it is mixed; and, upon the whole, there seems great reason, from its effects on these bodies compared with those of arsenic, to believe that it is very nearly allied to that poisonous mineral, though it do not exert the same fatal power in the body. The whole difference between the two substances seems to be, that the arsenic is fixed in Antimony by a vitrifying earth.

The ores of Antimony are very numerous and very various in their form, colour, and figure. It is pretended by many, that Antimony is often found pure, in its perfect state in the earth; and the cabinets of collectors hold so many substances under the name of native Antimony, that it should seem almost absurd to deny the existence of such a fossil. I can only observe, that, of all the specimens I have seen preserved as native Antimony, I never met with one that would bear the test, and prove truly such: and, to silence the clamour that such a harsh assertion may raise among the gentlemen who are robbed by it of some of the greatest glories of their cabinets, I may add, that many of the very finest of these substances preserved under this pompous name, and resembling the wrought Antimony in their grey colour and striated texture, are specimens of manganese.

Antimony is found reduced to the state of ore by sulphur and other extraneous matter, and, as these are blended with it in greater or lesser quantities, it has more or less of the external appearance of wrought Antimony, and is from this external appearance arranged by collectors in the class of native Antimony, or of Antimony-ores.

The most usual ore of Antimony is a hard and ponderous substance of a bluish grey colour, not striated as common Antimony, but composed of a number of small irregular granules, which appear very bright and sparkling, wherever the mass is fresh broken. This ore has much the appearance of a bright piece of cast iron, where fresh broken.

Other ores of Antimony, in which there is less extraneous matter, are formed of broader and flatter granules; these more nearly resemble wrought Antimony, but are more brittle: these are very bright, of a paler grey than the granules of the last mentioned kind, and the ores composed of them are more beautiful and more valued.

When there is yet less of the extraneous matter, and that is almost pure sulphur, the ores approach infinitely more than either of these to the appearance of wrought Antimony. They are composed of multitudes of fine and slender filaments, of a bright and glittering steel colour; these are laid more or less closely together in the several specimens, and are much broader and coarser in some than in others. These are properly enough called striated Antimony-ores; but, the generality of people who collect minerals loving sounding names, they are generally found in the cabinets, under the title of native Antimony.

These are the forms, in which Antimony appears in those ores in which it is most pure; but, besides these, there are others very frequently met with, in which this semi-metal is mixed with silver, and with iron; these give it a very different appearance. In England we also have Antimony mixed with lead in the same ore, a thing scarce known in any other part of the world; and some of our Cornish Antimony-ore contains also a small portion of tin. The German ores of Antimony, are frequently found of a fine silvery white, or a fine gold-like yellow: these colours are owing to the admixture of the white or yellow marcasites with them, and, though very splendid as to the appearance, they are far from being the most valuable of Antimony-ores for working.

Antimony-ore is very frequently blended with crystalline or sparry matter; sometimes it is perfectly covered with a fine yellow sulphur, and sometimes with a mixture of these and other substances together.

Antimony-ore is found in great abundance in many parts of the world. The German mines abound with it. There is a great deal of it in France and Italy. In Hungary, particularly about Presburg, there is a great deal of very rich ore found. The first Antimony of France is that of Poictou; and in England, where we have no small quantity, that of Endellion in Cornwall is the best; but this must be well purified from the lead the ore also contains before it is fit for use.

The Hungarian Antimony-ore is much of it of the naturally striated kind; this was called the male Antimony by the Romans. The broad-grained, or that formed of large and shining granules, which the Romans called the female, is frequent in Saxony. Some of the striated Hungarian Antimony-ores are variegated with yellowish or orange-coloured spots. These pieces are frequently found in the gold mines, and supposed to contain sulphur of gold. The chymists call this kind antimonium solare, and are very full of an opinion, that vast matters may be done with it in the great work of the transmutation of metals.

The Antimony-ore is never brought into the shops, or at least it never ought to be. What we see there has been all melted from its state of ore, and is in cakes of the figure of the vessels it has been cast in, all throughout composed of the same sort of striæ or filaments as the finer ores, resembling so many bright needles, disposed in fasciæ or bubbles throughout the mass.

It should be chosen very bright, tender, and friable; composed of long and broad striæ of the palest colour, and the most glittering that can be found; and the tops of the cakes, which are of an irregular or spongy texture, and blacker colour, ought to be thrown away. The sulphur that Antimony contains is not separated in that fusion in which it passes in the reducing it from its ore. We have the most evident instances of it in the calcination of it afterwards, in which operation we are offended with a smell, wholly like that of common brimstone; and, if it be performed in a dark place, we even see it burn away in thin blue flames.

Antimony, thrown into a crucible with nitre, deflagrates in the very same manner that common sulphur does under the same circumstances; and, if crude Antimony be distilled with corrosive sublimate, a cinnabar is prepared, called cinnabar of Antimony. This owes it origin solely to the mercury in the sublimate united with the sulphur in the Antimony. In fine, the sulphur may be separated from Antimony, in its proper form, by boiling crude Antimony in common water, after it has been run with a mixture of quicklime or pot-ash, and then adding vinegar or some other acid to the solution made of the sulphur of it, by the water and alkaline salts; for a plain sulphur is precipitated from it in this manner.

The glass of Antimony only loses its semi-metalline form by the sulphur's having been driven off from the Antimony in calcination; and if it be fused in the fire, and any sulphureous and inflammable matter be added to it, it instantly becomes Antimony again. Nay, this sulphur abounds so much in the common melted Antimony, that an acid, plainly of the kind of that of common sulphur or vitriol, for they are the same, may be produced from it.

The proper solvent of Antimony, in its reguline state, is aqua regia.

Antimony is more easily separated out of its ores than almost any others of the metalline substance. It needs no flux-powders, and the utmost caution necessary is to keep off in a great measure the communication with the external air, and to keep the fire moderate, that part of it does not burn away or go off in vapour. The method of separating it is no more than this: bore three or four holes in the bottom of a crucible, and, filling it half full of broken Antimony-ore, set it in another crucible, and cover it with a tile; lute all the junctures with some Windsor loam or any common lute, and set these vessels, thus joined, on the hearth. Place some stones or bricks round them at six inches distance every way, and fill up the intermediate space with ashes up to the rim of the lower crucible; then put burning charcoal about the upper crucible, and blow it till it be red-hot; keep it so a quarter of an hour, and then let all cool. The melted Antimony will be found in a striated mass in the lower vessel.

Antimony has had various names among the writers of the several ages, and chymists have added to these a number of fantastical ones, expressive either plainly or metaphorically of its qualities. We generally call it antimonium or stibium. The Greeks called it stimmi, and sometimes alabastrum. And, in the writings of Hippocrates in particular, it seems to stand under the name of tetragonon. Pliny calls it lapis spumæ candidæ nitentisque non tamen translucentis, and the Arabians antimad or atemed. The chymists, from its power of destroying other metals, call it lupus vorax, the voracious wolf, and saturnus, from the name of the god who was said to eat his own children. They have also called it plumbum sapientum, the lead of the wise men, from its performing the office of lead only more perfectly in the purifying of gold; and some of them magnesia saturnina. They also call it lavacrum solis.

The character they denote it by is this ♁, a circle, denoting the body to be gold, to which a cross is added, to shew it very corrosive at top.

Antimony is not only given in substance, but a great many preparations of it are in common use in medicine; they are either emetic, cathartic, diaphoretic, or sudorific. Crude Antimony, in powder, is found of great benefit in dissolving viscidities in the fluids; it gives relief in cutaneous diseases, and, as some very confidently assert, in convulsions and epilepsies. Externally, in ointments, it is much commended for drying up ulcers, and for curing the itch, and other diseases of the skin, and in plaisters for resolving of tumors. With the antients it was in frequent use among the cosmetics, being the most esteemed substance for tinging the eye-brows black. This practice is even as old as the Old Testament, for we find Jezebel, and others of the Israelitish women, censured cenfured for this ufe of it: the Greeks gave it two new names on this account, calling it gyraicon and platyophthalmon, from its making the eye-brows appear broader than they naturally are.

Diofcorides, and the older Greeks, feem to have been but imperfectly acquainted with its virtues internally; they tell us it was aftringent and cooling, but that it was apt to obftruct the paffages. They ufed it frequently in collyriums for the eyes, when they meant to dry up redundant humours, and alfo in old ulcers. They calcined it, in order to prepare it for ufe, and made it into paftils with the milk of a woman's breaft; thefe were ufually of a fquare form, and hence the name of tetragonon feems to have been given it by Hippocrates. The Greeks do not feem to have known any thing of it in any other intentions than thefe.

Its virtues, as a purge, became known in the twelfth century, at which time Bafil Valentine publifhed his book, entitled Currus Antimonii Triumphalis, in which he extols it as a remedy for almoft all difeafes. In the fifteenth century, Paracelfus brought it yet more into ufe. It was even after this, however, a difputed point a long time among the phyficians, whether Antimony were a falutary or a poifonous medicine. At prefent we are, however, very well fatisfied of its falutary effects, and know of two very different qualities in it, according to the different form it is given in, a purge and a diaphoretic. All the preparations of Antimony operate either by ftool or vomit, or by infenfible perfpiration or fweat. There appears no reafon in the world for people's ever having been afraid of giving the crude Antimony internally; we daily fee it taken in large dofes, a drachm or more at a time, and that for a long continuance, without any bad fymptom, or even the leaft naufea, unlefs, by accident, the acid of the ftomach fhould be ftrong enough to prove a menftruum to it. *Hill's Hift. Mat. Med.*

Golden fulphur of ANTIMONY, *fulphur auratum antimonii*—Boil the fcoriæ of Antimony, till they are all diffolved; into the inodorous liquor drop vinegar, and there will inftantly arife a moft noifome, ftercoraceous fmell, and the liquor, which before was thin, will become very thick. Drop in more vinegar, ftir the mixture about, and proceed in this manner, till nothing more will precipitate. Let the veffel ftand quiet, and a precipitate will gradually fubfide to the bottom, which will be reduced to a much lefs compafs than one would expect. Pour off the liquor that fwims at top; wafh the precipitate with water, till it is abfolutely infipid; dry it gently, and keep it under the title of fulphur auratum antimonii.

Remarks.

The fulphur of Antimony, mixed with an alcali, makes the fcoriæ of Antimony. Thefe, boiled in water, make a fulphureous lixivium; and from this, by the acid, the fulphur is precipitated. This has a mild emetic quality. If this is rubbed upon filver, it makes it of the colour of gold, and hence it is called auratum. *Boerhaave.*

Glafs of ANTIMONY, *vitrum antimonii.*—Take of powdered Antimony one pound, calcine it with a gentle fire in an unglazed earthen veffel, continually ftirring it with an iron fpatula till the fumes ceafe, and the Antimony is reduced to a grey powder; melt this powder with an intenfe fire, and pour the fufed matter on a heated plate of copper.

Diaphoretic ANTIMONY, *antimonium diaphoreticum*, called, alfo, *fweet Antimony.*—Take any quantity of calcined Antimony. Reduce it to a fine powder, pour hot water upon it, and ftir them about with a ftick, by which means the fixing nitre, that adheres to it, will be diffolved. Let the white calx fubfide, pour off the faline liquor, put on more water, and thus render the calx perfectly fweet, fo that there fhall be no nitre fenfibly adhering to it; and then dry it, and it will be white, infipid, and heavy, and is the thing you want.

Remarks.

This is called diaphoretic, but it is an inert, noxious calx, without any thing active in it, as far as one can judge by its effects, and wants every thing valuable it had before. It acts only in a fenfible manner, when it is mixed with half as much of a purgative; for then it truly quickens its operation, as appears by undoubted experiments in the pulvis Cornachini: But, otherwife, I diffuade the ufe of it. How furprifingly are the colours changed in the Antimony, by fimply varying the proportion of the nitre in the calcination? And what a furprifing alteration do we find in the ftrength? *Boerhaave's Chem.*

Kermes mineral, or *pulvis Carthufianorum.*— Take of Antimony four pounds, rain-water three pounds, and boil them for two hours. Then the boiling decoction is to be paffed through cap-paper, and fet in a quiet place for twenty-four hours, till a yellowifh or faffron-coloured powder finks to the bottom of the veffel, the liquor remaining clear. This liquor being poured off by inclination, the powder is to be firft wafhed by the frequent affufions of warm water, till it is deprived of all its falts; and then about four ounces of fpirit of wine burnt upon it, and afterwards dried, and kept for ufe.

This powder is looked upon as a kind of panacea, or univerfal remedy. It fometimes excites vomiting, efpecially when it meets with an acid in the ftomach, and is fometimes cathartic, diaphoretic, and fudorific, according as it is determined, by the difpofition of the patient, to act upon any one humour more than other. It is given from one to four grains, or, fometimes, when it is defigned only to attenuate and divide any vifcidities in the fluids, in the quantity of half a grain, repeated every three, four, or fix hours. In acute fevers, where there is a great crudity and fpiffitude of the humour, it is given in fmall dofes with fuccefs. It changes the crude and ferous evacuations by ftool, into a more bilious confiftence, by attenuating the vifcid bile, and fo difpofing it to pafs off by ftool. It is often given with fuccefs in the beginning of the fmall-pox and meafles, when they are apprehended to be of a bad kind, in fmall dofes mixed with bezoartic powders, or abforbents, fuch as crabs-eyes, red coral, pearl, egg-fhells, crabs-claws, and the like; for thus it excites a fpitting and diaphorefis, removes anxieties, corrects the lympha and coagulated ferum, and raifes fuch an effervefcence in the blood as tends to purify it. Glauber confirms thefe virtues by the examples of feven children in the fmall-pox. Frederic Hoffman commends the ufe of this powder in ftubborn autumnal agues, becaufe it powerfully opens obftructions, particularly of the liver, by which thefe fevers are produced, efpecially when taken in the quantity of a grain, mixed with detergent anti-febrile falts; fuch as the falt of wormwood, the febrifugous falt of Sylvius, vitriolated tartar, and the like.

It is, however, to be carefully obferved, that this powder is not to be given till the quantity of blood has been leffened, and all the fluids fufficiently diluted and attenuated; for, as by the ufe of it the blood is fuddenly rarefied, and put into a kind of effervefcence; if the veffels are before full, they muft be ftill more diftended, by the increafed heat and motion of the blood and other fluids, and hurtful congeftions may be formed in the vifcera. It ought, therefore, never to be given, till the dangers from a plethora are taken off, and till the humours have been rendered fluid by great quantities of diluents often repeated.

The lixivium in which Antimony has been boiled, paffed through cap-paper, is recommended by fome in fcabs, and other difeafes of the fkin. *Geoffrey.*

Vitrum ANTIMONII *ceratum.*—Take a glafs of Antimony in powder, one ounce; bees-wax, one drachm: melt the wax in an iron ladle; then add the powder; fet them on a flow fire without flame, for the fpace of half an hour, continually ftirring them with a fpatula; then take it from the fire, pour it upon a piece of clean white paper, powder it, and keep it for ufe. After it has been about twenty minutes in the fire, it begins to change the colour; and, in ten more, comes pretty near the colour of fnuff: by that colour I know it is fufficiently prepared, without attending to the degree of heat, or fpace of time.

Of all the preparations of glafs of Antimony this, which is given by Dr. Pringle in the Edinburgh medical effays, is doubtlefs the moft perfect; for it is infinitely fuperior to the chylifta of Hartman. This chylifta is nothing more than a glafs of Antimony well pounded, and opened by acids, and then digefted in fpirit of wine impregnated with maftic; which never can cover the particles of this glafs with coats of equal impenetrability with thofe formed by wax bituminized by burning.

This medicine fucceeds equally in bloody-fluxes, diarrhœa's, fimple loofneffes, quartan agues, even the moft obftinate, and in certain cafes of the fluor albus.

It muft be given with caution, beginning with a very fmall dofe, as one, two, or three grains, efpecially when it has been levigated again after its calcination: and thus it may be fafely given to children, and even to pregnant women.

In giving it to robuft perfons, I always began by a fmall dofe, as four or five grains, which I gradually increafed to eighteen, according to the effects produced by lefs confiderable dofes. By gradually increafing the dofe of this medicine, I have given as far as twenty-four grains at a time, which had no other effect, but to procure two or three moderate ftools the next day: but in this cafe it would be imprudent to continue its ufe, without interruption; becaufe, as it paffes flowly, the dofe may poffibly unite with the firft, at the time that it begins to operate; and thefe two dofes thus joined might caufe a fuperpurgation, which is always to be dreaded.

I fhould never have ventured to give this medicine to pregnant women, if chance had not convinced me, that it is not more dangerous for them than for others, when given with caution. For, among feveral women whom I have cured of bloody-fluxes with this medicine, there were fome that were actually with child, and did not know it themfelves, at the time of their taking it. They were all cured, and no accident happened to any of them.

When the patient has been purged too violently by one of the firft dofes of this medicine, which are always fmall, it is a proof of the weaknefs of the patient; and then I give it to him but every fecond or third day. The diftance of time obferved between the dofes of this medicine makes it operate lefs brifkly, and more equally.

When the vitrum Antimonii ceratum vomits, the patient is to drink warm water at every motion.

When the dyfenteric flux is attended with fharp pains in the abdomen, with heat and tenfion, the vitrum Antimonii is not to be given, till the pains are removed by emollient clysters, and other proper remedies.

I have not observed any difference in the effects of this medicine, whether the patient had, or had not, been bled or purged; whether the disease were recent, or of long standing; whether in fine it were attended with a fever, or not. They were all cured equally well, agreeable to what is said in the Edinburgh observation.

The vitrum Antimonii ceratum is a good febrifuge. Three or four days use of this medicine generally suffices for removing the fever accompanying diarrhœa's, loosenesses, &c. But, in order to its having this effect, it must either purge or vomit the patient; otherwise it cures the looseness, but the fever continues, and requires a very long use of the medicine to cure it. When it operates in a sensible manner, it generally gives the patient an appetite, when he is near being cured: but the weakness of his stomach does not allow his giving way to it, without running great risks.

When this remedy operates a cure without producing any visible effects, it would be dangerous to increase the dose till it causes evacuations; for, unless the patient be of a strong constitution, you endanger the bringing on a hypercatharsis. Moreover I have observed, that the fineness of the powder has a great influence on the manner of its operation. That, which is very fine, is much more active, than that which is somewhat less so: for example, a grain of the vitrum Antimonii ceratum reduced to a very fine powder will have more force and action, than two grains of the same glass reduced to a powder somewhat less fine. Wherefore I always preferred the first sort, as productive of more certain effects, and less incommoding the stomach.

The vegetable acids develope and increase the emetic quality of this medicine to such a degree, that you would always put the patient's life, who takes it, in great danger, if you did not absolutely forbid him the use of acid fruits, and aliments that are liable to turn sour, as milk, wine, &c.

In obstinate quartan intermittents, which had resisted the most powerful febrifuges, I have given this medicine on the two days of intermission, omitting it the day of the paroxysm; and continuing it thus, and increasing the dose very gradually, the paroxysms grew considerably weaker; and generally the fourth did not return. The patients, whom I cured in this manner near a year ago, have never had the least return of the fever.

Excepting in the cases of fevers, all the patients, who used the vitrum Antimonii ceratum, drank habitually of a ptisan made with rice, oatmeal or hartshorn. These ptisans prevent the pains of the stomach, which this medicine sometimes occasions. *Geoffroy.* See *Philos. Transact.* Vol. 47. p. 273.

ANTIO'CHIAN *Epocha*, a method of computing time from the proclamation of liberty granted the city of Antioch about the time of the battle of Pharsalia. *Strauch. Brev. Chronol.* l. 4. c. 34.

It is disputed among chronologers, whether the Antiochian epocha commences in the spring or the autumn before the battle of Pharsalia. The chronicle of Alexandria fixes it to the former; Scaliger and Calvisius to the latter. In the first year of the epocha began the first indiction; so that the Antiochian years being divided by fifteen, the remainder shews the true character of the cycle of indiction.

ANTI'PATHY is used, in painting, for an opposition between the qualities of colours. *Du Piles Conversat. sur la Connois. de la Paint.*

This Antipathy is chiefly observed between colours, which endeavour, as it were, to predominate over each other, and which, by their mixture, destroy each other, e. gr. ultramarine and vermilion. This does not obtain the clair obscure; for though there be nothing more opposite to each other than black and white, as the one represents light, and the other darkness; yet they each preserve themselves in the mixture, and form together a grey, which partakes of both.

ANTIPERISTA'LTIC *(Dict.)*—The cause of the Antiperistaltic motion is usually assigned to be a stoppage of some of the intestines, but chiefly of the ilium.

The mechanism whereby it is effected, differs in nothing from that which produces the peristaltic motion, except in the determination of the motion, which in iliac cases prevents the fæces from proceeding on to the anus; so that the motion is peristaltic from the stomach to the place of obstruction; but when the fecal matters are arrived there, they give rise to an Antiperistaltic motion, by occasioning a great influx of spirits into the fleshy fibres adjoining; these, being contracted, of course will compress, and propel the contents and chylous matters towards that side where there is the least resistance, which will be upwards, since an insurmountable obstacle is supposed downwards: consequently they must rise to the fibres next above, which, being contracted in their turn, will raise them a step further, till, by degrees, they have reached the pylorus, whose valve, being forced, admits them into the cavity of the stomach, from whence they continue their ascent to the mouth.

Some late ingenious authors have overturned the whole Antiperistaltic system, and shewn this motion imaginary, as well as unnecessary, for accounting for these disorders. Mess. Chirac and Du Verny have endeavoured to prove this, in respect to vomiting; and M. Haguenot, and after him M. St. Andre, in the iliac passion.

ANTIPERI'STASIS *(Dict.)* — Antiperistasis is usually defined "the opposition of a contrary quality, whereby the "quality it opposes becomes heightened, or intended: or "the action whereby a body, attacked by another, collects "itself, and becomes stronger by such opposition: or an in"tention of the activity of one quality, caused by the oppo"sition of another."

Thus cold, say the school-philosophers, on many occasions, exalts the degree of heat, as dryness that of moisture.

Thus it is, that quick-lime is set on fire by the affusion of cold water: so water becomes warmer in winter than summer, by Antiperistasis: and to the same cause it is owing, that thunder and lightning are excited in the middle region of the air, which is continually cold.

This Antiperistasis is a principle of great use and extent in the Peripatetic philosophy. "It is necessary," according to the authors of that class, "that cold and heat be both of them "endued with a self-invigorating power, which each may "exert, when surrounded by its contrary; and thereby pre"vent their mutual destruction. Thus it is supposed, that, "in summer, the cold, expelled from the earth and water by "by the sun's scorching beams, retires to the middle region "of the air, and there defends itself against the heat of the "superior and inferior air. And thus, also, in summer, "when the air about us is sultry hot, we find that cellars and "vaults have the opposite quality: so in winter, when the "external air freezes the lakes and rivers, the internal air, in "the same vaults and cellars, becomes the sanctuary of heat; "and water, fresh drawn out of deep wells and springs, in a "cold season, not only feels warm, but manifestly smokes."

Mr. Boyle has canvassed this doctrine thoroughly, in his history of cold.—It is certain, that a priori, or considering the reason of the thing, abstracted from the experiments alledged to prove an Antiperistasis, it appears highly absurd; since, according to the course of nature, one contrary ought to destroy, not to strengthen another: besides, that it is an axiom, that natural causes act as much as they can; which, as to inanimate creatures, must be allowed physically demonstrative, in regard these act not by choice, but by a necessary impulse.

It is commonly, indeed, alledged, as a proof of a power nature has given bodies of flying their contraries, that drops of water, falling on a table, collect into little globules, to avoid the contrary quality of the table, and keep themselves from being swallowed up by the dry wood: but this we can account for on more intelligible principles, viz. the power of attraction and repulsion. As to the Antiperistasis of cold and heat, the Peripatetics talk of those qualities being surrounded by their opposites, as if each of them had an understanding and foresight, that in case it did not gather up its spirits, and guard against its antagonists, it must infallibly perish; which is to transform physical agents into moral ones.

In effect, not only reason, but experiment also, concludes against the notion of an Antiperistasis; the leading argument, urged in the behalf of it, is, the heating of quick-lime in cold water; now, who can sufficiently admire at the laziness and credulity of mankind, who have so long and so generally acquiesced in what they might so easily have found to be false? For if, instead of cold water, the lime be quenched with hot water, the ebullition will, oftentimes, be far greater than if the liquor were cold.

Again, in freezing a bason to a joint-stool, with a mixture of snow and salt, by the fire-side, it is pretended, that the fire so intends the cold, as to enable it to congeal the water that stagnated upon the surface of the stool, betwixt that and the bottom of the vessel. But how little need there is of an Antiperistasis in this experiment appears from hence, that Mr. Boyle has purposely made it with good success, in a place where there neither was, nor ever probably had been a fire.

The patrons of an Antiperistasis usually plead that aphoristical saying of Hippocrates, "the viscera are hottest in winter," in behalf of their own opinion: but the only proof of such greater heat is, that men then have a greater appetite; so that the aphorism supposes digestion to be made in the stomach by heat, which is easily refuted.

Another argument, urged in favour of an Antiperistasis, is borrowed from the production of hail, which is presumed to be generated in summer only, not in winter; and, according to the schools, is made in the lowest region of the air, by the cold of the falling drops of rain being so highly intended by the warmth they meet with in the air near the earth, as to congeal into a solid form.

As to refreshing coldness which subterraneous places afford in summer, it may be denied that they are then really colder than in winter; though, if the contrary were allowed, it would not necessarily infer an Antiperistasis.—It is certain, the smoking of waters, drawn from deep places in frosty weather, do not necessarily infer such water to be warmer than at other times when it does not smoke; since that effect may proceed, not from the greater warmth of the water, but from the greater coldness of the air. For a man's breath in summer, or in mild winter weather, becomes very visible;

sible; the cold ambient air suddenly condensing the fuliginous steams discharged by the lungs, which, in warm weather, are readily diffused, in imperceptible particles, through the air.

ANTIPHRASIS.—Sanctius defines Antiphrasis to be a form of irony, whereby we say a thing, by denying what we ought rather to affirm it to be; Antiphrasis est ironiæ quædam forma, cum dicimus negando id quod debuit affirmari.—As when we say, it did not displease me, or, he is no fool; meaning, I was pleased with it, or, he is a man of sense.—On this principle, the Antiphrasis ought to be ranked among the figures of sentences, and not among those of words.

It is a common error to make Antiphrasis consist in single words; as when we say, that the parcæ are thus called by Antiphrasis, because they spare nobody, parcæ, quia nemini parcunt.—St. Jerom, in his epistle to Riparius against Vigilantius, says he ought rather to be called Dormitantius per Antiphrasin, than Vigilantius, because he opposed the Christians holding wakes at the tombs of the martyrs.

Sanctius holds it improper to call these Antiphrases; by reason, phrasis is not applicable to a single word, but signifies orationem, aut loquendi modum.

ANTIPHTHISICA *, in pharmacy, a remedy against a consumption.

* The word is formed from the Greek ἀντὶ, against, and φθίσις a phthisis, or consumption.

Tinctura ANTIPHTHISICA, a tincture against a consumption; which is prepared as follows:

Take of saccharum saturni, and vitriol of iron, each an ounce; French brandy, a pint; and, without heat, draw a tincture. *Edinburgh Disp.*

Quincy, in his English Dispensatory, gives it thus:

Take salt of steel, and saccharum saturni, each four ounces; put them into a matrass with two pints of good French brandy. Twenty hours digestion will make a beautiful tincture.

This is by some accounted a specific in hectic fevers; and it is not an unlikely medicine in such cases, because it will astringe and draw up the fibres, whereby their tone will be rendered more rigid, and the pores and secretory passages streightened, so that the juices and nourishment itself will not so soon run off by those ways. It will also procure a firmer texture to the blood itself, which, in those diseases, is almost fused and broken. This is also good in many hysterical affections.

ANTOFLE *of cloves*; thus they call cloves which remain by chance upon the clove-trees, after the cloves are gathered. The fruit, thus left upon the tree, continues to grow, and becomes an inch thick. The Dutch call them the matrix, or womb, of cloves, or mother-cloves. They are pretty much used in physic, but the apothecaries often put common cloves instead of them, though the virtues and smell of both are very different.

ANTIPODES (*Dict.*)—The Antipodes have nearly the same degree of heat and cold, days and nights of equal length, but in opposite seasons. It is noon to one, when midnight to the other; and the longest day with the one, when shortest with the other.

We have said the Antipodes have nearly the same degree of heat and cold, not absolutely the same of necessity. Because, first, there are many accidents to modify the action of the solar heat, so that people, situated in the same climate, have not the same temperature of air. This may in general be accounted for by the interposition of mountains, the nearness or distance of the sea, the winds, &c. Secondly, the sun is not throughout the whole year at the same distance from the earth; it is sensibly at a greater distance in the month of June, than in January; from whence it follows, that, consideratis considerandis, our summer in England is not so hot as that of our Antipodes, and our winter less cold. Nay, ice is found, in the seas of the southern hemisphere, at a much less distance from the equator, than in those of the northern hemisphere.

The horizon of the one place being 90 degrees distant from the zenith of the other, it follows, that the Antipodes have the same horizon; it follows also, that, when the sun rises to the one, he sets to the other.

Plato is esteemed the first who thought it possible that the Antipodes subsisted, and is looked upon as the inventor of the word. As this philosopher apprehended the earth to be spherical, he had only one step to make, to conclude the existence of the Antipodes.

The ancients, in general, treated this opinion with the highest contempt; never being able to conceive how men and trees could subsist suspended in air with their feet upwards; for so they apprehended they must be in the other hemisphere.

They never reflected that these terms, upwards, downwards, are merely relative, and signify only nearer to, or farther from the center of the earth, the common center to which all heavy bodies gravitate; and that, therefore, our Antipodes have not their feet upwards and heads downwards any more than ourselves; because they, like us, have their feet nearer the center of the earth, and their heads farther from it. To have the head downwards, and feet upwards, is to place the body in a direction of gravity, tending from the feet to the head; but this cannot be supposed with regard to the Antipodes; for they, like us, tend towards the center of the earth, in a direction from head to foot.

If credit may be given to Aventinus, Boniface, archbishop of Mentz and legate of pope Zachary, in the eighth century, declared one Virgil, a bishop in that age, a heretic, for having dared to maintain there were Antipodes.

As some people make use of this transaction, to turn the infallibility of the church into contempt, an anonymous author has called in question the truth of the fact in the memoirs de Trevoux.

The only authority, says this anonymous author, on which the truth of this fact can be supported, as tradition has transmitted it to us, is a letter of pope Zachary to archbishop Boniface: "If it be proved, says pope Zachary, in this letter, that Virgil maintains there is another world and other men under the earth, another sun, and another moon; call a council, condemn him, excommunicate him, after having degraded him from the priesthood, &c." This author asserts, that this order of pope Zachary was never carried into execution, and that Bonifice and Virgil lived afterwards in a very good understanding with each other; and that Virgil was even canonized by this very pope.

But the anonymous author goes yet farther: Admitting, says he, this story for a matter of fact, the pope cannot be accused of having acted contrary to truth and justice. For, says he, the notions they entertained of the Antipodes, were very different from our's. "Mathematical demonstrations gave rise to philosophical conjectures. Philosophical conjectures supposed the sea formed two great circles round the earth, which divided it into four parts; that the vast extent of the ocean and excessive heat of the torrid zone cut off all communication between those parts; so that it was impossible the inhabitants should be of the same species, or proceed from the same origin as ourselves. Thus much only, says this author, was understood, at that time, about the Antipodes. In this manner the anonymous author endeavours to justify pope Zachary; but the arguments he urges seem by no means conclusive. For pope Zachary's letter contains these words: "If Virgil maintains that there is another world and other men under this earth, condemn him." The pope therefore admitted of no Antipodes, and looked upon it as an heresy to assert any such thing. It is true, he adds these words, another sun, another moon. But, 1st, whoever asserts the existence of Antipodes, may very well advance they have another sun: What is more common than this expression, 'the sun in Ethiopia and England is not the same? Does this import any thing more, than that the action of the sun is different? That the moon of March and September are different, &c. so these words, another sun, another moon, might, both according to Virgil and the pope's letter, have a very simple, true, and obvious meaning. These words, "another sun under our earth," no more signify two suns than these words "Another world under our earth," signify another earth under our's.

It is indeed more than probable all Virgil meant was, that there were Antipodes; because, by allowing the earth a spherical form, and admitting the existence of the Antipodes, it is a necessary consequence they should have the same sun as we, to give them day, while it is night with us.

The anonymous author, in the following part of his dissertation, suppresses these words "under our earth," and pretends that pope Zachary did not deny the Antipodes, but only that there were other men, another sun, another moon. 2dly, on a supposition Virgil had maintained the real existence of another sun and moon for the Antipodes, in this he had only committed a gross error in natural philosophy, but seems not in my opinion to fall justly under the censure of heresy; and, in case the pope had a mind to condemn it as such, he ought to have distinguished between the pretended heresy, and the truth which Virgil asserted with regard to the existence of Antipodes, and not have jumbled together, in the same phrase, these words "other men under our earth, another sun and another moon."

What are we therefore to infer from what the anonymous apologist for pope Zachary advances, with regard to the general opinion concerning the existence of Antipodes, but that the pope fell into and followed a vulgar error, and on that score condemned poor Virgil as an heretic, for having maintained a truth in opposition to a received opinion? In fact, the good understanding, whether true or pretended, in which Boniface and Virgil lived afterwards, does not prove that pope Zachary was infallible, in condemning Virgil for an heretic, about the Antipodes; and, if Virgil recanted, so much the worse for him.

In the whole course of this argument we admit every thing for fact which the anonymous author relates; but at the same time are sensible it is the more generally received opinion, that the pope actually condemned Virgil for maintaining the existence of Antipodes; and perhaps this is the truth; but the question is of too little importance to be enquired into, whether it be a matter of fact or no.

It is surprizing, that the anonymous author of the apology did not hit on a shorter and wiser method, by passing over this

this whole affair, and ſhewing, that this miſtake of pope Zachary's in natural philoſophy is no argument againſt it. We maintain the earth's motion; the holy writings in general ſeem to attribute this motion to the ſun; becauſe, in matters where points of faith are not concerned, the ſcripture conforms to the common methods of expreſſion. So that, though the pope might be deceived in a queſtion of coſmology or natural philoſophy, we can by no means conclude from thence, that the church and general councils that repreſent it, were guilty of errors in matters of faith; this reply is very ſufficient, and we wonder how it eſcaped the anonymous author.

As to the ſentiments of the primitive Chriſtians, with regard to Antipodes; ſome, rather than admit the concluſions of the philoſophers, abſolutely denied the whole, even the demonſtrations of the geometricians relating to the ſphericity of the earth: which is Lactantius's way, Inſtit. lib. 3. c. 24. Others only called in queſtion the conjectures of the philoſophers: which is St. Auguſtine's method, de Civit. Dei, lib. 14. c. 9. After putting the queſtion, whether there ever were nations of Cyclops, or Pigmies, or of people whoſe feet ſtood outward, &c. he comes to the point of Antipodes, and aſks, "whether the lower part of our earth be inhabited by Antipodes?" He made no doubt of the earth's being round, nor of there being a part diametrically oppoſite to our's; but only diſputes its being really inhabited. And the conſiderations he ſuggeſts for that purpoſe are juſt enough: as, that they who aſſerted Antipodes, had no hiſtory for it; that the lower part of the earth may be covered with water; and that to place Antipodes there, of a different origin from us (as muſt have been the opinion of the ancients, ſince they thought it impoſſible to go from our world to their's;) is to contradict ſcripture, which teaches, that the whole race deſcended from one man. Such are the ſentiments of that father.

It may be added, that the Chriſtian fathers were not the only perſons who diſputed the truth of Antipodes. Lucretius had done it before them, at the end of his firſt book, v. 10. 63, &c. See alſo Plutarch, lib. de facie in orbe lunæ; and Pliny, who refutes the opinion, *lib.* 2. c. 65.

We have conſidered the Antipodes here, as being placed diametrically oppoſite on the terreſtrial globe, ſo that a perpendicular or vertical line being drawn through any place whatever, and which, conſequently, paſſes through the zenith of that place, the oppoſite part on the ſurface of the globe, which this vertical line continued would cut, is the ſituation of the Antipodes to that place; this depends on a ſuppoſition of the earth's being a perfect ſphere; for if the earth be not a perfect ſphere, but is an oblate or prolate ſpheroid, there are no reciprocal Antipodes. That is, for inſtance, if a line be drawn through the zenith of London, and center of that city which is in the northern hemiſphere, this line would cut the ſouthern hemiſphere in a point which will be diametrically oppoſite to London, but London then will not be the Antipodes to this place: thus the reciprocal equality of ſituation, latitude, day and night, in the oppoſite hemiſpheres at ſix months diſtance, and all that we are uſed to include in the idea of Antipodes, as inſeparable from it, is no longer ſo; and muſt alter, in proportion as the figure of the earth deviates from a true ſphere. A little attention will convince us of this.

What we have advanced is founded on this poſition, that the ſphere, or, to render the theory more ſimple, the circle, is the only regular figure, which all diametrical lines drawn through the center cut at right-angles. Therefore, in every figure terminated by another kind of curve, to inſtance in the ellipſis, the perpendicular drawn to one of its foci or to its tangent, except the two axes which correſpond to the polar line, or a diameter drawn at the equator, will not paſs through the center, nor cut the oppoſite part of the ellipſis at right-angles; therefore the nadir of Paris or London is not the zenith of their reſpective Antipodes. So if, in the center of London or Paris, a perpendicular column were erected, and another in their reſpective Antipodes, it would not make the ſame right-line, but would form an angle more or leſs acute, in proportion as the ellipſis departed more or leſs from a circle; and, conſequently, the latitude, days, nights, ſeaſons, &c. would alter in the ſame proportion. Places ſituated under either pole, or on the equator, are excepted for the reaſon we have before ſuggeſted; becauſe, in the former caſe, it is one of the axes of the ellipſis that joins both foci, and in the latter it is always a circle, the other axis of which is the diameter of the ellipſis: the ſpheroid, however oblate or prolate, being always ſuppoſed to reſult from the revolution of the elliptical meridian round the axis of the world. See *Hiſt. Acad.* 1741.

ANTIPTOSIS *, a figure in grammar, by which, as it is commonly ſaid, one caſe is put for another.

* The word is derived from ἀντὶ, for, inſtead of, and πτῶσις, caſe.

Examples, produced of this kind of figure by the grammarians, are numerous; from Virgil, *Æneid.* V. verſe 451. It clamor cœlo, inſtead of ad cœlum. Terence, in the prologue to the Andria, ſays, Populo ut placerent quas feciſſet fabulas, inſtead of fabulæ, &c. But Sanctius, Voſſius, Perizonius, and other grammarians, who have attended to the rationale of grammar, though it muſt be owned the number is ſmall, have branded this figure in rhetoric with the name of an abſurdity, and juſtly too; becauſe admitting it into uſe would overturn ſyntax, and render the regimen of verbs unworthy attention; a ſcholar might juſtify his error, in this point, to a maſter, by an Antiptoſis, ſays Sanctius, lib. 4. cap. 13. "Figura hæc Latinos canones excedere videtur, nihil imperitius, quod figmentum ſi eſſet verum, fruſtra quæreremus quem caſum verba regerent." "This figure ſeems to leap over all grammar rules, for, if this be admitted, the government of verbs needs not be attended to." Under the word CONSTRUCTION we ſhall endeavour to ſhew what figures ought to be admitted.

The ſame thought may be expreſſed in a different manner, but we muſt always have regard to propriety of language; thus we meet with urbs Roma, the city Rome, by appoſition, on account of the identity, where urbs is uſed adjectively, and muſt be explained urbs quæ eſt Roma, the city which is Rome. In Cicero we find this paſſage, urbs Romæ in oppido Antiochiæ; in Virgil, Butroti aſcendimus urbem; in both theſe paſſages urbs repreſents the ſpecies, the names Roma and Butrotum the particular city.

In theſe different methods of expreſſion, if we meet with any thing which the grammarians ſolve by an Antiptoſis, we ought firſt to enquire whether the copyiſt has not committed ſome blunder in the text, and afterwards, without having recourſe to ſo irrational a figure, ſee if the expreſſion be of ſufficient authority, and whether we can reconcile it to propriety of language, and always give the preference to that which is uſed by the beſt authors.

But to explain this, and ſhew the abſurdity of the figure Antiptoſis in the examples already quoted, which will account for all others of the ſame kind. With regard to it clamor cœlo, the verb is put acquiſitively; and, therefore, cœlo in the dative caſe, inſtead of ad cœlum, which is an elegant and natural ſyntax. In the paſſage cited from the prologue to Terence's Andria, "Populo ut placerent quas feciſſet fabulas," we muſt conſider the relative qui, quæ, quod, to have ſome antecedent, and baniſhing ſo abſurd a figure as the Antiptoſis, ſolve it by the ellipſis to be ſupplied in this manner, ut fabulæ, quas fabulas feciſſet, placerent populo.

ANTIQUE, a term moſt in uſe among architects, ſculptors, and painters: they make uſe of it to expreſs pieces of architecture, ſculpture, or painting, executed, in the ages when thoſe arts were carried to the higheſt perfection, by men of the fineſt genius in Greece and Rome; that is, from the age of Alexander the Great to the reign of the emperor Phocas, about, the year of our Lord 600, when Italy was over-run by the Goths and Vandals.

Antique in this ſenſe is oppos'd to modern; thus we ſay an Antique edifice, buſto, baſſo relievo, or manner; an Antique model; and of a ſtatue, that it is in an Antique taſte.

We have ſeveral Antique pieces of ſculpture left, as the Laocoon and Venus in poſſeſſion of the family of Medicis, the Apollo and Hercules of the houſe of Farneſe, &c.

Antique paintings are more ſcarce; we have only the wedding of Aldobrandinus, ſome little figures of the pyramid of Ceſtius, a Venus which is the palladium of Rome, and ſome ſmall pieces in freſco, preſerved out of the ruins of the baths of Titus and Heraclius.

Some ſculptors have counterfeited Antiques ſo nicely as to impoſe on the judgment of the public; witneſs the famous ſtory of Michael Angelo's Cupid, which we have related in the preface to the Dictionary.

Antique is ſometimes diſtinguiſhed from ancient, which means a leſs degree of antiquity, a time when the art was not in its higheſt perfection. Some writers uſe a compound word antiquo-modern in ſpeaking of old Gothic churches and other buildings, which they would not confound with thoſe of the Greeks and Romans.

ANTIQUITY, *antiquitas*; we make uſe of this term to denote paſt ages.

In this ſenſe we ſay, the heroes of Antiquity, traces or veſtigia of Antiquity, monuments of Antiquity.

We make uſe of the ſame word, to expreſs what is left us of the ruins, monuments, remains, &c. of the ancients.

In this ſenſe we ſay a maſter-piece of Antiquity; a fine piece of Antiquity; Italy, France, and England are full of Antiquities.

Antiquity is taken alſo for the ancientneſs of any thing, or the time it has ſubſiſted.

In this ſenſe we ſay, the Antiquity of a kingdom, a cuſtom, or any thing of the like nature. Moſt nations pretend to a greater Antiquity than they can prove. We may ſay, that the preſent time is the age of the world, and that, in thoſe times which we call ancient, the world was only in its infancy.

We read in Plato, that Solon learned from an Egyptian, that the Antiquity of the Athenians was 9000 years, of the Saides 8000. Pomponius goes farther back ſtill, following the traces of Herodotus; reckons 330 kings before Amaſis, and ſo concludes the world to be above 13000 years old. Diodorus Siculus reckons an interval of 23000 years, between the firſt king of Egypt and the expedition of Alexander the

the Great. Diogenes Laertius leaves all other writers behind him in the Antiquity of his chronology, and doubles this number of 23000 years. When Alexander went into Egypt, the priests pretended to prove to him by their sacred histories (in which mention was made of the Persian empire which he had just conquered, and the Macedonian empire, which was his birth-right) that they were both 8000 years old. Yet it is demonstrable from the best authors, historians, and chronologists, that the Persian empire, at that time, was of no more Antiquity than 300, nor the Macedonian of more than 500 years.

We need not be surprized that the Egyptians and Assyrians fell into such ridiculous errors in point of chronology, for the Egyptians compute the reigns of their first kings at 4000 years, the Assyrians at 1200 only.

The Chaldeans asserted, in the time of Alexander the Great, that they had made observations of the celestial motions 470000 years, and taken the horoscopes of children born in this prodigious interval of time. But Callisthenes, having been appointed by Aristotle to enquire into these observations they pretended to produce, found they could actually go backwards no farther than 1900 years before Alexander. This is a fact acknowledged by Porphyry, who certainly had never any intention to give authority to the books of Moses.

The study of Antiquity is to a certain degree absolutely necessary, since there are in all authors a great many expressions, allusions, and comparisons, which cannot be understood without it; and it is scarce possible, without it, to make one single step in the perusal of history, without being puzzled with difficulties, which a very slight knowledge of Antiquity would frequently resolve. Let any one but lightly run over the first book of Livy, which, with the origin of the Roman people, contains that of the greatest part of their laws and customs, and he will soon be sensible how useful and serviceable this study is.

This science, however, like all others, if carried too far, has its rocks and dangers. There is a kind of obscure and ill-managed learning, which is employed only upon questions equally vain and frivolous, which seeks only what is most abstruse and uncommon in every subject, being almost wholly confined to the discovery of such things as are absolutely superfluous, and which it is often better to be ignorant of, than acquainted with. Seneca often complains of this bad taste, which taking rise among the Greeks, was got among the Romans, and began to seize upon that nation. He observes, that there is, in point of study, as in every thing else, a vicious excess and intemperance; that it is no less blameable to collect, at a large expence, an heap of useless knowledge, than of superfluous furniture; that this sort of learning is calculated to make men impertinent, foolishly possessed with a notion of their own merit, and at the bottom really ignorant. In applying one's-self to history or Antiquities, we should not carry our enquiries too far, but be guided in this point by prudence and discretion: with this precaution, the study of Antiquity cannot be recommended too much, as it makes a part of learning which is not only suitable to their character, but absolutely necessary for all such persons as are designed by their station to study and teach the belles lettres.

Thus, though Antiquities, and, consequently, the study and reading of antient authors, are things much recommended, yet must we by no means put such an implicit faith in whatever they deliver, if repugnant to reason, or even common-sense or observations, as never to scruple giving up our belief of them, strenuously adhering to all they assert, never contradicting, examining, or refuting their doctrines, &c. Yet has this prevailing humour of extolling every thing that is antique, and passing slightly over the merit of our contemporaries, ever been a grievance, that men of a free and unprejudiced thought have complained of through all ages.

The immoderate respect and adherence to Antiquity is, says Dr. Brown, a general cause of error, and a mortal enemy to knowledge. That which has done the greatest execution upon truth, has been a peremptory adhesion to authority and Antiquity, more especially, the establishing of our belief upon the dictates of it. For most men of the present age so superstitiously look on ages past, that the authorities of the one exceed the reasons of the other; whose persons, indeed, being far removed from our times, their works, which seldom, with us, pass uncontrouled, either by contemporaries, or immediate successors, are now out of the distance of envy; and, the farther removed from present times, are conceived to approach the nearer unto truth itself. But hereby we manifestly delude ourselves, and widely walk out of the track of truth. For men, by these means, impose a thraldom on their times, which the ingenuity of no age shall endure, or, indeed, the presumption of any did ever yet enjoin. Thus Hippocrates, about 2000 years ago, conceived it no injustice, either to examine or refute the doctrines of his predecessors; Galen the like, and Aristotle most of any: yet did not any of these conceive themselves infallible, nor give their opinions as positive verities; but when they either delivered their own inventions, or rejected other men's opinions, they proceeded with judgment and ingenuity; establishing their judgments not only with great solidity, but submitting them also to the correction of future discoveries.

In criticism many pretenders insinuate, that all that is good is borrowed from Antiquity. This is very common in the mouths of pedants, and, perhaps, in their hearts too; but is often urged by men of no great learning, for reasons very obvious. Now, nature being still the same, it is impossible for any in modern life to paint her otherwise than the antients have done; if, for example, one was to describe the general's horse at the battle of Blenheim, as fancy represented such a noble beast, and that description should resemble what Virgil hath drawn from the horse of his hero, it would be almost as ill-natured to urge the description from Virgil, as to reproach the duke of Marlborough for fighting only like Æneas. All that the most exquisite judgment can perform, is, out of the great variety of circumstances wherein natural objects may be considered, to select the most beautiful, and to place images in such views and lights, as will affect the fancy after the most delightful manner. But, over and above a just painting of nature, a learned reader will find a new beauty superadded in an happy imitation of some famous antient, as it revives in his mind the pleasures he took in his first reading such an author. Such copyings as these give that kind of a double delight, when we look upon children of a beautiful couple; where the eye is not more charmed with the symmetry of the parts, than the mind by observing the resemblance transmitted from parents to their offspring, and the mingled features of the father and mother. The phrases of holy writ, and allusions to several passages in the inspired writings, though not produced as proofs of doctrines, add majesty and authority to the noblest discourses of the pulpit. In like manner an imitation of the air of Homer and Virgil raises the dignity of modern poetry, and makes it appear stately and venerable. However, if the antients excel the moderns in any thing, it is only in acuteness of wit and elegance of language, in their poetry and oratory. As for painting and sculpture, music and architecture, some of the moderns certainly equal, if not excel, the best of them, not in theory only, but, also, the practice of those arts: neither do we give place to them in politics or morality; but, in natural history and experimental philosophy, we far excel them. In the purely mathematical sciences abstracted from matter, as geometry and arithmetic, we may certainly vie with them: but, in astronomy, geography, and chronology, we excel them much. No wonder they should out-strip us in those arts which are conversant in polishing and adorning their language, because they bestowed all their time and pains in cultivating them, and had but one, and that their native tongue, to mind. But those arts are by wise men censured as far inferior to the study of things; and to be wholly occupied about them is to fall in love with a picture, and neglect life: and oratory, which is the best of these arts, is but a kind of voluptuary one, like cookery, which sophisticates meat, and cheats the palate, spoiling wholesome viands, and helping unwholesome.—— *Brown's Vulgar Errors. Rollin's Belles Lettres. Ray's Letters.*

ANTIRRHINUM (ἀντίῤῥινον, of ἀντὶ, against, and ῥὶν, the nostrils, as though it represented a nose: it is also called cynocephalus, of κύων, a dog, and κεφαλή, an head; because its fruit resembles the head of a dog) *snap-dragon*, or *calf's snout*, a genus of plants whose characters are:

It is a plant with an anomalous flower, consisting of one leaf, which is divided, as it were, into two lips; the upper of which is cut into two parts, and the under into three parts: out of the flower-cup arises the pointal, fastened like a nail in the hinder part of the flower; which afterwards turns to a fruit resembling a calf's-head, which is divided in the middle by a partition into two cells, in which are contained many small seeds. Botanists enumerate twelve species of this plant.

All the sorts of snap-dragon are pretty ornaments in a garden, and, requiring a very little culture, are rendered more acceptable. They are all hardy plants, and will resist the cold of our winters extremely well, especially if they are planted on a dry, gravelly, or sandy soil; for, when they are planted in a rich moist soil, they will grow very luxuriant for a while, but are very subject to rot in autumn or winter, and are much more susceptible of cold, than when they are in a dry, hungry, rocky soil: they will grow in the joints of old walls, where they may be placed so as to make some abject part of the garden agreeable; for they will continue in flower for several months; and, if the seeds are permitted to shed, there will be a continual supply of young plants, without any trouble.

Where-ever those plants are designed to grow upon walls, or on a rocky barren soil, the seeds should be sown the beginning of March, where they are designed to remain (for if the plants are first raised in a better soil, and afterwards transplanted into those places, they seldom succeed well). When the plants are come up, they will require no other culture but to keep them clear from weeds; and, where they come up too thick, to pull some of them out, so as to give them room to grow. In July these sorts will begin to flower, and will continue flowering till the frost prevents them.

These plants which grow on walls, will be strong, and have woody stems, which will continue two or three years or more. *Miller's Gard. Dict.*

ANTISI'GMA, among the ancient grammarians, signifies one of the notes or sentences affixed to those verses whose order was to be changed.

ANTI'STROPHE, in the ancient drama, implied the stanza repeated by the chorus to the audience on the left-hand; the word being derived from ἀντὶ, against, and στρέφω, to turn. Thus the strophe signifies that stanza or those verses which the chorus sing, turning themselves towards the spectators on the right hand; the Antistrophe means the same stanza sung by the chorus turning themselves towards the audience on the left. In rhetoric, the Antistrophe or epistrophe signify repartee, as, for example, if, after having said the man of such a master, we add, and the master of such a man, this last phrase is an Antistrophe, or expression in reply to the first; a famous passage in St. Paul is expressed in this figure of rhetoric. Hebræi sunt, et ego; Israelitæ sunt, et ego; semen Abrahæ sunt, et ego; 2. Cor. chap. xi. verse 22.

This is also a term used in antient lyric poetry among the Greeks; the Antistrophe made one of the three parts of their ode, the other two were called the strophe and epode. The strophe and Antistrophe always contained an equal number of verses, and those too of the same measure, which could consequently be sung to the same music: but the epode was composed in verses of a different measure, either longer or shorter. The Antistrophe was a kind of answer or relative echo both to the strophe and the epode; the Greeks called these three united a περίοδος, and is the same thing that we should call a song of three stanza's.

ANTITHETA'RIUS, in law, signifies a man who endeavours to discharge himself of the fact of which he is accused, by recriminating and charging the accuser with the same fact. This word is mentioned in the title of a chapter in the laws of Canutus, cap. 47. *Jacob's Law. Dict.*

A'NTITYPE, a Greek word, properly signifying a type or figure. In this sense St. Paul uses the word, Heb. ix. ver. 24, where he says, that Jesus is not entered into the holy of holies made with hands, which was the type of the true: instead of the word type, we read, in the Greek of St. Paul, Antitype, which Messieurs Port-Poyal and Amelot have translated type or figure. Thus, according to the true import of the word, it signifies a type, which answers to another type, or rather that which is in the place of a type.

Tower of ANTO'NIA, in antiquity, the most magnificent monument which Herod the Great ever built; he gave it that name in memory of Anthony his friend: it was built on the hill of Jerusalem, formerly called Barri. The front of it was built entirely of white marble, and defended by a wall of three cubits high; the distance from this wall to the tower was forty cubits; within it were contrived halls, apartments, and baths. At equal distances were four other towers, three of which were fifty cubits high; and the fourth, which took up the southern and eastern angles, was of seventy cubits. These towers had galleries communicating with the temple-stairs, from whence the Roman soldiers used to observe the people on festival days, to see that they did not form any dangerous enterprize.

ANTONIA'NA *Aqua*, in the materia medica, the name of a medicinal water of Germany, remarkably pleasant to the taste, and of service in many cases as a medicine.

This water, if mixed with any acid liquor, raises a considerable effervescence, and when mixed with Rhenish wine and sugar, which is a common way of drinking it, it makes a great hissing and bubbling, and becomes turbid and milky. If powder of galls be added to it, it suffers no change but remains limpid and colourless, whence it is plain that it contains no iron, nor vitriol; syrup of vitriol mixed with it turns the whole green, whence it is plain that it contains an alkali; and, if oil of tartar be added to it, it becomes turbid and milky, and precipitates a white sediment, whence it appears that there is either common salt or a calcarious earth in it. If it be exposed some time in the air in an open vessel, it, like all the other mineral waters, loses its pungent taste and pellucidity, becoming turbid and vapid. A quart of it evaporated with a very gentle heat leaves two scruples of a dry sediment, which, being separated by another solution, is found to be one half an alkaline salt, and the other a calcarious earth. Oil of vitriol mixed with the salt produces a great effervescence, and a penetrating scent arises, like that produced by the mixture of oil of vitriol and common salt. Hence it appears that these waters contain a small portion of an alkaline salt, a larger portion of sea salt, and a yet larger of a calcarious earth, and with these a very considerable quantity of a subtile and penetrating mineral spirit.

It is a very temperate water, not too strongly operating either by stool or urine; and hence it is a very proper drink for persons in chronic and many acute diseases, either alone, or mixed with wine, to supply the place of malt liquor, which is proper but in very few illnesses. A long use of it alone may also prove of considerable service in hypochondriac cases. *Hoffman's Oper.*

ANU'BIS, a God of the antient Egyptians, represented by a statue having a dog's head, and in one hand a caduceus, and in the other a lyre. Moreri has given us various conjectures with regard to the origin and odd figure of this deity. Cynopolis was built in honour of him, where they kept a number of dogs which they stiled sacred.

Both Christians and heathens have made themselves merry at the expence of poor Anubis. Apuleius and Jamblichus have spoken very indecently about the consanguinity of Isis and Anubis. Eusebius calls him the Egyptian Mercury, and with very good reason; for there is very great probability that the Grecian Mercury and Egyptian Anubis were the same god.

The Romans who were extremely polite in admitting the gods of nations they conquered, permitted him priests, but these priests came to a terrible end; they suffered themselves to be bribed by a young nobleman of Rome called Mundus, who had conceived a passion for Paulina; this lady unhappily frequented the temple of Anubis, and the priests corrupted by Mundus persuaded her, the God Anubis had fallen in love with her. This flattering Paulina's vanity, she came to the temple at night, and found something more agreeable than a god with a dog's head. Mundus could not keep the secret, but spoke of the adventure of the temple, in such a manner as made it easy to guess Mundus had played the part of Anubis. She complained to her husband, and to the emperor Tiberius, who resented it very highly. The priests were crucified, the statue of the lady and Anubis thrown into the Tiber, and the temple demolished. The great men of Rome diverted themselves a long time with this metamorphosis into the god Anubis, and Volusius a Roman senator, escaped the proscription of the triumvirate under this disguise.

A'NVIL (*Dict.*)— The face or uppermost surface of the Anvil must be very flat and smooth, without flaws; and so hard that a file will not touch it. At one end is sometimes a pike, bickern or beak-iron, for the rounding of hollow work. The whole is usually mounted on a firm wooden block.

Forged Anvils are better than those of cast-work. Locksmiths have also a smaller kind of Anvil called a stake, which is moveable and placed ordinarily on their work-bench. Its use is for setting small cold work straight, or to cut or punch on with the cold chissel, or cold punch. *Moxon's Mech. Exerc.* p. 3.

ANNUNCIA'DA, a society founded at Rome in the year 1640, by cardinal John Turrecremata, for the marrying poor maids. It is now grown so very rich, that it gives fortunes of 60 Roman crowns to above 400 maids for their portion, with a suit of white serge, and a florin for slippers every Lady-day. The popes have so great a regard for this charitable foundation, that they make a cavalcade, attended with the cardinals, &c. to distribute the tickets for these 60 crowns, &c. for those who are to receive them. If any of these maids are desirous to be nuns, they have each of them 120 crowns, and are distinguished by a chaplet of flowers on their head.

AORA'SIA *, in antiquity, the invisibility, of the gods.

* The word is Greek, ἀορασία, and derived from α privative, and ὁράω, to see.

The opinion of the ancients, with regard to the appearance of the gods to men, was, that they never shewed themselves face to face, but were known from their backs, as they withdrew. Whence it followed, according to them, that every being they had time to look at in the face, was not a deity. Neptune assumed the form of Calchas to speak to the two Ajaxes, but they knew him not till he turned his back to leave them; and discovered the god by his majestic step, as he went from them. Venus appeared to Æneas in the character of a huntress, but her son knew her not till she departed from him; her divinity was betrayed, if I may use the word, by her radiant head, her flowing robe, and her majestic pace.

AORI'STUS *, ἀόριστος, in the Greek grammar, an indefinite or indeterminate kind of tense which sometimes expresses the present, sometimes the future, but oftenest the past time.

* The word is compounded of α priv. and ὁρίζω, to bound or limit.

Critics are divided as to the proper and primary import of the Greek Aoristus. Some take them for mere variations of the præterperfect tense, introduced only for copiousness, without any peculiar signification; but it is certain the ancient grammarians of that nation allowed a difference between the Aorist and præter tenses. According to them, the præterperfect tense expresses a thing just now, or lately compleated; whereas the Aorist denotes it past, but indeterminately whether it were lately or long ago. This distinction, however, is rejected by Gretzer, who produces instances among the ancients, where the two are used indifferently. Ursinus also allows this promiscuous use, but looks deeper into the origin and reason of the Aorist. According to this writer, an Aorist is then properly used ἀορίστως, as an Aorist, when it does not denote any certain or definite time, but, in reality, comprehends all times. That this is the primitive use of the Aorist, he shews by a great number of instances. This appears

appears a peculiarity in the Greek tongue, unknown in any other language, to have a tense merely indefinite, yet comprehending all the other tenses.

The Greeks usually distinguish two Aorists. Some, however, will not allow any second Aorist, maintaining that what grammarians call the second Aorist, is the same tense with the first, only under a little difference of termination. *Bibl. Anc. & Mod.*

AO'RTA, (*Dict.*)— The Aorta is subject to many disorders; the following cases will give some light into the nature of others, which it is necessary to know, in order to distinguish them, and make a proper prognostic; for they are always incurable.

Mr. Littre, having opened the body of a woman who died suddenly in the street, and who had, till the very moment of her death, been vigorous, sound, besides other things, the coats which form the trunk of the Aorta ossified in several places, and its interior part full of ulcers and fungous excrescences, but yet without any inflammation: the sigmoid valves were likewise become hard and callous.

This state of the Aorta, besides other concurring causes, may have contributed very considerably to the sudden death of this patient; for the arteries are all along in their course furnished with fleshy fibres, which, by their action and spring, continue to the blood that momentum or impulse, which it at first received from the heart; for it is plain, that the contractile force of the heart, considering its weakness, could not, without this continued impulse, throw the blood so far, and that too in canals so winding and so small; but it is in a particular manner impossible, that, without this impulse of the arteries, the contraction of the heart should propel the blood with such a degree of force, as to make it enter the imperceptible orifices of the distant veins. Thus the arteries, and all their ramifications, are, as it were, so many continued hearts, seconding and promoting the action of the chief and principal one. Now it is plain, that in this woman the ossification and consumption of a part of the substance of the trunk of the Aorta must have absolutely taken away its spring, and, consequently, deprived the heart of that assistance, without which it could not carry on the circulation of the blood.

Mr. Merry says, that, having opened a man that died suddenly, he found his Aorta so dilated, that it had begun to separate itself from the base of the heart, in which case, the circulation of the blood must have necessarily had an immediate stop put to it. *Hist. de l'Acad.* 1710.

Mr. Morand the younger, upon opening the body of a merchant in Paris, who died suddenly, after having been some time subject to palpitations of the heart, was not surprised to find polypous concretions formed in the Aorta, and in the branches of the pulmonary arteries and veins; but was astonished with some other uncommon circumstances; for, on the left side of the heart, one of the two valvulæ mitrales of the pulmonary sack was transformed into a kind of cystis, the bottom of which lay towards the sack itself, and the mouth towards the ventricle of the heart. This cystis was the valve itself, dilated to such a degree as to be able to contain one's thumb, thickened, and having small bones in several parts of it; the sigmoid valves of the Aorta, in like manner, being considerably thickened, and in each of them, in several places, small bones, very solid, irregularly ranged, and rising like so many rocks. Nor is it easy to conceive, that, of the blood, which flowed from the pulmonary sack to enter the left ventricle, some part must remain in this cystis, preternaturally formed; and that the other part could not, without a great deal of difficulty, make its way through the Aorta, the valves of which, being thickened and ossified, did not become flat, as they ought to have done, in order to perform their functions duly. *Hist. de l'Acad.* 1729.

AOVA'RA, in natural history, a fruit as large as a hen's egg, which grows with many others in a cluster, inclosed in a great pod, fastened to a species of very high and prickly palm-tree, which grows in the East-Indies and Africa.

When the pod is ripe, it bursts, and there appears a cluster of fruit, which, being ripe, are fleshy, and of a golden yellow colour: the Indians eat them; the flesh incloses a stone very hard and bony, as large as a peach-stone, having at its superficies three holes at the side, and two lesser near each other. The bark of the stone is two lines thick; it contains a fine white kernel, which, being chewed, at first hath an agreeable taste; but, at the end, it becomes of a sharp taste, which approaches that of some sorts of cheese. They extract from the kernel a sort of palm-oil.

The kernel of Aovara is astringent, and good to stop a looseness, being eaten. *Lemery des Drogues.*

APA'NAGE, Appenage, Appanage, Apannage, or Apennage, in the French laws, the fortune of a king's younger son: or a settled portion of lands, &c. assigned for the subsistance of the cadets, or younger sons of a sovereign prince.

Some will have the Apanages, at their first institution, to have been only pensions, or annual payments of a certain sum of money.—The younger sons of England have no certain Apanages, as in France; but only what the good pleasure of the king bestows upon them.

Even in France, during the first and second race of kings, the right of primogeniture, and Apanages, were unknown; but the domains were divided pretty equally among all the children.

Great inconveniences arising hence, it was at length found proper to put off the younger born with counties, duchies, or other districts, on condition of their paying homage and fealty for the same, and of their reverting, in defect of heirs-male, to the crown.

This has happened accordingly to the first and second branch of the dukes of Burgundy.— The duchy of Orleans is the Apanage of the second son of France.

APARI'NE, *cleavers*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf and is bell-fashioned, very wide, and open at the mouth, and divided into several segments; the cup becomes a fruit, which is dry, covered with a very thin skin, and composed of two round bodies, which contain an umbilicated seed. The leaves of this plant are rough and hairy, and stand in rundles round the stalk.

Aparine, in the Linnæan system of botany, makes a distinct genus of plants; the characters of which are these: the calyx is an extremely small perianthium, placed on the germen, and divided by four notches at its end. The flower consists of one single petal which forms no tube, but is placed flat, and divided into four segments; the stamina are four pointed filaments shorter than the flower. The antheræ are simple; the germen of the pistillum is double, and situated below the receptacle; the style is slender, somewhat bifid at the end, and of the same length with the stamina; the stigmata are headed. The fruit is composed of two roundish dry bodies, growing together, and armed with hooked hairs which make them rough and rigid, and stick to things; the seeds are single, roundish, umbilicated, and large. *Linnæi Genera Plantarum.*

APATU'RIA *, in antiquity, a solemn feast celebrated by the Athenians in honour of Bacchus.

* The word is generally derived from the Greek ἀπάτη, fraud.

It is said to have been instituted in memory of a fraudulent victory, obtained by Melanthus king of Athens, over Xanthus, king of Bœotia, in a single combat, which they agreed upon, to put an end to a debate between them relating to the frontiers of their countries.—Hence Budæus calls it *festum deceptionis*, the feast of deceit.

Other authors give a different etymology of this feast, from what we have now related; they tell us, that the young Athenians were not admitted into the tribes on the third day of the Apaturia, till their fathers had first swore that they were their own children; and that till that time they were supposed, in some measure, to be without fathers, ἀπάτορες, whence the feast, say they, took its name.

Xenophon, on the other hand, informs us, that the relations and friends met on this occasion, and joined with the fathers of the young people who were to be received into the tribes; and that from this assembly the feast took its name: that, in ἀπατούρια, the α, far from, being a privative, is a conjunction, and signifies the same thing with ὁμοῦ, together.

This feast lasted four days: the first day, those of the same tribe made merry together; and this they called δορπία. The second day, which they called ἀνάῤῥυσις, they sacrificed to Jupiter and Minerva. The third day, which they called κουρεῶτις, such of their young men and maids as were of age, were admitted into their tribes. The fourth day they called ἐπίβδα.

APHA'CHA, in botany, the name of a genus of plants, the characters of which are these: the flower is of the papilionaceous kind, and its pistil, which arises from the cup, finally becomes a pod which contains roundish seeds. To this it is to be added, that there are only two leaves at every joint of the stalk, and that the tendrils grow from the alæ of these leaves.

There is only one known species of Aphacha, which is the yellow vetching, called, by some, the bind-weed-leaved vetch. *Tournef. Inst.*

APHA'NIS, in the Linnæan system of botany, the name of a genus of plants, the characters of which are these: the cup is a tubular perianthium remaining till the seeds are ripe; it consists of one leaf divided at the extremity into eight segments, which are extremely small, and alternately different in size. There are no petals; the stamina are four erect, pointed, and very small filaments, inserted on the rim of the cup; the antheræ are roundish. The pistillum has two germina of an oval figure, and two styles of the same length with the stamina, inserted on the basis of the germina; the stigmata are headed. The cup supplies the place of a fruit, shutting together at its mouth, and containing two oval, pointed, compressed seeds, of the length of the styles. *Linnæi Genera Plantarum.*

APHE'A, in mythology, a goddess worshipped by the Cretans and people of Ægina.

Aphea, before she was made a deity, went by the name of Britomartis in Crete; her passion for hunting attached her

to

to the train of Diana, and dedicated her virginity to the goddeſs; to avoid the purſuit of Minos, who was deſperately in love with her, ſhe threw herſelf into the ſea, and was taken up in the nets of ſome fiſhermen. Diana rewarded her virtue with the honours of immortality. Britomartis afterwards appeared to the people of Ægina, who paid adoration to her under the name of Aphea.

APHE'LION, *(Dict.)*— The celebrated Dr. Halley has given us the following geometrical method of finding the Aphelia of the planets.

The annual motion of the earth through the ecliptic occaſions an optical inequality in the motions of the other planets, which is well known to aſtronomers that embrace the Copernican ſyſtem, by the name of the parallax of the orbit. And this inequality, which without much labour is derived from obſervations, I lay down as the ſtrongeſt foundation of the following method. In which, beſides obſervations, nothing elſe is ſuppoſed, than that the orbits of the planets are ellipſes, and that the ſun is placed in the common focus of all the orbits; and laſtly, that the periodical times of them all are ſo well known, that no error can be perceived at leaſt in two or three revolutions. Theſe things being granted, firſt I muſt begin with the motion of the earth, which is neceſſarily required to account for the motions of the other planets.

Let S be the ſun, A B C D E *(plate* IV, *fig.* 12.) the orbit of the earth, P, the planet Mars, which for many reaſons is chiefly to be preferred for this purpoſe. And firſt let the true time and place be obſerved, when Mars is oppoſite to the ſun; for then the ſun and earth coincide in the ſame right-line with Mars; or, if he has latitude (which almoſt always happens) with that point where a perpendicular from Mars falls upon the plain of the ecliptic. Thus, in the ſcheme S, A, and P are in a right-line. Again, after 687 days Mars returns to the ſame point P, where he was oppoſed to the ſun in the former obſervation: but, as the earth does not return to A till after 730½ days, in B it regards the ſun in the line S B, but Mars, in the line B P; and, the longitude of the ſun and Mars being obſerved, all the angles of the triangle P B S are given, and, PS being ſuppoſed 100000, in the ſame parts the length of the line S B is found. In like manner, after another period of Mars, the earth being in C, the line SC is found, and ſo likewiſe the lines S D, S E, S F; and the differences of the obſerved places of the ſun are the angles at the ſun A S B, B S C, C S D, D S E. Thus we come at laſt to this geometrical problem, three lines being given both in length and poſition, meeting in one of the focus's of an ellipſis, to find the length of the tranſverſe diameter, and the diſtance of the foci. The reſolution of this problem may be extended alſo to the other planets, if, after the theory of the earth's motion is known, we find out (according to the method propoſed by the right reverend the biſhop of Saliſbury, in his geometrical aſtronomy, lib. 2. part 2. cap. 5.) three diſtances of any planet from the ſun with its poſitions. Now, becauſe the biſhop ſuppoſes the planet ſo to move in its orbit, that in equal lines it compleats equal angles at the other focus of the ellipſis, and upon this ſuppoſition builds his calculations; it will not be improper to ſhew how the ſame thing may be done without that ſuppoſition, which obſervation obliges us to reject.

Let S be the ſun, A L B K *(fig.* 2.) the earth's orbit, P, the planet, or the point in the plain of the ecliptic, marked out by the perpendicular from the planet; A B, the line of the earth's apſides. Firſt let the longitude and latitude of the planet be obſerved, and alſo the ſun's longitude from the earth, in K; and after a period of the ſame planet, the earth being in L, let two poſitions of the planet and the ſun be again obſerved as before. Now from the obſerved longitudes of the ſun and the earth's Aphelion are given the angles A S K, A S L, and conſequently the ſides S K, S L. Now, in the triangle K S L, are given the ſides K S, L S, and the angle K S L; required the ſide K L, and the angles S K L, S L K. Then in the triangle K L P are given K L, K P L, the difference of the obſerved longitudes of the planet, and P K L the difference of the angles S K L laſt found, and of S K P the planet's elongation from the ſun in the firſt obſervation; required L P. Then in the triangle L S P are given the ſides L S, L P, and the angle P L S, the planet's elongation from the ſun in the ſecond obſervation; required the ſide S P and the angle L S P; which being found, it is, as S P to L P, ſo is the tangent of the latitude obſerved at L to the tangent of inclination or latitude to the ſun; and, as the co-ſine of inclination to radius, ſo is S P, the curtated diſtance, to the true diſtance of the planet from the ſun. So at laſt we have found the deſired poſition and longitude. It remains to ſhew, how from three given diſtances from the ſun, with the intercepted angles, to find the middle diſtance excentricity of the ellipſis.

Let S be the ſun, and S A, S B, S C, *(fig.* 3.) three diſtances in due poſition, and drawing A B, B C, let A B be the diſtance of the foci in an hyperbola, and S A — S B = E H be the tranſverſe diameter. Theſe things being premiſed, let the hyperbolical line be deſcribed, whoſe internal focus is at the point A, and the extremity of the longer line S A. In like manner let B, C, be the foci of another hyperbola, whoſe diameter is S B — S C = K L; from which let the hyperbolical line be deſcribed, having its internal focus at the point B. I ſay theſe two hyperbola's thus deſcribed will interſect one another in the point F, which is one of the foci of the ellipſis required; and drawing the line F A, F B, or F C, either S A + F A, S B + F B, or S C + F C, will be equal to the tranſverſe diameter, and S F is the diſtance of the foci. Theſe being ſuppoſed, the deſcription of the ellipſis will be very eaſy. But, whereas the reaſon of this conſtruction may not be obvious to every one, it will not be improper to give ſome illuſtration of it. I ſay therefore, that, from the moſt known property of the ellipſis, it is S B + F B = S A + F A, and tranſpoſing the parts of the equation F B — F A = S A — S B, ſo that, though we did not know F B and F A, yet their difference is equal to S A — S B, that is, to E H. And ſince it is from the nature of the hyperbola, that it has any two lines from their foci to any point in the curve, conſtantly differing by the quantity of the tranſverſe diameter; it is plain that the point F is ſomewhere in the curve of the hyperbola, whoſe tranſverſe diameter is equal to S A — S B, and its foci A and B. In a like manner it may be demonſtrated, that the point F is in an hyperbola, whoſe diameter is S B — S C, and its foci B and C. Therefore it muſt neceſſarily be in the interſection of theſe two hyperbola's, which, as they interſect one another in one point only, plainly ſhew where the other focus of the ellipſis required muſt be.

Now, that the ſame thing may be performed analytically, ſuppoſe it done, and let F B = a, S a — S B = F B — F A = b, A B = c, S B — S C = F C — F B — d, B C = f, and let the ſine of the angle A B C = S, and the coſine of the ſame = s.

Then $c : b :: 2a - b : \frac{2ab - bb}{c}$; and $\frac{2ab - bb + cc}{2c}$ = B D, by 36. *Eucl.* III.

And $f : d :: 2a + d : \frac{2ad + dd}{f}$, and $\frac{ff - 2ad - dd}{2f}$ = B G, by the ſame. Now, to abbreviate the calculation, make $\frac{cc - bb}{2c} = g$, and $\frac{b}{c} = h$; alſo make $\frac{ff - dd}{2f} = k$, and $\frac{d}{f} = l$. Then B D = $g + ha$, and B G = $k - la$.

And becauſe in every {Obtuſe-angled / Acute-angled} Triangle the ſquare of the baſe is equal to the {Sum / Difference} of the ſquares of the ſides, and of the double rectangle of the ſides into the coſine of the contained angle; it will be $gg + 2gha + hhaa + kk - 2kla + llaa + 2gks - 2glsa + 2khsa - 2hlsaa$ is equal to the ſquare of D G. But D G is equal to the ſine of the angle D F G or D B G drawn into F B or a (for F B D G is a quadrilaterum inſcribed in the circle whoſe diameter is F B) therefore S S $aa = gg + 2gha + hhaa + kk - 2kla + llaa + 2gks - 2glsa + 2khsa - 2hlsaa$: which equation is eaſily reſolved, ſince it does not exceed an affected quadratic, and is always compoſed of thoſe ſquares and rectangles. Yet the ſigns + and —, becauſe of the different conſtitution of the three lines, muſt be applied to the rectangles with good caution. *Philoſ. Tranſ. Numb.* 128.

Kepler places the Aphelion of Saturn, for the year 1700, in 28°. 3′. 44″. of Sagittarius: De la Hire, in 29°. 14′. 41″.— The Aphelion of Jupiter in 8°. 10′. 40″. of Libra: De la Hire, in 10°. 17′. 14″.— The Aphelion of Mars in 0°. 51′. 29″. of Virgo: De la Hire, in 0°. 35′. 25″.— The Aphelion of the earth in 8°. 25′. 30.″ of Cancer.— The Aphelion of Venus in 3°. 24′, 27″. of Aquarius: De la Hire, in 6°. 56′. 10.″— And the Aphelion of Mercury in 15°. 44′. 29″. of Sagittarius: De la Hire, in 13°. 3′. 40″.

The annual motion, according to Kepler, of the Aphelion of Saturn is 1′. 10″. of Jupiter 47″. of Mars 1′. 7″.— Of Venus 1′. 18″. and of Mercury 1′. 45″. According to De la Hire, that of Saturn is 1′. 22″. of Jupiter 1′. 34″. of Mars 1′. 7″. of Venus 1′. 26″. and of Mercury 1′. 39″.

APHO'NIA *(Dict.)*—a loſs of ſpeech.

The learned Frederic Hoffman has given a very accurate account of this diſeaſe, and the method of cure.

By the word ſpeech we commonly underſtand ſuch an emiſſion of articulate ſounds, as is capable of conveying the ideas of a man's mind to his neighbour; whereas the voice is not, properly ſpeaking, an articulate ſound, but a certain diverſified illuſion and repercuſſion of the air thrown with a kind of force through the aſpera arteria, the larynx, and its fiſſure called the glottis, to the cavity of the mouth and jaws. Thus, though ſpeech and voice are different things, yet the former cannot ſubſiſt without the latter: for, when the organs neceſſary for emitting ſounds, eſpecially the aſpera arteria, and its head the larynx, with their reſpective cartilages, muſcles, and nerves, or the roof of the mouth, are vitiated, the power of forming ſounds, and, conſequently, the faculty of of speech, is destroyed. Now, Galen long ago proved by reiterated experiments, that when one of the recurrent nerves which are formed by the par vagum and the nervus accessorius, and reach to the larynx, and, according to Winslow, to the tongue itself, is cut, the animal becomes only capable as it were of an half and unfinished pronunciation; and, when both are cut, it loses at once the power of uttering sounds, and the faculty of speech; or, in other words, becomes intirely dumb.

This incapacity of emitting sounds, and consequent loss of speech, a case which frequently happens in hysteric suffocations, is by physicians called Aphonia. But I take the word Aphonia in a more restrained sense, and confine it to the incapacity of speaking or emitting articulate sounds, which depends on some fault of the tongue; in which case sounds may be uttered, but the faulty tongue cannot articulate them right, and seems, as it were, to be silenced by its own fruitless struggles. There is an affinity betwixt this distemper and that hesitation in speaking, which we commonly call stammering; in which case indeed articulate sounds are formed, but not distinctly enough expressed, because the tongue is too slow, as it were, and incapable to cloath the ideas with language, with the same celerity with which they are excited in the mind.

Now, since in an Aphony the tongue is principally in fault, and since we consider it as the seat of the disorder, it will not not be improper to take such a view of its structure as we think necessary, to answer our present purpose. The tongue then is a muscle of all others perhaps the most moveable, by reason of its longitudinal, transverse, perpendicular, acuminated, angular, and other variously disposed fibres; and by means of the mylo, stylo, hyo, and genioglossi muscles, as well as those ascribed to the os hyoides, it can move itself most nimbly and expeditiously in all possible directions. These muscles now mentioned derive their vis motrix, or moving power, from the third branch, called the lower maxillary branch, of the fifth pair of nerves, which is almost totally employed in producing motion; just as the ninth pair seems to be destined for the purposes of taste.

If by the volubility of the tongue, and its capacity of moving in all directions, sounds formed by the assistance of the larynx are modified into certain letters, speech is produced; but, the more difficult the motion of the tongue is, the more difficult speech must consequently be; and when its mobility ceases, the facility of speech is destroyed with it, though sounds at the same time may be clearly enough uttered.

Since the motion of any given part is either diminished or destroyed by the diminution or interception of the nervous fluid, which should flow into its nerves; and since the nerves, destined for the motion of the tongue, arise principally from the fifth pair; it plainly appears, that the seat of an Aphony is to be sought for in the said pair, and that the influx of the nervous fluid into that nerve, being more or less diminished, is to be assigned as its immediate cause. In this opinion we shall be confirmed, if we carefully dissect human subjects, who during their lives were aphonous. Thus Bonetus (in Sepulchr. Anat. lib. 1. sect. 22. obs. 7.) affirms, that in a man, whose melancholy degenerated into madness, and who remained aphonous to his very death, he found the brain very dry, and the origin of the nerves in the same state, but much smaller than ordinary, the tongue in the mean time remaining unaffected; and (obs. 20.) he quotes a case, from Riverius, of a stammering person, in whose brain about the lingual nerves a cystis was found with a hole in it, from which a serum always drivelled.

Whatever therefore tends to hinder the influx of the nervous fluid into the nerves destined to the motion of the tongue, that very thing contributes proportionably to the bringing on an Aphony. Hence a palsy of the tongue, which is either antecedent or subsequent to hemiplectic or apoplectic disorders, deserves our most attentive consideration. This disorder sometimes happens in old men, and in languid or much weakened constitutions. If it appears alone, it is generally the unwelcome omen of an approaching hemiplexy or apoplexy; but if it succeed these disorders, and is complicated with a weakness of memory, and a sluggish heaviness of the mental powers, it threatens the return of the former distemper. In this case the tongue is generally tumid, flaccid, half numbed, less susceptible of motion than in its natural state, and its taste impaired; and in an hemiplegia is vitiated and faulty only in one side.

That Aphony is like to terminate more happily, which proceeds from a stagnation, or secession of serous humours compressing the nerves of the fifth pair, which run to the tongue; but it is no less afflicting to the patient, and proves sufficiently obstinate against the means of cure. Aphonies of this kind happen after the striking-in of serous pustules and efflorescences, especially in moist and rainy seasons.

There also arises an Aphony from too great a congestion of blood in the fauces and tongue; but this species of the disorder generally uses to quit the patient immediately, upon lessening the quantity of humours. An instance of this degree of disorder's being cured, by a subsequent hæmorrhage from the nose, may be seen in the *Acta Academ. Natur. Curios.*

An Aphony proceeding from worms lodged in the cavities of the stomach and intestines deserves our consideration, because it occurs pretty frequently. This species of the disease seizes the patient suddenly, but ceases to rage when the worms, its remote and secondary cause, are dislodged.

The cure.—The first intention of cure, in an Aphony, is to remove the causes compressing the lingual nerves, and thereby hindering the influx of the nervous fluid into them. The second is to strengthen them, and corroborate the weakened parts: but, as these causes differ widely from one another, so he that will take the trouble of thinking, must plainly perceive, that they call for proportionably different methods of treatment; and it is no hard matter for any one to see, that an Aphony, produced by a cause that lies latent and remote in the cavity of the cranium, must with incredible difficulty admit of a cure.

That species of Aphony therefore which proceeds from a true palsy of the tongue, calls for a discussion and evacuation of the serum, which compresses the nerves and brain: the cure is therefore to be attempted by venesection, pretty sharp clysters, diuretics, sternutatories, &c. but especially nervous and balsamic medicines are to take place, and be applied even externally to the tongue itself. For this purpose the following are recommended:

Strong waters of lily of the valley, cowslips, rosemary, mother of thyme, of ants, essence of amber, and of Peruvian balsam, oil of cinnamon, and of clove-gilliflowers, and a few drops of my balsamum vitæ, taken in sugar, and kept under the tongue. Internally also the same balsamum vitæ, mixed with three parts of the vinous spirit of sal ammoniac, and two parts of the acid tincture of antimony, may be taken with great success, twice or thrice a day; and the dose may be thirty drops. Neither will it be improper to apply a gentle vesicatory to the nape of the neck.—The reader will find the method of making the balsamum vitæ, under the article BALSAMUM *Vitæ*.

If suppressions of sweat, or a stop put to the usual excretion in case of a catarrh, have contributed to the disorder, nothing can be used with greater advantage and efficacy, than diaphoretics and diuretics, duly and skilfully prescribed; for, immediately upon the diaphoresis being restored, the faculty of speech returns. Infusions to be drank by way of tea, a mild regimen, succinated spirit of harts-horn, acid tincture of antimony, and essence of amber, especially if they be mixed with balsam of Peru, or my balsamum vitæ, are also most sovereign and efficacious remedies in this case.

An Aphony sometimes seizes the patient under a mercurial salivation, that is, when the serous and salival humours flow to the tongue and fauces in too great a quantity. In this case, the intention of cure consists in making a derivation and evacuation of those humours from the head. This end is most effectually answered by diaphoretic decoctions drank warm; by laxatives, and especially by cephalic pills of a pretty sharp and stimulating quality, a proper regimen in the mean time being entered into, and carefully persisted in.

In an Aphony which remains after the shocks of an hemiplexy or apoplexy, and has all the appearances of being sufficiently obstinate, I have observed remarkable effects, produced by applying to the nape of the neck plaisters prepared of turpentine or pitch, and the gums caranna and mastich; for other remedies, how rich and generous soever, generally come short of expectation, and disappoint our hopes in this case.

If an Aphony proceeds from too great a congestion of blood in the head, the whole cure consists almost in letting blood in proper places, and in due quantities. The quantity taken from the patient must be large, and drawn, just as circumstances require, either from the arm, the feet, or sometimes the veins under the tongue. Cupping and scarification are also proper. The feet must also be washed, in order to procure a derivation of the humours to the inferior parts. Nitrous antispasmodic medicines are also to be used internally, because, in cases of this nature, the spasms of the lower parts are generally complicated with some other disorders: for this reason, temperating powders, mixed with nitre and cinnabar, or my anodyne liquor, mixed with essence of castor, are highly serviceable in this case. See *Anodyne* LIQUOR.

Though bleeding is a circumstance of great importance and efficacy in the present case, yet it is not to be used indiscriminately and at random; for in old men, languid constitutions, and patients of phlegmatic habits, or those whose strength is exhausted, it does more harm than good; and, if drawn in a larger quantity than is sufficient to answer the end, is so far from guarding against it, that it even excites and brings it on. Phlebotomy then should rather take place where the pulse is quick and large, and the face red and turgid with blood. And even in this case it is not to be used, till the strictures of the lower parts are relaxed, and mitigated by previous clysters, frictions, and bathing of the feet. Plethoric people before bleeding should carefully abstain both from the internal and external use of the hotter, more ſpirituous, and nervous medicines; becauſe they ſtimulate the humours more, and hurry on their congeſtion to the fauces.

If ſpaſmodic conſtrictions of the fauces and tongue have produced an Aphony, as happens in hyſteric and hypochondriac paroxyſms, which are attended with difficulty of deglutition, external paregorics are of more ſervice than in ternal medicines. For this purpoſe a little caſtor, or nutmeg, or theriaca, or ſage, may be held under the tongue; or a few drops of the balſamum vitæ, mixed with ſome anodyne liquor, may be poured upon the tongue. Beſides, bathing the feet, carminative clyſters, emollient fomentations and baths, are highly ſerviceable in this caſe.

Laſtly, that Aphony which is produced by worms lodged in the cavities of the inteſtines and ſtomach, is eaſily cured by anthelminthic medicines, and ſuch as relax and mitigate the ſtrictures of the inteſtines; for, when theſe are at an end, the power of ſpeaking returns, but is again frequently loſt, till the worms, the remote cauſe of the diſorder, are diſlodged: For this reaſon, when the ſpaſms are gone, the phyſician is to endeavour, by proper remedies, to diſlodge theſe troubleſome animals, as effectually as he poſſibly can. *Hoffman.*

APHRA'CTÆ, in antiquity.— The gallies of the ancients which were open without any deck, and had only one bank of oars, were diſtinguiſhed by this appellation from the cataphractæ which had decks.

The Aphractæ had only at the ſtem and ſtern a little floor of planks, which they mounted to fight on; but this method of building was not general.

It alſo appears from hiſtory ſome veſſels were called Aphractæ, which were cloſe and had a deck with one of theſe raiſed floors at their ſtern which they called roſtra. Livy, ſpeaking of Octavius, ſays, that when he ſailed from Sicily with thirty men of war and two hundred ſtore-ſhips, he had not good weather all the voyage, for, when he was juſt arrived in ſight of the African coaſt with a fair wind, on a ſudden he was retarded by a calm; after which the wind changed, and a ſtorm riſing diſperſed his fleet, and he had great difficulty to keep his naves roſtratæ from ſinking by the help of his oars. Here he calls thoſe naves roſtratæ, which he had before called naves longæ, men of war. He ſays, beſides, that open boats were built with roſtra at their ſtern; from whence it follows, that the difference between the Aphractæ and cataphractæ conſiſted principally in this, that the Aphractæ were open boats, the cataphractæ decked veſſels; for the roſtrum was common to both.

APHRODI'SIA, in antiquity, feſtivals in honour of the goddeſs 'Αφροδίτη, or Venus. There were ſeveral of theſe Aphrodiſia, obſerved in divers parts of Greece; the moſt remarkable was that at Cyprus, firſt inſtituted by Cinyras, out of whoſe family certain prieſts of Venus were elected, and for that reaſon named κινυράδαι. At this ſolemnity ſeveral myſterious rights were practiſed: all who were initiated to them offered a piece of money to Venus as an harlot, and received, as a token of the goddeſs's favour, a meaſure of ſalt, and a φαλλὸς; the former, becauſe ſalt is a concretion of ſea water, to which Venus was thought to owe her birth; the latter, becauſe ſhe was the goddeſs of wantonneſs. *Pott. Archæol. Græc.*

APHRODI'TE *, a name of Venus.

* The word is Greek, and derived from ἀφρὸς, foam; becauſe, according to the poets, Venus ſprung from the foam of the ſea.

APHRODI'TES, in natural hiſtory, a name given by ſome authors to the fineſt ſpecies of amethyſt.

The ancients had a way of diſtinguiſhing what they allowed to be gems, into ſeveral kinds, according to their degrees of colour: theſe they called ſo many ſpecies, and gave to each its peculiar name. This has been the occaſion of no little confuſion among the writers on theſe ſubjects, by ſeemingly enlarging the number of the gems. The pæderos and gemma Veneris of the antients are the ſame ſtone with this, though many have applied theſe names to the opal.

A'PHTHÆ *(Dict.)* Aphthæ, or ſmall ulcers, are frequent in acute diſeaſes, attended with inflammations of ſome of the viſcera. Theſe are ſmall, round, ſuperficial ulcers, on the inſide of the mouth; which, upon an accurate examination, appear to be exulcerations of the extremities of the excretory ducts of thoſe glands which ſeparate the ſalivary humour, and convey it to the mouth: now, when this fluid is, by any cauſe, rendered too thick and viſcid, it ſtops up the extremities of theſe canals, which, upon this, exulcerate.

Every part, therefore, into which ſuch excretory ducts diſcharge themſelves in a natural ſtate, are ſubject to Aphthæ; as the lips, gums, internal parts of the cheeks, tongue, palate, fauces, tonſils, uvula, throat, ſtomach, and ſmall inteſtines.

It is ſaid, that the large inteſtines, though rarely, are infeſted with theſe ſmall exulcerations; and that they are propagated through the whole inteſtinal tube.

The northern people, who inhabit marſhy places, are moſt ſubject to Aphthæ in a hot and rainy ſeaſon; and infants and old people are, in general, moſt affected with them. But in countries which are warm or mountainous, or where the air is habitually ſerene and dry, they are ſcarcely, if ever, known.

Aphthæ, in the mouth, are uſually preceded by a continual putrid fever; or an intermittent, degenerated into a continual fever, which began with a diarrhœa or dyſentery; a conſiderable and perpetual nauſea, vomiting, loſs of appetite, and great anxieties about the præcordia, frequently returning; by great weakneſs, or any conſiderable evacuation of the humours; by ſtupor and heavineſs; by unequal, but perpetual, and not very violent drowſineſs; and by perpetual complaints of a ſenſation of heavineſs and pain about the ſtomach: and it is remarkable, that thoſe preceded by great evacuations of the humours are very dangerous.

Sometimes, in the beginning, a ſolitary puſtule will appear in different parts of the mouth; as upon the tongue, in the angles of the lips, in the fauces, or elſewhere, without any certainty as to the part on which they are firſt viſible; and theſe are generally of a mild nature. But, ſometimes, they appear firſt at the lower part of the fauces, and a white thick cruſt, ſhining like new bacon, which adheres firmly to the parts, and aſcends ſlowly, ſeems, as it were, to proceed from the œſophagus: theſe are uſually a very bad ſort, and generally fatal. But the worſt ſort, and of which the patient very ſeldom recovers, are thoſe which cover the whole mouth, as far as the extremities of the lips, with a hard, firm, thick, and tenacious kind of cruſt. The two laſt ſpecies ſhould ſeem to have their origin in the ſtomach, and thence to aſcend into the mouth.

The malignancy of Aphthæ may be eſtimated by their colour. Thus thoſe which are white and pellucid, and almoſt of the colour of pearls, are the leaſt malignant; thoſe which are white, but opaque, by reaſon of their thickneſs, are more ſo; but not ſo bad as thoſe which are brown, yellow, or livid: the black are, of all others, the worſt.

When theſe Apthæ, or apthoſe cruſts, have adhered ſome time to the parts affected, they begin to ſeparate, and be looſened from the ſubjacent part, and to fall off, ſo that all the affected parts are, by degrees, and ſucceſſively, freed from them: but this ſeparation is effected in ſome kinds ſooner, in others later. And hence, alſo, we may judge of the degrees of malignity; for, the ſooner the ſeparation happens, the leſs is the danger.

Sometimes theſe, when fallen off, are immediately ſucceeded by freſh Aphthæ; but ſometimes this ſucceſſion happens more ſlowly, and ſometimes not at all: ſometimes, alſo, the ſucceeding Aphthæ are as thick, or more ſo, than the firſt; and hence, alſo, the danger may be eſtimated; for the ſooner they are renewed, and the thicker, the greater is the malignity.

From conſidering what has been premiſed, we may readily form an idea of the ſeat, nature, cauſe, and ſymptoms of the Aphthæ, and of their different ſorts; and hence, alſo, their effects may be underſtood.

Thus, if ſuch an aphthoſe cruſt, as is above deſcribed, covers the whole ſuperficies of the parts mentioned, all ſenſation, which ſhould be communicated to the nerves, is intercepted, and the patient loſes his taſte. Beſides this, the egreſs of the fluids, by theſe obſtructed emiſſaries, is utterly prevented; the conſequences of which are, a drineſs of the parts, a dilatation of the ſubjacent veſſels, a putrefaction of the fluids ſtagnating under the aphthoſe cruſt, and an inflammation of the parts themſelves in which they ſtagnate.

Hence, alſo, the orifices of the abſorbent veſſels are obſtructed in ſuch a manner, that no freſh chyle, fluids, or medicines, can enter them; and this produces all thoſe diſorders which may proceed from a deficiency of nouriſhment, and, in the end, death.

When theſe cruſts fall off, there is an increaſed flux of humours from the mouths of the diſtended veſſels now opened; hence a large diſcharge of ſaliva, or a diarrhœa, which are good ſymptoms, if the aphthoſe cruſts are not renewed; but bad, if they are.

Upon the falling off of the cruſts, a great pain ſucceeds of the parts underneath, which are now inflamed and expoſed: theſe often diſcharge blood, whence bloody ſaliva, and a bloody dyſentery.

If what has been ſaid is applied to the ſtomach, the excretory ducts of the liver, pancreas, and of the other glands which open into the inteſtines, we may form an idea of an infinite number of diſorders ariſing from this diſtemper; inſomuch that a farther detail of the prognoſtics will be ſuperfluous.

If theſe ulcerous cruſts are very ſlow of ſeparation, thick, broad, and compact, the ſubjacent fleſh, being, as it were, ſuffocated, inflames, ſuppurates, or even mortifies; the conſequences of which are malignant ulcers, which ſometimes affect the os palati, and its perioſteum: hence we may judge of their effects in the ſtomach and inteſtines.

The cure.— 1ſt, The impulſe of the vital fluids, upon the parts affected, is to be gently excited, and ſo conducted, that, by a proper ſupply of fluids, the ulcerous cruſts may be looſened, ſeparated, and fall off: this is effected by drinking great quantities of warm, diluting, reſolving, and abſterging liquids.

liquids. And becaufe, in fome bad cafes, the orifices of the lacteals are fo obturated, as not eafily to admit the liquids thus taken; fomentations, vapours, and baths, are of fingular ufe. The very beft aliment is bread boiled in water, and then mixed with wine and honey.

Take, of fweet almonds blanched, two ounces; of piftachio-nut kernels, one ounce; of the four greater and leffer cold feeds bruifed, each three drachms; of excorticated oats, three ounces: boil thefe in a fufficient quantity of water, that two pints of liquor may at laft remain in a clofe veffel for an hour; and then add, of liquorice root, an ounce, and let them boil together a little: then let the boiled ingredients be thoroughly bruifed in the decoction, and of this let the patient drink frequently; and with this let him wafh his mouth: Or,

Take, of the roots of carrots, fkirrets, china, farfaparilla, and turneps, each four ounces; of whole barley, an ounce: let thefe ingredients be well bruifed, and boiled in water; and, to thirty ounces of the expreffed liquor, add, of fyrup of marfh-mallows, an ounce. Let this be ufed as the preceding.

Take, of the roots of turneps unpared, a fufficient quantity; let them be grated or rafped, and let the juice be preffed out; and, whilft it is boiling, let it be defpumated; then, to fixteen ounces of this juice, add the yolks of two eggs, and of fyrup of violets two ounces. Let the patient take half an ounce every half hour.

The moft proper aliments, befides thofe mentioned before, are decoctions of the farinaceous vegetables.

2dly, The cruft muft be difpofed to feparate foon and eafily; which is effected by fomentations, gargarifms, and clyfters: thefe muft confift of warm, relaxing, emollient, and deterging liquors, which moiften the parts by adhering to them a fufficient time, and which refift putrefaction. Thus,

Take, of the leaves of mallows, brank-urfine, marfh-mallows, pellitory of the wall, mullein, mercury, lady's-mantle, each two ounces; of the roots of marfh-mallows, one ounce; of the roots of turneps, ten ounces: to three pints of the decoction, made with water and expreffed, add the yolks of four eggs, and honey of rofes two ounces. With this let the mouth be perpetually wafhed or gargled.

Make a cataplafm of the refiduum, to be applied externally to the region of the fauces.

Let clyfters, alfo, of this decoction, be adminiftered.

3dly, As foon as the cruft is fallen off, it will be proper to ufe anodyne and demulcent remedies, and fuch as contribute to ftrengthen the relaxed parts. Thus,

Take, of fyrup of white poppies, two ounces; of cream, two ounces; the yolks of two eggs; of rofe-water, two ounces: let a little of this be held continually in the mouth. Or,

Take of the jelly of harts-horn, or of flefh, made very thick, and cut into flices, a fufficient quantity: let one of thefe flices be perpetually diffolving on the tongue, and fo gradually fwallowed.

Thefe two medicines act agreeably upon the excoriated parts, and the following contributes to ftrengthen them.

Take, of the decoction of the frefh leaves of agrimony, feven ounces; of honey of rofes, an ounce: let this be applied perpetually to the afflicted parts.

4thly, As foon as the fever is abated, a fediment appears in the urine, and the pulfe begins to be free, corroborating medicines are to be directed. Thus,

Take, of the root of the fharp-pointed dock, one ounce; of the Peruvian bark, and that of tamarifk, each fix drachms; of the leaves of agrimony, one handful: boil thefe ingredients in a fufficient quantity of water, and to a pint and an half of the decoction add, of the fyrup of kermes, an ounce. Of this let the patient take half an ounce every hour. This corroborates the relaxed veffels of the inteftines. *James's Dict.*

APHYLLA'NTHES, in botany, the name of a genus of plants, the characters of which are thefe: the flower is of the liliaceous kind, and is compofed of fix petals which arife from the center of a fquamofe and fome degree tubular cup; the piftil arifes alfo from the cup, and finally becomes a trigonal turbinated fruit, which, when ripe, burfts into three parts or cells, which contain roundifh feeds. *Tournef. Inft.* p. 657.

There is only one known fpecies of this plant, which is the Montpelier Aphyllanthes, called by fome the blue Montpelier pink.

A'PIARY (*Dict.*) — Methods of making an Apiary. When there are but few bees, it is ufual to fet them in any corner of the garden, or court; and fometimes in clofes adjoining to the houfe; though fome, for want of room without doors, have fet them in lofts or upper rooms; but this is not fo proper for them. If a perfon intends to have a confiderable ftore of bees, a fquare plat muft be made by itfelf, proportioned to the number of bees intended to be kept, not quite a fquare, but rather lower extended from eaft to weft, but fo contrived that they may have as much of the morning and evening fun as poffible. The Apiary fhould be fecurely defended from high winds on either fide, either naturally by hills, trees, &c. or artificially by houfes, barns, walls, &c. It ought alfo to be well fenced from cattle, efpecially hogs, and from all forts of fowl, their dung being very prejudicial to them; neither fhould there be any ill fmells, nor any poultry kept near the place.—The Apiary fhould be furnifhed with ftools or benches, of wood or ftone; but the firft is beft, ftone being hot in fummer, and cold in winter: thefe are placed at different heights, but about twelve inches is a good height; they fhould be fet a little fhelving, that the rain may run off; they fhould alfo be two or three inches wider than the hives fet upon them, and at leaft five feet diftant from the other.

To have a compleat Apiary, for every ftock of bees intended to be kept, make a cot or houfe about two feet fquare, and two and a half high, fet on four legs about ten inches above ground, covered over with boards or tiles to keep off the rain, the back or north fide being clofed up, and the fides facing the eaft and weft, to have doors with latches and hafps to them; the fore or fouth fide to have a falling door to cover one half thereof, which is to be raifed up at pleafure, and in fummer-time ferves for a pent-houfe, not only to keep off the beating rain from the hives, but to defend them from the extreme heat of the fun, which at noon-day is apt to melt the honey. The other lower half fhould have two fmall doors to open to either hand, which will ferve to defend the doors or holes of the hives from injurious winds: all the doors may be faftened in winter, when the weather is too cold, or in fummer, when it is too hot for the bees; only making a little open fquare at the bottom of the little doors juft againft the bee-hole, that the bees may have fome liberty to fly abroad, after the doors have been fhut: by means of the fide doors, efpecially if the weft door be made to open to the right hand, a perfon may fit fafe, and fee the feveral workings of the bees in glafs hives, if any fuch are ufed; if not, at thefe places he may order, view, and obferve them better than when they ftand on naked ftools, and with lefs offence to the bees, and more fecurity to himfelf.

In the winter feafon, if the Apiary ftand cold, good fweet ftraw may be ftuffed within the doors about the hives to keep them warm; but extremity of cold does not hurt bees fo much in the winter as wet, from which thefe cafes beft preferve them; or as light, and the warm beams of the fun, at fuch time when there is no provifion abroad for them, againft which this houfe or cot is the beft prefervative; for, when the doors are fhut, though the fun fhine, yet they are infenfible of it, the hives ftanding fix or eight inches within the doors; whereas, after the common way of benches or ftools, the fun cafts rays to their very doors, which warmth and light together draw them out, at the expence of their provifions and lives together, as is evident from frequent experience, the mildeft and cleareft winters ftarving and deftroying moft bees; when, on the contrary, the coldeft and moft frozen beft fecure them.

A'PIOS, the knobbed-rooted Viginian liquorice vetch, in botany, a genus of plants, whofe characters are: it has a climbing ftalk; the leaves grow almoft oppofite, and faftened, as it were, to the mid-rib; the root is tuberous.

There is, at prefent, but one fpecies of this plant known to us, which is, *Apios Americana Cornuti*; the American Apios of Cornutus.

This plant hath large knobbed roots, which part as they grow old, by which means the plant is increafed; for it rarely produces ripe feeds with us: it is hardy, and will endure the cold in the open ground, if planted in a dry foil; but is fubject to rot with too much wet in winter: it dies to the root every autumn, and rifes again the fucceeding fpring, and will twift itfelf round a pole, and grow to the height of eight or ten feet, and produce, in July, fine fprigs of flowers: it hath alfo been planted near arbours, where it hath covered them very well towards the latter end of fummer, but is cut down with the firft cold of autumn: and in fevere frofts the roots are often deftroyed, where they are not well covered with litter or tanners bark; for want of this precaution, moft of the roots of this plant were deftroyed in the hard winter, 1739-40. *Miller's Gard. Dict.*

A'PIS, a famous deity among the Egyptians, reprefented by an ox with certain external marks. Into this animal, according to the Egyptians, the foul of the great Ofiris retired and withdrew itfelf from the world. He gave this creature the preference, becaufe the ox is the fymbol of agriculture, the perfection of which this prince had very much at heart.

The ox, Apis, muft have a ftar in the forehead, that is, a fquare white mark, the figure of an eagle on his back, a knot under his tongue in the form of a beetle, the hair of his tail double, and a crefcent on his right flank; and the cow that bore him muft have conceived by a clap of thunder.

As it is difficult to apprehend nature fhould produce an animal with all thefe marks, requifite for an Apis, we muft fuppofe that the priefts took care, by impreffing the neceffary marks on young calves, to be provided always with one.

And if it happened at any time an Apis could not immediately be found, and they were obliged to put it off for some time, it was, certainly, because they were very careful not to be thought guilty of the imposition. But this artifice seems needless; people, on these occasions, voluntarily shut their eyes. When they had found the Apis, before they carried him to Memphis, they fed him forty days in a city on the Nile. Women only were permitted to see and wait upon him, and these were obliged to present themselves before the divine ox in an undress. After these forty days, they put him on board a superb vessel, and brought him down the Nile to Memphis, where the priests received him with all imaginable pomp; they were attended by numbers of people, and children were happy who could smell his breath, because they imagined it inspired them with the gift of prophecy.

On his arrival at Memphis, they conducted him to the temple of Osiris, wherein were two magnificent stalls; one of which was built by Psammeticus, supported by statues, after the manner of the colossus, twelve cubits high; here he continued almost always shut up, being hardly ever seen but by strangers, to whom he was shewn in a little meadow joining to the temple. If they at any time led him about the city, he was attended by officers to keep off the croud, and accompanied by young children who sung his praises.

According to the sacred books among the Egyptians, the god Apis had a certain appointed time to live; near the expiration of which, the priests brought him forth, and led him to the banks of the Nile with great pomp and solemnity, and drowned him in that river. He was afterwards embalmed, and his obsequies celebrated in so expensive a manner, that the charge generally ruined the person to whom the care of his funeral was committed. Under Ptolemæus Lagus, they borrowed fifty talents to celebrate the funeral of Apis. The people, at the death of Apis and his embalming, lamented as if they had lost Osiris, and the mourning continued till the priests thought proper to shew them another Apis to succeed him. At the sight of their new god they rejoiced, as if their prince had risen from the dead; and the festival on this occasion lasted seven days.

Cambyses, king of Persia, on his return from Ethiopia, found the Egyptians celebrating their festival on account of the appearance of their god Apis; and, imagining they made rejoicings at the ill success of his expedition, commanded the pretended god to be brought before him, whom he slew with his sword, buffeted the priests, and ordered his soldiers to destroy all they should find celebrating this festival.

The Egyptians consulted Apis as an oracle; if he took what was offered him to eat readily, it was looked on for a good omen; his refusal, on the contrary, was accounted a presage of ill fortune. Pliny, an author of no mean reputation for sagacity and judgment, observes that Apis would not eat what Germanicus offered him, and that this prince died soon after. Surely, he could not be of opinion there was any connection between these two events. It was the same with regard to the two stalls they had built him, his continuing in one foreboded happiness to Egypt; his removal into the other, the contrary. Those who went to consult this god, laid their mouth close to his ear, and their hands upon their own, keeping them stopped till they were without the walls of the temple, and then took the first thing they heard for the answer of the god.

APO'CALYPSE (*Dict.*)— This book, according to Irenæus, was written about the year 96 of Christ, in the island of Patmos, whither St. John had been banished by the emperor Domitian. But Sir Isaac Newton, with very good reason, places the writing this book earlier, viz. in the time of Nero, Some attribute this book to the arch-heretic Cerinthus: but the ancients unanimously ascribed it to John, the son of Zebedee, and brother of James. This book has not, at all times, been esteemed canonical. There were many churches in Greece, as St. Jerom informs us, which did not receive it; neither is it in the catalogue of canonical books prepared by the council of Laodicea, nor in that of St. Cyril of Jerusalem: But Justin, Irenæus, Origen, Cyprian, Clemens of Alexandria, Tertullian, and all the fathers of the fourth, fifth, and the following centuries, quote the Revelations as a book then acknowledged to be canonical. The Alogians, Marcionites, Cerdonians, and even Luther himself, rejected this book: but the Protestants have forsaken Luther in this particular; and Beza has strongly maintained against his objections, that the Apocalypse is authentic and canonical.

The Apocalypse consists of twenty-two chapters. The three first are an instruction to the bishops of the seven churches of Asia Minor. The fifteen following chapters contain the persecutions, which the church was to suffer from the Jews, Heretics, and Roman emperors. Next, St. John prophesies of the vengeance of God, which he will exercise against those persecutors, against the Roman empire, and the city of Rome, which he describes under the name of Babylon, the great whore, seated upon seven hills. In the last place, the 19th, 20th, 21st, and 22d chapters describe the triumph of the church over its enemies, the marriage of the Lamb, and the happiness of the church triumphant.

'It is a part of this prophecy (says Sir Isaac Newton) that it should not be understood before the last age of the world; and therefore it makes for the credit of the prophecy, that it is not yet understood.— The folly of interpreters has been to foretel times and things by this prophecy, as if God designed to make them prophets. By this rashness they have not only exposed themselves, but brought the prophecy also into contempt. The design of God was much otherwise: he gave this and the prophecies of the Old Testament, not to gratify men's curiosities, by enabling them to foreknow things, but that, after they were fulfilled, they might be interpreted by the event, and his own providence, not the interpreters, be then manifested thereby to the world.— There is already so much of the prophecy fulfilled, that as many as will take pains in this study, may see sufficient instances of God's providence.— Amongst the interpreters of the last age, there is scarce one of note, who has not made some discovery worth knowing; and thence I gather, that God is above opening these mysteries.

The Apocalypse of John is written in the same style and language with the prophecies of Daniel, and hath the same relation to them, which they have to one another; so that all of them together make but one consistent prophecy, pointing out the various revolutions that should happen, both to the church, and to the state, and, at length, the final destruction and downfal of the Roman empire. *Newton on Prophecies.*

APO'CRYPHA *, or *apocryphal books*, such books as are not admitted into the canon of scripture, being either not acknowledged as divine, or rejected as heretical and spurious.

* The word is Greek ἀπόκρυφα, which is derived from ἀπὸ and κρύπτω, which signifies to hide or conceal.

When the Jews published their sacred books, they only gave the appellations of canonical and divine to such as they then made public; and such as were still retained in their archives they called Apocryphal, for no other reason, but because they were not public; so that they might be really sacred and divine, though not promulged as such.

Thus, in respect of the Bible, all books were called Apocryphal, which were not inserted in the Jewish canon of scripture.—Vossius observes, that, with regard to the sacred books, none are to be accounted Apocryphal, except such as have neither been admitted into the synagogue, nor the church, so as to be added to the canon, and read in public.

The Protestants do not only reckon those books to be Apocryphal which are esteemed such in the church of Rome, as the prayer of Manasseh king of Judah, the third and fourth books of Maccabees, the third and fourth book of Esdras, St Barnabas's epistle, the book of Hermas, the addition at the end of Job, and the 151st psalm.

But also Tobit, Judith, Esther, the book of Wisdom, Jesus the son of Sirach, Baruch the prophet, the song of the three children, the history of Susanna, the history of Bell and the dragon, and the first and second book of Maccabees.

It is not pretended that these books were received by the Jews, or so much as known to them. None of the writers of the New Testament cite or mention them: neither Philo nor Josephus speak of them. The Christian church was for some Ages an utter stranger to these books. Origen, Athanasius, Hilary, Cyril of Jerusalem, and all the orthodox writers, who have given catalogues of the canonical books of scripture, unanimously concur in rejecting these out of the canon. And for the New Testament they are divided in their opinions, whether the epistle to the Hebrews, the epistle of St. James, and the second epistle of St. Peter, the second and third epistles of St. John, the epistle of St. Jude, and the Revelations, are to be acknowledged as canonical or not.

The Protestants acknowledge such books of scripture only to be canonical as were so esteemed to be in the first ages of the church; such as are cited by the earliest writers among Christians, as of divine authority; and after the most diligent enquiry were received, and so judged to be by the council of Laodicea. The several epistles above mentioned and the book of Revelations, whatever the sentiments of some particular persons are, or may have been of them, are allowed by all the reformed churches to be parts of the canon of the New Testament.

APOCY'NUM, *dogs-bane*, in botany, a genus of plants, whose characters are: the leaves are produced opposite, by pairs, upon the branches: the flower consists of one leaf, which is cut into several segments: from its flower-cup arises the pointal, which is fixed like a nail in the back part of the flower, and is afterwards changed into a fruit, which is, for the most part, composed of two capsules, or pods, which open from the base to the top, inclosing many seeds, which have a long pappous down adhering to them: to this may be added, that the whole plant abounds with a milky juice.

There are several sorts of this plant cultivated in the curious gardens of plants, some of which are very beautiful, and deserve a place in every good garden. *Miller's Gard. Dictionary.*

APOLLINA'RIAN *Games*, *Apollinares ludi*, in antiquity, games at Rome, celebrated yearly in honour of Apollo, on the fifth day of July, under the direction of the prætor, in the circus maximus.

The occasion was a kind of oracle delivered by the prophet Marcus after the fatal battle at Cannæ, declaring, that to expel the enemy, and cure the people of an infectious disease, which then prevailed, sacred games were to be annually performed in honour of Apollo. The prætor to have the direction of them, and the decemviri to offer sacrifices after the Grecian rite. *See Livy*, *l.* 25. *c.* 12.

APOLLO'NIA, Ἀπολλωνία, in antiquity, feasts sacred to Apollo at Egialea.

The occasion of their institution is thus related: Apollo, after his victory over Python, went to Egialea, accompanied with his sister Diana; but, being frighted thence, fled into Crete. After this the Egialians were infected with an epidemical distemper, and, being advised by the prophets to appease the two offended deities, sent seven boys, and as many virgins, to intreat them to return; Apollo and Diana accepted their piety, and came with them to the citadel of Egialea, in memory of which a temple was dedicated to Pitho the goddess of persuasion; and it became a custom to appoint chosen boys and virgins to make a solemn procession, in shew, as if they designed to bring back Apollo and Diana; which solemnity was continued till Pausanias's time. *Pott. Archæol Græc.*

APO'MYOS *Deus*, in the mythology of the ancients, a name under which Jupiter was worshipped at Elis, and both Hercules and Jupiter at the Olympic games.

APO'PHTHEGM, a wise, short, and pithy saying.

A'POPLEXY *(Dict.)*— It has been the general opinion of physicians, that an Apoplexy is caused by an extravasation of the fluids, or the fulness of the vessels. But the learned M. le Cat, by curing a surprizing hydrocele in the head, has shewn that this opinion is ill founded; for the patient, notwithstanding the prodigious quantity of water, which continually pressed on the brain, had not the least symptom of an Apoplexy.

"How can one then believe, says this author, that the Apoplexy is caused by the extravasation of the liquids, or by the fulness of the vessels, after having seen a brain filled with water, and distended so vastly as this was, without any one apoplectic symptom? Verduc, who in his pathology proposes an objection similar to this against his own system, endeavours to solve it, but has not succeeded. The objection remains victorious.

Nevertheless, when the brain of a person dead of an Apoplexy is opened, and extravasated blood is found in it, his death is imputed to this extravasation alone, and the Apoplexy is pronounced sanguineous. This has happened on the death of M. de Frequienne, president of our parliament. On opening him I found about a tea-spoon full of blood extravasated within the medulla oblongata, between the third and fourth ventricle, at the beginning of the latter. Could so small a quantity of blood press on the principles of the nerves so as totally to intercept the course of the spirits? No, certainly; for this would be mistaking the effect for the cause. This extravasated blood was but an accident owing to the convulsive motions of the dura mater, and of the vessels of the whole basis of the scull, seized with the apoplectic disorder, which most commonly is nothing else but the matter of the gout or rheumatism fixing on this source of the nerves. Now this general attack, which swells and distends the dura mater throughout this whole basis, makes the blood stagnate in the vessels, some of the weakest of which burst, and at the same time closes all the canals of the nerves, and consequently kills the patient. Unless a person would chuse to say, that these broken canals were those, which concurred in the substance of the brain to the formation of the spirits, that give motion to the heart: which opinion is not free from difficulties; since it is well known, that this organ receives the influences of several nerves at a time, all which ought to bear their part in this accident, which, after all, is but the rupture of a simple capillary vessel.

The drift of these reflections is to engage practitioners to have somewhat less confidence in their theories, and, for example, not to make a poor apoplectic patient die under the lancet; a thing, which I have seen several times, from the notion which they hold, that it is the over-great quantity of blood, that kills: for, besides that this false opinion is fatal to this patient in particular, it will still be so to all future apoplectics, if the prejudice in favour of this theory be such as to prevent seeking the true causes, and the real remedies of the Apoplexy." *Philosophical Transactions, vol.* 47, *pag.* 271.

APOSTA'GMA, in natural history, the juice which flows from the grapes, before they are trodden or pressed.

APO'STLE *(Dict.)*— The Apostles of our Saviour were the first and most distinguished of his disciples; he invested them with an authority superior to that of others, filled them with the Holy Spirit, trusted them particularly with his mysteries, and chose them, out of all those that followed him, to raise the edifice of his church upon them. Jesus Christ, after his resurrection, sent them into all the parts of the world, with commission to preach and baptize in the name of the Father, and of the Son, and of the Holy Ghost, and with power to work miracles and cures of all kinds.

The Apostles continued to exercise their ministry in Palestine near twelve years, our blessed Saviour having commanded them not to depart from Jerusalem, and the parts adjacent, till twelve years after his ascension. According to Apollonius and Clemens Alexandrinus, they resolved to disperse, and apply themselves to the full execution of the commission Christ had given them, to go teach and baptize all nations; and, having settled the general affairs and concerns of the church, they betook themselves to the several provinces of the Gentile world, preaching the gospel to every nation under heaven. Many believe, that before their departure they composed the creed, called the Apostles creed, and those canons called the Apostles canons; but most learned men are satisfied that they are both the composure of later times, though the former is acknowledged to be the summary of the Apostles doctrine. It is generally affirmed by the ancients, that the Apostles agreed among themselves, what parts of the world they should take; and this, according to some, was done by lot, though not without the guidance and direction of the Holy Ghost. According to this division, St. Peter went into Pontus, Galatia, and those other provinces of the lesser Asia. St. Andrew had those vast northern countries of Scythia and Scydiana to his portion: though afterwards he is supposed to return towards Greece, and to have founded the bishopric of Byzantium. St. John's portion was partly the same with St. Peter's, namely, the lesser Asia: though, it is believed he did not immediately enter upon his charge, but stayed some years in Jerusalem, till after the blessed Virgin's death. St. Philip had the upper Asia appointed him, with some parts of Scythia and Colchis. Arabia Felix was allotted to St. Bartholomew, into which parts he carried the gospel of St. Matthew. St. Matthew himself preached in the Asiatic Ethiopia, by Chaldea, Persia, and Parthia: but Parthia was more particularly allotted to St. Thomas, who also preached to the Hyrcanians, Bactrians, and Indians. St. James the less, being bishop of Jerusalem, continued principally in that city. As for St. James the great, we have no certain account what became of him immediately after our Saviour's ascension. St. Jerom tells us, that he preached to the dispersed Jews, by which, he probably means the Jewish converts, dispersed after the death of Stephen. And we may conclude, that since the Apostles, after our Lord's ascension, staid several years together at Jerusalem, or in the bounds of Judea; and since St. James lived so short a while; it is utterly improbable that he went either to Spain, Portugal, Britain, or Ireland, to plant christianity; however, some Spanish and other monastic writers affirm it; but, there being no account of this earlier than the middle age of the church, it is safest to confine his ministry to Judea, and the parts thereabouts. St Simon had for his portion Egypt, Cyrene, Lybia, and Mauritania. St Jude had Syria and Mesopotamia; and St. Matthias, Cappadocia and Colchis. Of all their travels and actions we have but a very short and imperfect account. Had we the writings of Papias, bishop of Hierapolis, and, according to Irenæus, scholar to John; the commentaries of Hegisippus, Clemens Alexandrinus's institution, Africanus's chronology, and other writers about that time, mentioned by the ancients; we might expect a much more perfect and authentic account. Dr. Cave among the moderns, in his Antiquitates Apostolicæ, gives the best account we have seen of the Apostles travels, the success of their ministry, the places and countries to which they went, the churches they planted, and their acts and martyrdoms. There are no authors extant, who wrote an history of the church near the apostolic times; the first ecclesiastic historian that now remains being Eusebius, who wrote in the 4th century.

In order to qualify the Apostles for the arduous task of converting the world to the Christian religion, they immediately received the doctrine they taught from the mouth of Christ himself. They were infallibly secured from errors, in delivering the principles of christianity, and to this end had the spirit of truth promised to them, who should guide them into all truth. Hence there was an exact harmony among them in all their doctrines: these twelve stars all shone with the same light, conveyed to them by the sun of righteousness. They had been eye-witnesses of all the material passages of our Saviour's life, and reported nothing but what they had seen with their own eyes, and of the truth whereof they were as competent judges as the most antient philosopher in the world: they were miraculously enabled to speak the languages of the several nations to whom they were to preach, and were endowed with the power of working miracles, such as healing diseases, casting out devils, foretelling things to come, and raising the dead, in confirmation of the doctrine they taught; gifts which were unnecessary, and therefore ceased in future ages of the church, when christianity came to be established by the civil power.

APOSTLE, was an appellation given the ordinary travelling ministers of the church.

APOSTLE, was also a title given to those sent by the churches to carry their alms to the poor of other churches. This usage they borrowed from the synagogues, who called those, whom they sent on this message, by the same name.

APOSTLE, in the Greek liturgy, is particularly used for a book containing the epistles of St. Paul, printed in the order wherein they are to be read in churches, through the course of the year.

APOSTLE, is also used, among the Jews, for a kind of officer, anciently sent into the several parts and provinces in their jurisdiction, by way of visitor, or commissary; to see that the laws were duly observed, and to receive the monies collected for the reparation of the temple, and the tribute payable to the Romans.

These Apostles were a degree below the officers of the synagogue called patriarchs, and received their commissions from them.

APOSTO'LIC, or APOSTOLICAL, something that relates to the apostles, or descends from them. Thus we say, the apostolical age, apostolical doctrine, apostolical character, constitutions, traditions, &c. The Romanists calls their church the catholic and Apostolic church; and thus appropriated a title to Rome, which anciently was held in common with it by several other churches.

Apostolic, in the primitive church, was an appellation given to all such churches as were founded by the apostles; and even to the bishops of those churches, as being the reputed successors of the apostle. These were confined to four, viz. Rome, Alexandria, Antioch, and Jerusalem.

In after-times, other churches assumed the same quality, on account, principally, of the conformity of their doctrine with that of the churches which were apostolical by foundation, and because all bishops held themselves successors of the apostles, or acted in their dioceses with the authority of apostles.

The first time the term apostolical is attributed to bishops, as such, is in a letter of Clovis to the council of Orleans, held in 511; though that king does not here expressly denominate them apostolical, but (apostolica sede dignissimi) highly worthy of the Apostolic see. In 581 Guntram calls the bishops met at the council of Manson apostolical pontiffs, apostolici pontifices.

In progress of time, the bishop of Rome growing in power above the rest; and the three patriarchates of Alexandria, Antioch, and Jerusalem falling into the hands of the Saracens, the title apostolical became restrained to the Pope, and his church alone. Though some of the Popes, as St. Gregory the great, not contented to hold the title by this tenure, began, at length, to insist, that it belonged to them by another and peculiar right, as being the successors of St. Peter.

APO'THECARY (*Dict.*)— This is a very genteel business, and has been in great vogue of late years, there being, as has been computed, upwards of 1000 in and about London. There are, in this profession, various degrees, as to employ and extent.

Some do little else but make up medicines, according to the prescription of the dispensatory (compiled by the order of the college of physicians, for their direction) and those of particular physicians, besides visiting their patients.

Others not only prepare almost all kinds of medicines, as well galenical as chemical, but likewise deal in drugs; with all which they supply their brethren in trade, and so become a sort of wholesale dealers, as well as Apothecaries.

Others, again, practise surgery, manmidwifery, and, many times, even officiate as physicians, especially in the country, and often become men of very large practice, and eminent in their way. There is another branch, also, many of them fall into, which is that of curing lunatics, &c.

A youth intended for this profession should be a pretty good scholar, and have a tolerable knowledge in the Latin tongue at least, that he may be the better able, in due time, to read some of the best authors who have wrote upon the subjects of botany, pharmacy, anatomy, and medicine; though it must be owned there are, at present, almost innumerable helps in our mother-tongue.

In London, they are one of the city companies, and were first incorporated with the grocers in the year 1606, in the reign of king James I, but not alone till 1617.

They have a hall, where there are two fine elaboratories, out of which all the surgeons chests are supplied with medicines for the use of the British navy.

In the year 1712, the 10th of queen Anne, an act passed for reviving and continuing several acts therein mentioned, one whereof was for exempting the Apothecaries from serving the offices of constables and scavengers, and other parish and ward-offices, and from serving upon juries: which act was made perpetual in the 9th year of king George the First.

The Apothecaries in England are obliged to make up their medicines according to the formula's prescribed in the dispensatory of the college of physicians, and are under an obligation to have the medicines there enumerated always ready in their shops; and their shops are liable to be visited by the censors of the college, who have it in their power to destroy such medicines as they judge not to be good.

The Apothecaries of Paris make but one corporation with the merchants-grocers, which is the second of the six corporations of merchants.

By a regulation of the 15th of October, 1631, all the Apothecaries of Paris are prohibited to give any medicine to patients, unless by the order, and with the advice of a regular-bred physician, or of a person approved by the faculty; nor are they to make up any prescription, given, or drawn up, by any person stiling himself an empiric physician, or operator.

Among the good regulations made in Denmark, that which the Apothecaries are obliged to observe, is reckoned one of the best: for no person can have leave to follow that profession, unless he be approved of by the college of physicians, and confirmed by the king himself. There are but two Apothecaries allowed for the city of Copenhagen, and but one in every other considerable town. The magistrates, attended by the doctors of physic, visit their shops and drugs twice or thrice a year, and those drugs that are either stale or bad are seized, and publickly thrown upon a dung-hill without the city; and this is a stain upon the character of such Apothecary, that is scarce ever wiped off. The price of all drugs is fixed, so that one may, without fear of being imposed upon, send even a child for any drug to an Apothecary's shop, where nothing is sold but what is good, and at a reasonable price. All drugs are sold for ready money, and yet the Apothecaries are obliged to register in a book what they sell, to whom, and by what physician's prescription. So that there seldom happens any accident by poison, either accidentally, or with design: and, if any such thing happens, it is easily found out, and quickly punished. Present state of Denmark (in French) by Des Roche, 1730, tom. 9. p. 431.

APOTHEO'SIS (*Dict.*)— It was one of the doctrines of Pythagoras, which he had borrowed from the Chaldees, that virtuous persons, after their death, were raised into the order of the gods.

And hence the ancients deified all the inventors of things useful to mankind, and who had done any important service to the common-wealth.— Tiberius proposed to the Roman senate the Apotheosis of Jesus Christ, as is related by Eusebius, Tertullian, and St. Chrysostom. Juvenal, rallying the frequent Apotheoses, introduces poor Atlas, complaining that he was ready to sink under the prodigious burden of so many new gods as were almost every day added to the heavens.

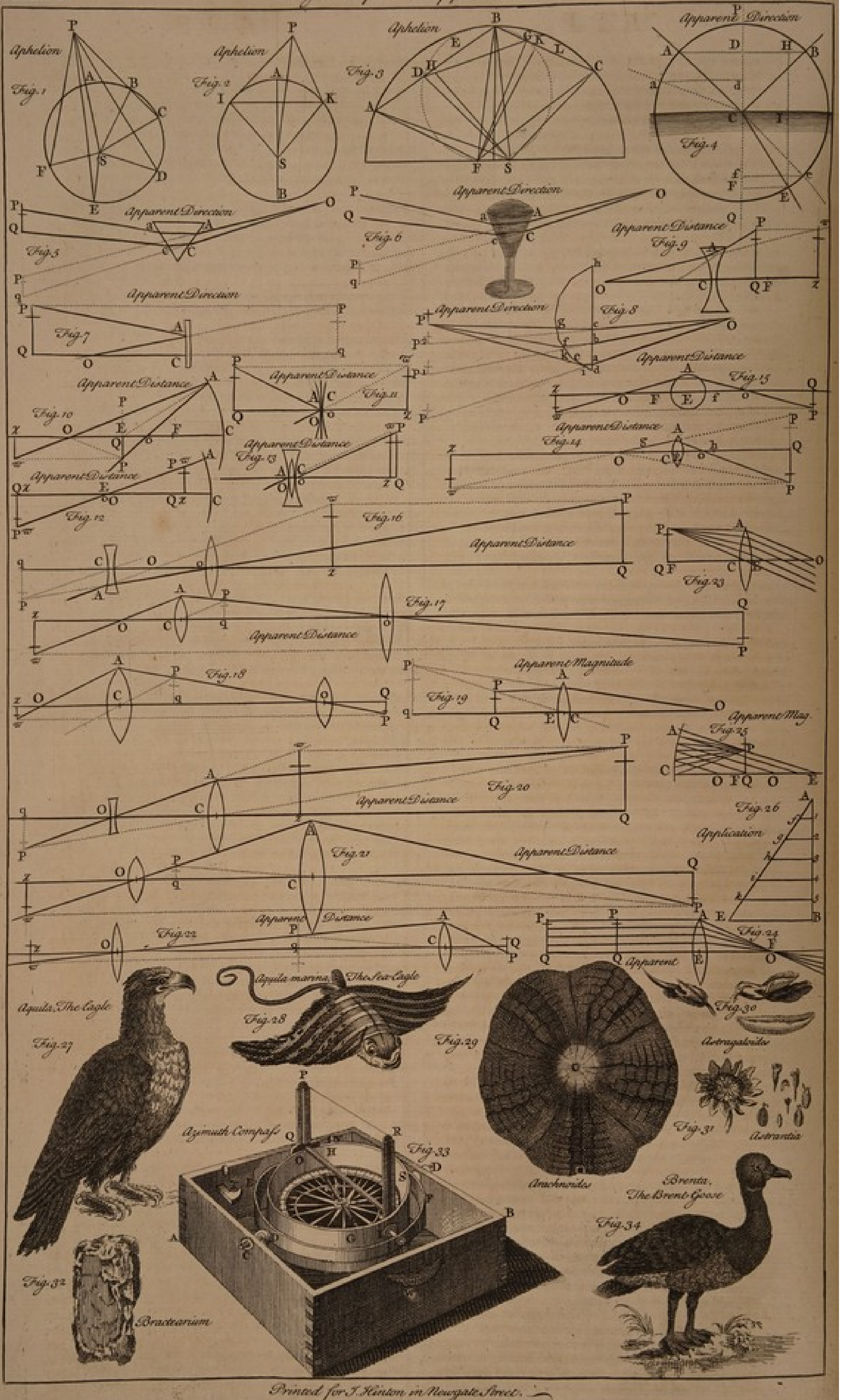
Seneca ridicules the Apotheosis of Claudius with admirable humour.— Herodian, lib. 4, in speaking of the Apotheosis of Severus, gives us a very curious description of the ceremonies used in the Apotheosis of the Roman emperors.— After the body of the deceased emperor, says he, had been burnt with the usual solemnities, they placed an image of wax, perfectly like him, but of a sickly aspect, on a large bed of ivory, covered with cloth of gold, in the vestibule of the palace. The greatest part of the day, the senate sat ranged on the left side of the bed, dressed in robes of mourning; the ladies of the first rank sitting on the right side, in plain and white robes, without any ornaments.— This lasted for seven days successively, during which, the physicians came from time to time to visit the sick, always making their report that he grew worse; till at length they published it, that he was dead.

This done, the young senators and Roman knights took the bed of state upon their shoulders, carrying it through the via sacra, to the old forum, where the magistrates were used to divest themselves of their offices. There they set it down between two kind of amphitheatres, in the one whereof were the youth, and in the other the maidens of the first families in Rome, singing hymns set to solemn airs, in praise of the deceased. These hymns ended, the bed was carried out of the city into the Campus Martius, in the middle of which place, was erected a kind of square pavilion, the inside whereof was full of combustible matters, and the outside hung with cloth of gold, and adorned with figures of ivory, and various paintings.

Over this edifice were several others, like the first in form and decoration, but less; always diminishing and growing slenderer towards the top.— On the second of these was placed the bed of state, and a great quantity of aromatic perfumes; and odoriferous fruits and herbs were thrown all around: after which, the knights made a procession or cavalcade in solemn measures around the pile; several chariots also run round it, those who conducted them being clad in purple robes, and bearing the images of the greatest Roman emperors and generals.

This ceremony ended, the new emperor came to the catafalco or pile, with a torch in his hand; and at the same time fire was set to it, on all sides; the spices and other combustibles kindling all at once.

While this was doing, they let fly, from the top of the building, an eagle, which, mounting into the air with a fire-brand, carried



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carried the soul of the dead emperor along with it into heaven, as the Romans believed; and thenceforward he was ranked among the gods.—It is for this reason, that the medals, wherein Apotheoses are represented, have usually an altar with fire upon it; or, however, an eagle taking its flight into the air, and sometimes two eagles.

A'PPANAGE. See the article APANAGE.

APPA'RENT *Directions of visible Points*, in optics.—Any small object or point of an object, seen by refracted or reflected rays, appears somewhere in the direction of that line, which the visual ray describes after its last refraction or reflection in falling upon the eye.

By experiments made to prove the laws of reflection and refraction, the pin at B (*plate* IV. *fig.* 4.) seen by a ray reflected from the water, appears somewhere in the line A C produced, which the visual ray B C A describes after reflection at C, when it advances to the eye. And as the whole line C E appears lifted up by the refraction at the water, as if it had been a continuation of the line A C straight on; so, if a straight oar be in part immersed obliquely in the water, it appears crooked, as if the part immersed was broken at the surface, and lifted higher. For this part of the oar is seen in the direction of rays which are bent downwards by refraction, at their emergence from the water, and, consequently, advance to the eye, as if they came from a place in the water which is higher than the real place of the oar. In like manner any point P (*fig.* 5, 6, 7.) of an object seen by the ray P A O twice refracted, either by passing through the edge of a prism, or of a concave or convex lens, or through the sides of a globe or decanter, or of a drinking-glass filled with any transparent liquor; or seen by a ray P A O reflected from a plane or spherical looking-glass; appears to the eye at O, somewhere in the direction of the last refracted or reflected ray A O. Lastly, an object P (*fig.* 8.) viewed by the eye at O, through a multiplying-glass, appears at one view in as many different places, *p*, *p* 1, *p* 2, situated in as many different directions O A, O B, O C of the last refracted rays produced, as the glass has different surfaces, D E, E F, F G, differently inclined to the opposite surface D H. For these surfaces, like so many different prisms, give the visual rays P I A O, P K B O, P G C O, so many different bendings at I and A, K and B, G and C, and make them fall upon the eye at O, in as many different directions A O, B O, C O. And in all these instances when the refracting or reflecting surfaces of the water or glasses are shaken by the wind, or otherwise, the objects seen by reflection or refraction appear to shake and tremble; because the last directions of the visual rays are shaken and varied by those motions.

Now, the reason why an object or point of an object appears always in the direction of the last refracted or reflected ray, is, because the place of its picture upon the retina is the same as it would be if the object was really removed from its proper place into the direction of that ray, and was seen by direct rays. And having no sensation of the previous reflections or refractions of the rays at the glasses, but only of their action upon a certain place of the retina, we form the same judgment of the place of the object as we used to do in the more common cases of direct vision. How we know and judge of the place and position of an object by the place and inverted position of its picture upon the retina, will be shewn under the article EYE; whence it will appear to be entirely the effect of experience.

It is manifest from what has been said, that any point P of an object P Q, seen by refractions or reflections, appears somewhere in the line *p* O, drawn from the corresponding point *p* of its last image to the eye at any place O; because all the rays which flowed from P, do after the last refraction or reflection flow from or towards the corresponding point *p* of the last image. The reason why I say the last image will be mentioned under APPARENT *Magnitude*.

It is also manifested why an object seen by refracted or reflected rays appears sometimes upright and sometimes inverted. For when the refracted or reflected rays A O, C O, have the same situation with respect to each other, as two rays that come directly from the same points of the object to the eye, these points will appear in the same situation with respect to each other in both cases. But, if the rays that come from these points shall have crossed each other before they arrive at the eye, they will then have a contrary situation to that of two rays coming directly from the same points to the eye; and, consequently, these two points will appear in the glass in a contrary situation. And one may add that, in the former case, the picture upon the retina of the eye will have the same position, though not the same magnitude, as if the glass was removed, and will have a contrary position in the latter case. *Smith's Optics.*

APPARENT *Distance (Dict.)*—The Apparent distance of an object, perceived by sight, is an idea of a real distance usually measured by feeling, as by the motion of the body in walking, or otherwise; and is suggested to the mind by the Apparent magnitude of the object in view, if seen alone (as a bird in the air, or as an object in a telescope or microscope;) but if it be seen with other objects, as it usually happens, its distance is suggested both by its own apparent magnitude, and by the apparent magnitudes of other adjoining objects obliquely extended between the eye and the object in view; as the surface of the ground, rivers, walks, high-ways, hedges and ditches, or the houses in a street, or the walls and ceiling of a room, or the sky over head. For what is the Apparent magnitude or Apparent extension of an object, but the Apparent distance of its extremities from one another? And what is the Apparent distance between two objects in any situation, or between one object and the spectator himself, but the Apparent extension of intermediate objects? And since they are seldom seen alone, excepting through glasses, it cannot be doubted, but we estimate their distances from one another, and from ourselves, by our ideas of the magnitudes of those intermediate objects: and every one knows that surveyors, gunners, travellers, and all sorts of artificers, who are conversant in measuring distances, are able to make a truer estimate of distance by the eye, than others that have not had so much experience. Sometimes, indeed, without attending to those oblique surfaces, we are sensible of the approach of a body by the increase of its own Apparent magnitude, and on the contrary; and, sometimes, we are also sensible of it when the body is at rest, provided it be known and familiar to us. For bodies are distinguished into sorts chiefly by their shapes and colours, and we reckon them small or great, not with comparison with bodies of another sort, but with one another; and having found by experience, that certain quantities of Apparent magnitudes of a known body are constantly attended by certain quantities of distance, the sensation of the magnitude of the body immediately excites the usual idea of its distance: which is also evident in oblique surfaces, as well as those that are perpendicular to the eye: for the ideas of variable distances must either mediately or immediately be excited in the mind by variable sensations, caused by some certain variations in the pictures upon the retina. But, while the distance of the object varies, nothing is varied in its picture, excepting its magnitude; its figure, colour, brightness, and distinctness, receive no sensible variation in most cases: and, for one idea to excite another, every one knows it is sufficient that they have been constantly observed to go together; as in languages, and a thousand things besides. Lastly, I have found by abundance of experiments made with glasses of all sorts, that, while the Apparent magnitude of an object increases by moving the glass, eye, or object, it always appears to approach and to recede, while its Apparent magnitude decreases, excepting a particular case or two to be mentioned hereafter. And these experiments seem to me to put the question beyond dispute. For in looking through a glass with one eye only, and on a single object, when nothing is perceived in the space interposed, how it is possible for different Apparent magnitudes of the object to suggest the ideas of different quantities of that invisible space, according to a certain rule to be mentioned hereafter, if those ideas had not usually gone together, before we looked into the glasses? I find, also, that by altering the degrees of Apparent brightness and distinctness of an object, either by looking through little holes made with a pin, or through lenses of different figures put close to my eye, or through both at once put close together and to my eye, that neither the Apparent magnitude, nor Apparent distance, is sensibly altered thereby. The reason is, we have had no experience in such confused vision with the naked eye, and, therefore, though different degrees of confusion and distinctness in glasses are plainly perceived, yet, like the words of an unknown language, their signification of distance, or of any thing else, is entirely unknown. The same may be said of the degrees of brightness and obscurity. By day-light objects appear equally bright at all moderate distances from the eye, and we retain much the same ideas of their distances in the night, when we see them more obscurely. The permanent colours, and shades of bodies, serve chiefly to distinguish their Apparent shapes; and their colours and shapes are manifest distinctions of their various sorts, but, being permanent, they are no distinctions of their Apparent distances from the eye. When the eye is fixed, and a fixed line is extended from it, the divergency of rays, from different points of that line, is neither distinguished, nor so much as perceived by sense, by persons that see distinctly. It is a rational deduction from sense, which informs us that rays diverge from the points of an object; which the majority of mankind are entirely ignorant of: and the ancient philosophers, who thought that something like rays proceeded from the eye to the object, could distinguish distances as well as we. Therefore, the divergency of rays from points at different distances is not the medium which introduces the ideas of distances into the mind. Sometimes, indeed, there are degrees of its distinctness and confusion consequent upon it, but their relation to distance, as I said before, is not perceived. Besides this, in vision with glasses, we have ideas of as many different degrees of distance conveyed to us, as well when the rays come converging towards points behind the eye, as when they diverge from points before it,

as

as will be shewn hereafter. The divergency of rays from the place of an object is, therefore, no cause of its appearing in that place. It is also matter of fact, in painting and perspective, that our sensible ideas of the places of the objects in the picture are quite different from our rational ideas of the places from whence the rays diverge: and the difference in these ideas is caused by the different Apparent magnitudes of the known objects represented in the picture. It is also evident, that our sensible ideas of the places of the remote parts of a long walk or gallery, and of the clouds over head, and of all celestial bodies, are quite different from the rational ideas of the places from whence the rays diverge, as will appear more fully hereafter. Neither is distance suggested to the mind by the magnitudes of the angles in a triangle made by the optic axes, and the interval between the eyes. For these angles are all varied by turning the head sideways while we look at the object, till at last we see it at the same distance with one eye as with both: which shews, also, that the faint and confused appearance of collateral objects does not alter our ideas of their distances. Nor is distance suggested by feeling the turn of the eyes in widening or contracting the interval between pupils, when we direct them to different places. For the place of the object is generally perceived by a side-view, before we direct our eyes to view it more distinctly. From what has been said, it appears to me, that the ideas of distance are suggested to the mind by the ideas of the magnitudes of objects.

Hence it follows, that an object, seen by refraction or reflection, appears at the same distance from the eye, as it usually does from the naked eye, when it appears of the same magnitude as in the glasses. To determine this distance in all cases, I conceive a ray A O (*plate* IV. *fig.* 9, 10.) to go from the eye at O, and after its last reflection or refraction to belong to the focus ε, in the common axis O C Q of all the surfaces, and to meet an object P Q in P, placed perpendicular to O Q; and that a line P ϖ is drawn parallel to the axis O Q till it meets the ray O A, produced, in ϖ. Then, supposing the object P Q to be removed to the place ϖ κ, and there to be viewed by the naked eye; since it appears under the same angle ϖ O κ or A O C as it appeared under in the glasses, when it was at P Q, it will also appear of the same magnitude, and, consequently, at the same distance from the eye in both cases. Therefore, if, when the object is placed at ϖ κ, its Apparent distance from the naked eye be represented by its real distance O κ, the same O κ will also represent its Apparent distance in the glasses when it was at P Q. I shall, therefore, call O κ the Apparent distance of the object P Q, and ϖ κ the Apparent object.

When the point P and the ray O A, by which it is seen, are on contrary sides of the axis O Q, the point ϖ and the line ϖ κ will be behind the eye, and, therefore, must be viewed by the naked eye inverted and turned about. But, if you had rather ϖ κ should always be before the eye, in this case invert the object P Q, and then slide it along the axis; and its extremity P will touch the visual ray O A, produced, at the same distance from the eye as before; because the opposite angles A O C, ϖ O κ, are equal.

Hence, while the eye, object, or glasses are in motion, the Apparent distance of the object will be increased in the same proportion as its Apparent magnitude decreases; and, on the contrary. For the same Apparent distance of the same object, seen at ϖ κ by the naked eye, varies in the proportion of the same Apparent magnitude.

Hence, also, the Apparent distance, O κ, of an object, P Q, seen in glasses, is to its Apparent distance, O Q, seen by the naked eye, as its Apparent magnitude to the naked eye to its Apparent magnitude in the glasses. For conceiving a line O P, which is omitted in the figures for the sake of simplicity; since P Q and ϖ κ are equal, the former distance, O κ, is to the latter O Q, as the latter angle P O Q to the former ϖ O κ.

The ratio of the Apparent and true magnitudes being determined in most cases in the next article, their Apparent distances are also determined by this rule. But, because this subject of Apparent distance has hitherto been handled but very imperfectly by all optic writers, it may not be unacceptable to some readers to see it pursued a little farther. I will, therefore, deduce all the cases of Apparent distance immediately from the definition of it, without the help of those former demonstrations.

The Apparent and true distances (*fig.* 11, 12, 13.) O κ and O Q will be equal, first, when the object touches any thin lens or any single surface; for then the points P, A, ϖ, will coincide. Secondly, when the eye touches any thin lens or reflecting surface. For, when the points O, A, C, coincide at a lens, the visual ray will pass through the middle of it very nearly; and, consequently, its incident and emergent parts produced will be nearly parallel and coincident, and so the points P, ϖ, will nearly coincide; and when the points O, A, C, coincide at a reflecting surface, the incident and reflected rays produced will make equal angles with the perpendicular Q C κ, and so the triangles P C Q, ϖ C κ, will be equal. Thirdly, when the eye is at the center of a reflecting concave; then the incident and reflected rays, and, consequently, ϖ κ and P Q will coincide. Fourthly, when a ray (*fig.* 10, 14, 15.) P O, coming directly to the eye, makes an angle P O Q equal to A O C or ϖ O κ; for then the triangles P O Q, ϖ O κ, are equal. This happens in a reflecting concave, when the object is very near its center; for producing the object P Q till it cuts the reflected ray in *p*, since the angles P O Q, ϖ O κ, or *p* O Q, are supposed to be equal, the lines P Q, *p* Q, will also be equal, and, consequently, a line Q A will nearly bisect the angle P A *p*, when A is very near to C, as a line drawn from the center E will do, and so the points Q, E, are almost coincident.

The Apparent distance of an object seen in a telescope, or a microscope, is to its Apparent distance perceived by the naked eye, as its Apparent magnitude to the naked eye to its Apparent magnitude in the telescope or microscope; for conceiving (*fig.* 20, 21, 22.) A C to be the object-glass, and the eye to be close to the eye-glass at O, the visual ray A O will go in a manner straight through it; and so the Apparent magnitude, and Apparent distance of the object, will continue the same as when there was no eye-glass: and since, when the vision is distinct, the rays in every pencil come parallel through the eye-glass, the Apparent magnitude, and, consequently, the Apparent distance, will still continue the same as before, while the eye is drawn back.

Consequently, the Apparent distance in a telescope is to the Apparent distance perceived by the naked eye, as the focal distance of the eye-glass to the focal distance of the object-glass, by the 120th and 141st articles; which may thus be demonstrated, independently of the 120th article: let *p q* be the image of a remote object terminated by the line P C *p*, so that *q* C and *q* O may be the focal distances of the object-glass and eye-glass; then supposing the object viewed by the naked eye at C, since the angles ϖ O κ, P C Q, have equal subtenses ϖ κ and P Q, the Apparent distance, O κ, in the telescope, is to the Apparent distance, C Q, to the naked eye at C, as the latter angle P C Q to the former ϖ O κ, or as the opposite angle *p* O *q*, or, since *p q* subtends them both, as the latter focal distance *q* O to the former *q* C.

The same proportion may be proved when (*fig.* 16, 17, 18.) A C represents the eye-glass of a telescope or microscope, and the object-glass is placed at ε, the conjugate focus to O. For let *p q* be the image of the remote object P Q terminated by the line P ε A, and when *q* ε and *q* C are the focal distances of the glasses at ε and C, the ray A O will be parallel to *p* C. Now the Apparent distance O κ is to the Apparent distance ε Q, perceived by the naked eye at ε, as the latter angle P ε Q to the former ϖ O κ, or as the opposite angle *p* ε *q* to the opposite angle A O C, or its equal *p* C *q*, or as the latter distance *q* C to the former *q* ε.

An object seen in any glass will appear behind it, or at it, or before it, according as (*fig.* 9, 10.) ϖ κ or P Q, the real magnitude of the object, is bigger, equal, or less, than A C, the part of the glass in which it appears. For since ϖ κ and A C do both subtend the same, or equal angles, at the eye, O ϖ will be bigger, equal, or less, than O C, according as ϖ κ or P Q is bigger, equal, or less, than A C.

Hence it follows, that an object always appears behind any surface or glass which cannot make rays go parallel that diverged from the eye; for then P Q or ϖ κ will always be greater than A C.

The rule is true in a globe, or in any number of surfaces, taking A for the concourse of the incident and emergent parts of the visual ray produced, and a perpendicular A C upon the axis, instead of the aperture of a single glass. *Smith's Optics.*

APPARENT *Magnitude* (*Dict.*) — The Apparent magnitude of an object P Q (*plate* IV. *fig.* 8.) seen by refracted or reflected rays, either upright or inverted, is a quantity of visible extension, measured by the angle A O C, which the two rays, A O, C O, that came from its extremities, P, Q, do make, after their last refraction or reflection, in falling on the eye. Or, in other words, the object appears greater or smaller, in proportion as that angle A O C is greater or smaller; because its extremities appear in the directions of the last refracted or reflected rays O A, O C; and, also, because its picture upon the retina is greater or smaller, in proportion as these rays constitute a greater or smaller angle at the eye.

Therefore, the Apparent magnitude of an object PQ (*fig.* 19.) is also measured by the angle *p* O *q*, which its last image *p q* subtends at the eye. For the lines A O, *p*O, are but one line continued, and so are CO, *q* O; and, therefore, the angles A O C, *p* O *q*, are the same when the image lies before the eye, and are equal when it lies behind it.

Hence, the Apparent magnitude of an object increases and decreases, in proportion as the eye approaches to, or recedes from, its last image (just as if it was a real object) placed either before or behind the eye; for, when the image is fixed, the angle *p* O *q*, when small, increases in the same proportion as O *q* decreases, and on the contrary.

Hence, if the last image be removed to an infinite distance, that is, if the object be placed in the principal focus of a lens, sphere, or concave looking-glass, its Apparent magnitude to the eye, at any place whatever, will be invariably the same; and

and equal to its Apparent magnitude seen by the naked eye, supposing it put into the place of the center of the sphere, lens, or reflecting concave. For since all the rays of any one pencil are parallel to its axis P E (*fig.* 23.) the angle C O A, which measures the Apparent magnitude at any point O, is every where equal to the angle Q E P at the center E.

The Apparent magnitude of the object will also be invariable wherever it be placed (*fig.* 24.) when the eye is fixed at the principal focus of any glass which makes parallel rays converge to the eye. For, conceiving them to flow back again from the eye to the object, they will fall upon the same points of the object from whence they came, while it is moved in any place along the axis of the glass: and no other rays but these can return from the same points of the object to the eye, in that place: therefore, the several parts of the object will always be seen under the same angles, and, consequently, will appear of the same magnitudes.

The Apparent magnitude of an object seen by reflected or refracted rays being measured by the angle which its last image subtends at the eye, and its Apparent magnitude to the naked eye in any place being measured by the angle which the object itself subtends at the eye in that place, it follows that the former Apparent magnitude is to the latter, as the former angle to the latter angle. For the measures of things and the things measured by them are proportionable.

Consequently, the Apparent magnitude of an object, seen in a glass, will be equal to its Apparent magnitude to the naked eye in the same place, if the glass was removed. First, when the object touches any thin lens or any single surface. For the image is then equal to the object, and coincides with it. Secondly, when the eye touches any thin lens or any reflecting surface. For then the ray P A O will pass from the object to the eye, through the middle of the lens very nearly, and, therefore, being almost straight, will make nearly the same angle with the axis as an unrefracted ray would do: and, when the point of incidence, A (*fig.* 25.) coincides with C at any reflecting surface, the incident and reflected rays P A, A O, produced, will also make equal angles with the axis or perpendicular Q C; and so the object will appear under the same angle as it would do to the naked eye turned about. Thirdly, when the eye is at the center of a reflecting concave, for then the incident and reflected rays, P A, A O, will coincide with the direct ray P E, and, consequently, will make the same angles with the axis. Fourthly, when the object is at the center of the reflecting concave; for then the reflected image is also at the center, and is equal to the object. Fifthly, when a ray, coming directly from P to O, would make an angle with the axis equal to the angle A O C, which the refracted or reflected ray P A O makes with it on the other side.

These cases being excepted, the Apparent magnitude of an object, seen through a concave lens, is always less than the true; and when it is seen uprightly through a convex lens, or a globe, it is greater than the true; for the ray P A O, coming from the extremity of the object to the eye, is bent by the concave lens from its axis, and therefore makes a less angle with it at the eye, than a ray coming directly from that extremity to the eye. But the same ray is bent by the convex lens towards its axis, and therefore makes a greater angle at the eye than the direct ray: and the Apparent magnitudes are measured by these angles.

What has hitherto been demonstrated concerning the Apparent magnitude of an object P Q, will continue in force, if you suppose the object P Q to be an image formed by another glass, or other glasses; for the rays diverge from either of them in the same manner, and for this reason I have always called *p q* the last image of the object.

The place of the eye at O (*fig.* 19.) being given, to determine what part of an object is visible in a given portion or aperture A C of any refracting or reflecting glass, draw A O to the edge of the aperture and produce it till it cuts the image in *p*, and through the center of the glass draw *p* E cutting the object in P; and P Q will be the part in view in the aperture A C. For the whole pencil of rays flowing from P will belong to *p* after refraction or reflexion, and, consequently, some one of those rays will advance to the eye in the line A O drawn through *p*. If the image be at an infinite distance, all the rays that belonged to *p* will be parallel to the axis of the pencil; therefore P Q is now determined by drawing E P parallel to O A. In a plane looking-glass, *p* P must be drawn from *p* parallel to *p* Q, or perpendicular to the glass, to cut off the part P Q visible in the aperture A C. For this glass may be considered as having a center at an infinite distance from it.

Hence, if the glass and object be fixed, the part in view in a given aperture will decrease perpetually while the eye recedes from the glass, unless the image be behind the eye. For then it will decrease only till the eye arrives at the image, and, after the eye has passed by the image, it will increase perpetually. The reason is, because the object and image, being fixed in their places, do both increase or both decrease together, being both terminated by two lines P *p*, Q *q*, that meet or cross in E the center of the glass.

Therefore the part in view is greatest when the eye is close to the glass, and least when close to the image; and, in this latter case, it appears infinitely magnified. For, conceiving the distance O *q* infinitely diminished, the parts *p q*, P Q, cut off by the lines A O *p*, *p* E P, will both be infinitely diminished; but the magnitude of the angle at O, subtended by *p q* or by A C, continues finite, while the angle subtended by P Q at O is infinitely diminished: and so the disproportion between these angles, that is, between the Apparent and true magnitudes of the particle P Q, is infinitely great. It appears also infinitely confused, when the pupil is open, for the reason given under the article EYE.

APPARENT *Place* (*Dict.*) — Opticians are divided in their opinions with regard to the Apparent place of an object, seen by a mirrour, or through a glass. It was thought in general, till lately, that the object appeared in that point where the reflected or broken ray, passing through the center, met the perpendicular drawn from the object on the surface of the mirrour or glass. This principle father Taquet has applied, in his Catoptrics, to explain the phænomena of convex and concave mirrours; M. Mairan, in a memoir read before the Academy of Sciences at Paris, published in the year 1740, proceeded on the same principle to find the apparent curve of the bottom of a basin full of water. But father Taquet himself acknowledges, at the end of his Catoptrics, that this principle is not universal, and is contradicted by experiments. With regard to M. Mairan, he rather lays it down as a principle of geometry than optics, and owns that Sir Isaac Newton, Dr. Barrow, and other authors, of the first reputation, never entirely admitted it. They, to determine the Apparent place of the object, imagine first, that the object throws, on the surface of the glass or mirrour, two rays infinitely near each other, which, after suffering one or more refractions or reflexions, pass to the eye. These broken or reflected rays, being continued, meet in one point, and, consequently, enter the eye as if they came from this point; from whence it follows, according to Newton and Barrow, that the Apparent place of the object is the point of concourse of these reflected or broken rays, which passes on to the eye, and is easy to determine by the laws of geometry. Dr. Barrow produces an experiment which seems unanswerable, by which he demonstrates that a plumb line sunk in water forms a curve; whence it follows that the Apparent place of an object, seen by refraction, is not in the point where the refracted ray cuts the perpendicular drawn from the object to the refracting surface. But we must own also, that Dr. Barrow, at the end of his Optical Lectures, mentions an experiment that seems to contradict the foregoing principle. He adds that this experiment contradicts Taquet's principle, as well as his own. He is however of opinion that a particular case which does not conform to this principle, ought to be looked upon only as a trifling exception against a general rule. With regard to Sir Isaac Newton, though he follows the principle of Dr. Barrow about determining the Apparent place of the image, yet he looks on this problem as one of the greatest difficulties in all optics; his words are these: *Puncti illius accurata determinatio problema solutu difficillimum præbebit, nisi hypothesi alicui saltem verisimili, si non accurate veræ, nitatur assertio. Opt. Schol. Prop.* VIII. *p.* 80.

APPA'RITORS.— Among the Romans, Apparitors were the same with serjeants or tip-staffs among us; or rather Apparitor was a general term, and comprized under it all the ministers and attendants of the judges and magistrates, appointed to receive and execute their orders. And hence, they say, the name was derived, viz. from apparere, to be present, or in waiting.

Under the general name of Apparitores the ancients comprehended the scribæ, accensi, interpretes, præcones, viatores, lictores, statores, and even carnifices or hangmen.

They were usually chosen out of the freed-men of the magistrates; and their condition was held in such contempt, that, as a mark of ignominy, the senate appointed a city that had revolted from them, to furnish them with Apparitors.

There were also a kind of Apparitors of cohorts, called cohortales, or conditionales, as being attached to a cohort, and doomed to that condition. The Apparitors of the prætors, prætoriani, were those who attended the prætors, or governors of provinces; and who, on their master's birth-day, were always changed and preferred to better posts. Add, that the pontifices had also their Apparitors, as appears from an inscription of an ancient marble in the Via Appia.

APPEA'L, of wrong imprisonment, is used by Bracton for an action of wrong or false imprisonment.

Appeal is more particularly used for a private accusation of a murderer, by one who had interest in the murdered party; or of any felon by one of his accomplices in the fact.

If an appeal of murder or felony be used by any common person against a peer, he shall be tried by commoners, and not by his peers.

The person who brings an Appeal, is called the appellant; and the person appealed to, the appellee.

APPEA'RANCE, the exterior surface of a thing; or that which first strikes the sense, or the imagination.

The Academics maintain, that the sensible qualities of bodies are only appearances; and the like doctrine is held by some later philosophers.

APPEARANCE, in perspective, is the representation or projection of a figure, body, or the like object, upon the perspective plane.

The Appearance of an objective right-line is always a right-line. The appearance of an opake body and a luminary given, we can find the Appearance of the shadow.

A'PPLE, denotes a well known fruit, of a roundish figure, of considerable use both as a food, a remedy, and likewise yielding cyder.

The Apple is composed of four distinct parts, viz. the peel, the parenchyma, the branchery, and the core.

The peel or skin is only a dilatation of the outermost skin or rind of the bark of the branch on which it grew.

The parenchyma or pulp, as tender and delicious as it is found, is only a dilatation, or, as Dr. Grew calls it, a swelth, or superbience of the inner part of the bark of the branch.

This appears not only from the visible continuation of the bark from the one through the pedicle or stalk to the other, but also from the structure common to both, as being both composed of bladders; with this only difference, that whereas, in the bark, the vesiculæ are spherical, and very small, scarce exceeding one sixteenth part of an inch in diameter; in the pulp they are oblong, and very large, generally measuring one third of an inch in length. But all uniformly stretched out by the arching of the vessels from the core towards the circumference of the Apple.

The branchery or vessels are only ramifications of the woody part of the branch sent throughout all the parts of the parenchyma, the greater branches being made to communicate with each other by inosculations of the less. The main branches are usually twenty; ten of them distributed through the parenchyma, most of which inarch themselves towards the cork or stool of the flower; the other ten, running from the stalk in a directer line, at last meet the former at the cork, and are there inosculated with them. To these branches the coats of the kernels are fastened. Most of the branches were originally extended beyond the fruit, and inserted into the flower for the due growth thereof; but when the fruit afterwards grew to a head, and thus intercepted the aliment before sent to the flower, this latter being starved and falling off, the service of the said branches became wholly appropriated to the fruit, fifteen to the pulp, and five to the seed. The Apple core is originally from the pith of the branch; the sap of which, finding room enough in the parenchyma, through which to diffuse itself, quits the pith, which by this means hardens into a core.

All the sorts of Apples are propagated by grafting or budding, upon the stocks of the same kind; for they will not take upon any other sort of fruit-tree. In the nurseries there are three sorts of stocks generally used, to graft Apples upon: the first are called free-stocks: these are raised from the kernels of all sorts of Apples, indifferently; and these are also termed crab-stocks; for all those trees which are produced from the seeds, before they are grafted, are termed crabs without any distinction: but, as I before observed, I should always prefer such stocks as are raised from the kernels of crabs where they are pressed from verjuice: and I find several of the old writers on this subject of the same mind. Mr. Austin, who wrote an hundred years ago, says, the stock which he accounts best for Apple-grafts, is the crab; which is better than sweeter Apple-trees to graft on, because they are usually free from canker, and will become very large trees; and, I conceive, will last longer than stocks of sweeter Apples, and will make fruits more strong and hardy to endure frosts: and it is very certain, that, by frequently grafting some sorts of Apples upon free-stocks, the fruits have been rendered less firm and poignant, and of shorter duration.

The second sort of stock is the Dutch creeper: these are designed to stint the growth of the trees, and keep them within compass for dwarfs or espaliers.

The third sort is the paradise-Apple, which is a very low shrub; so only proper for trees which are kept in pots, by way of curiosity; for these do not continue long.

Some persons have made use of codlin-stocks for grafting of Apples, in order to stint their growth: but, as these are commonly propagated by suckers, I would by no means advise the use of them; nor would I chuse to raise the codlin-trees from suckers, but rather graft them upon crab-stocks; which will cause the fruit to be finer, last longer, and have a sharper flavour: and these trees will last much longer sound, and never put out suckers, as the codlins always do; which, if not constantly taken off, will weaken the trees, and cause them to canker; and it is not only from the root, but from the knots of their stems, there are generally a great number of strong shoots produced, which fill the trees with useless shoots, and render them unsightly, and the fruit small and crumpled.

The method of raising stocks from the kernels of crabs or Apples is, to procure them where they are pressed for verjuice or cyder; and, after they are cleared of the pulp, they may be sown upon a bed of light earth, covering them over about half an inch thick with the same light earth: these may be sown in November or December, where the ground is dry; but, in wet ground, it will be better to defer it till February: but then the seeds should be preserved in dry sand, and kept out of the reach of vermin; for, if mice or rats can get to them, they will devour the seeds: there should also be care taken of the seeds, when they are sown, to protect them from these vermin, by setting of traps to take them, &c. In the spring, when the plants begin to appear, they must be carefully weeded; and, if the season should prove dry, it will be of great service to water them two or three times a week; and, during the summer, they must be constantly kept clear from weeds; which, if suffered to grow, will soon over-top the plants, and spoil their growth: if these thrive well, they will be fit to transplant into the nursery the October following; at which time the ground should be carefully digged, and cleansed from the roots of all bad weeds: then the stocks should be planted in rows three feet asunder, and the plants one foot distance in the rows, closing the earth pretty fast to their roots: when the stocks are transplanted out of the seed-bed, the first autumn after sowing, they need not be headed; but, where they are inclined to shoot downward, the tap-root must be shortened, in order to force out horizontal roots: if the ground is pretty good in which these stocks are planted, and the weeds constantly cleared away, the stocks will make great progress; so that those which are intended for dwarfs, may be grafted the spring twelve-month after they are planted out of the seed-beds: but those which are designed for standards will require two years more growth, before they will be fit to graft; by which time they will be upwards of six feet high.

The other necessary work to be observed in the culture of these trees, while they remain in the nursery, being exhibited under the article of NURSERY, I shall not repeat in this place.

I shall next treat of the manner of planting such of these trees, as are designed for espaliers in the kitchen garden; where, if there is an extent of ground, it will be proper to plant, not only such sorts as are for the use of the table, but also a quantity of trees to supply the kitchen: but, where the kitchen garden is small, the latter must be supplied from standard-trees, either from the orchard, or wherever they are planted: but as many of these kitchen Apples are large, and hang late in the autumn upon the trees, they will be much more exposed to the strong winds, on standard-trees, than on espaliers; whereby many of the fruit will be blown down before they are ripe, and others bruised, so as to prevent their keeping: therefore, where it can be done, I should always prefer the planting them in espaliers.

The distance I should chuse to allow these trees, should not be less than twenty-five feet, for such sorts as are of moderate growth (if upon crab or free-stocks) but the larger growing sorts should not be allowed less room than thirty or thirty-five feet, which will be found full near enough, if the ground is good, and the trees properly trained: for the branches of these trees should not be shortened, but trained at their full length, so that in a few years they will be found to meet. Indeed, at the first planting, the distance will appear so great, to those persons who have not observed the vigorous growth of these trees, that they will suppose they never extend their branches so far, as to cover the espalier; but if these persons will but observe the growth of standard-trees of the same kinds, and see how wide their branches are extended on every side, they may be soon convinced, that, as these espalier-trees are allowed to spread but on two sides, so they will of course make more progress, as the whole nourishment of the root will be employed in these side-branches, than where there is a greater number of branches on every side of the tree, which are to be supplied with the same nourishment.

The next thing to be observed, is the making choice of such fruits as grow nearly alike, to plant in the same espalier. This is of great consequence, because of the distance which they are to be placed; otherwise those sorts which make the largest shoots, may be allowed less room to spread, than those of the smaller growth: beside, when all the trees in one espalier are nearly equal in growth, they will have a better appearance, than when some are tall, and others short.

If these Apples are grafted upon crab-stocks, I would willingly place them at the following distance from each other; especially where the soil is good; viz. the largest-growing trees at forty feet, the middle-growing at thirty feet, and the small-growing at twenty feet; which, from constant experience, I find to be full near enough: for in many places, where I have planted these trees at twenty-four feet distance, the trees have shot so, as that in seven years their branches have met, and in ſome places, where every other tree have been taken up, the branches have almoſt joined in ſeven years after: therefore it will be much the better way to plant theſe trees at a proper diſtance at firſt; and between theſe to plant ſome dwarf cherries, currans, or other ſorts of fruit, to bear for a few years; which may be cut away when the apple-trees have extended their branches to them: for, when the apple-trees are planted nearer together, few perſons care to cut down the trees, when they are fruitful; ſo that they are obliged to uſe the knife, ſaw, and chiſſel, more than is proper for the future good of the trees; and many times, where perſons are inclinable to take away part of their trees, the diſtances will be often ſo irregular (where there was not this conſideration in planting) as to render the eſpalier unſightly.

When the trees are upon the Dutch dwarf-ſtock, the diſtance ſhould be for the larger growing-trees twenty feet, for thoſe of middle growth ſixteen, and the ſmaller twelve feet; which will be found full near, where the trees thrive well.

The next is the choice of the trees, which ſhould not be more than two years growth from the graft; but thoſe of one year ſhould be preferred: be careful that their ſtocks are young, ſound, and ſmooth, free from canker, and which have not been cut down in the nurſery: when they are taken up, all the ſmall fibres ſhould be intirely cut off from the roots, which, if left on, will turn mouldy and decay, and ſo will obſtruct the new fibres in their growth: the extreme parts of the roots muſt be ſhortened, and all bruiſed or broken roots cut off; and if there are any miſplaced roots, which croſs each other, they ſhould alſo be cut away. As to the pruning of the head of theſe trees, there need be nothing more done, than to cut off any branches which are ſo ſituated as that they cannot be trained to the line of the eſpalier: in the planting, there muſt be care taken not to place their roots too deep in the ground, eſpecially, if the ſoil is moiſt; but rather raiſe them on a little hill, which will be neceſſary to allow for the raiſing of the borders afterwards. The beſt ſeaſon for planting theſe trees (in all ſoils that are not very moiſt) is, from October, to the middle or latter end of November, according as the ſeaſon continues mild; but, as ſoon as the leaves fall, they may be removed with great ſafety. After the trees are planted, it will be proper to place down a ſtake to each tree, to which the branches ſhould be faſtened, to prevent the winds from ſhaking or looſening their roots, which will deſtroy the young fibres, for, when theſe trees are planted pretty early in the autumn, they will ſoon puſh out a great number of new fibres; which, being very tender, are ſoon broken; ſo the trees are greatly injured thereby. If the winter ſhould prove ſevere, it will be proper to lay ſome rotten dung, tanners-bark, or ſome ſort of mulch, about their roots, to prevent the froſt from penetrating the ground, which might damage theſe tender fibres: but I would not adviſe the laying this mulch before the froſt begins; for if it is laid over the roots, ſoon after the trees are planted (as is often practiſed) it will prevent the moiſture's entering the ground, and do much harm to the trees.

The following ſpring, before the trees begin to puſh, there ſhould be two or three ſhort ſtakes put down on each ſide of the tree, to which the branches ſhould be faſtened down as horizontally as poſſible, never cutting them down, as is by ſome practiſed; for there will be no danger of their putting out branches enough to furniſh the eſpalier, if the trees are once well eſtabliſhed in their new quarters.

In the pruning of theſe trees, the chief point is, never to ſhorten any of the branches, unleſs there is an abſolute want of ſhoots to fill the ſpaces of the eſpalier: for, where the knife is much uſed, it only multiplies uſeleſs ſhoots, and prevents their fruiting; ſo that the beſt method to manage theſe trees is, to go over them three or four times in the growing ſeaſon, and rub off all ſuch ſhoots as are irregularly produced; and train the others down to the ſtakes, in the poſition they are to remain: if this be carefully performed in ſummer, there will be little left to do in the winter; and by bending of their ſhoots from time to time, as they are produced, there will be no occaſion to uſe force, to bring them down, nor any danger of breaking their branches. The diſtance which theſe branches ſhould be trained from each other, for the largeſt ſorts ſhould be about ſeven inches, and for the ſmaller four or five. If theſe plain inſtructions are followed, it will ſave much unneceſſary labour of pruning; and the trees will, at all times, make an handſome appearance: whereas, when they are ſuffered to grow rude in ſummer, there will be much greater difficulty to bring down their ſhoots, eſpecially, if they are grown ſtubborn. All theſe ſorts of Apples produce their fruit upon curſons or ſpurs, ſo that theſe ſhould never be cut off; for they will continue fruitful a great number of years. *Miller's Gard. Dict.*

APPLICATION *of one ſcience to another*, is a term generally made uſe of to convey the idea of the uſe we make of applying the principles and truths which belong to one ſcience, to complete and advance another.

In general, it may be ſaid that there is no art or ſcience which has not ſome connection with another; many articles, in this work, furniſh matter enough to prove this.

APPLICATION *of algebra to geometry*.—Algebra being the calculation of magnitude, in general, and the analyſis the uſe of algebra to diſcover unknown quantities; it was natural, after having diſcovered algebra and the analyſis, to think of applying theſe two ſciences to geometry; becauſe the line, the ſurface, and the ſolid, objects of geometry, are commenſurable magnitudes, and, conſequently, bear a proportion to each other: however, till Deſcartes, nobody ever thought on it; though algebra had made a great progreſs, eſpecially under the hand of Vieta. It is in Deſcartes's geometry that we firſt find the Application of algebra to it, as well as ſome excellent methods to carry algebra itſelf to perfection. This great genius has, by theſe means, done immortal ſervice to the mathematics, and given a key to the moſt important diſcoveries we can ever hope to make in this ſcience.

He firſt taught us to expreſs the nature of curves by equations, to reſolve geometrical problems by theſe curves: in ſhort, often to demonſtrate theorems of geometry by the help of algebraical calculation, when it would be too laborious to demonſtrate them any other way; at leaſt by making uſe of the common methods. Under the articles CONSTRUCTION, EQUATION, and CURVE, *in the Dictionary, and Supplement*, may be ſeen in what this Application of algebra to geometry conſiſts. We know not whether the antients had any help like this in their ſtudies; if they had not, we cannot help wondering they continued ſo long in the dark. We have a treatiſe of Archimedes on ſpiral lines, and his own demonſtrations; but it is hard to know, whether theſe demonſtrations exactly ſhew the method by which he arrived at a diſcovery of the property of ſpiral lines; or, whether, after having made the diſcovery by ſome private method, which he kept to himſelf, had a mind to conceal it, by puzzling demonſtrations. But, if he, indeed, followed no other method than that contained in theſe demonſtrations, it is amazing he did not loſe himſelf, and it is impoſſible to give a greater proof of the depth and ſtrength of his genius. Bouillaud confeſſes he never underſtood the demonſtrations of Archimedes; and Vieta has unjuſtly charged them with abſurdity.

But, be this as it may, theſe ſame demonſtrations which gave Bouillaud and Vieta ſo much trouble, and, perhaps, coſt Archimedes as much, may, at preſent, be rendered extremely eaſy, by the Application of algebra to geometry. The ſame may be ſaid of all the geometrical works of the antients: for ſcarce any man can read and underſtand them eaſily, without knowing how to apply algebra to their demonſtrations.

Sir Iſaac Newton, however, who knew, better than any other man, all the advantages of analytical algebra in geometry, complains, in many places of his works, that reading the antient geometricians is ſhamefully neglected.

In ſhort, the method made uſe of by the antients who applied themſelves to geometry, is looked upon to be more difficult, than that of analytical algebra; and on this principally Sir Iſaac Newton's complaints are grounded; apprehending, by the too frequent uſe of algebra, geometry, which is ſo remarkably difficult in its demonſtrations, might be loſt, or leſs cultivated, ſomething ſo much more eaſy being ſubſtituted in its room. I apprehend, this great man recommends reading the antient geometricians, becauſe their demonſtrations exerciſe the mind ſo much more, accuſtom it to greater application, enlarge its views, and form it to a degree of patience and perſeverance, neceſſary for making new diſcoveries. But we muſt be careful not to run into the oppoſite extreme; for, by applying cloſe to the method of the antients, there is no likelihood, that even the fineſt genius will make ſo great diſcoveries in geometry, or, at leaſt, ſo many, as he might by the help of algebra. As to the ſuperiority given to demonſtrations after the manner of the antients, becauſe they are more difficult, I am in great doubt whether the plea be well founded. On opening Sir Iſaac Newton's Principia, I ſee every thing therein demonſtrated after the manner of the antients; but at the ſame time I perceive very plainly, that Sir Iſaac found out his theorems by other methods than thoſe whereby he demonſtrates them, and that his demonſtrations are nothing more than analytical calculations, which he has diſguiſed by ſubſtituting the name of lines to the algebraical ſymbols. If it be objected that the demonſtrations of Sir Iſaac are difficult, which is true, why ſhould not transferring theſe demonſtrations into the language of algebra be difficult alſo? Let us call a line A B, or expreſs it in algebra by the letter *a*, what difference can ariſe from this, as to the certainty of the demonſtration? In truth, this laſt method has this particular in it, that, when we have expreſſed all the lines in algebraical characters, we may perform many operations, without thinking either on the lines or figure; by which advantage, the mind is relaxed; and, as its ſtrongeſt attention is required to ſolve ſome problems, analytical algebra ſpares it as much as poſſible. It is ſufficient to know, that the principles of calculation are right; the hand works, as it were, mechanically, and exhibits the theorem or problem ſought; which, without theſe methods, we ſhould never have obtained, but by a great deal of trouble. The algebraiſt will have no more to do, to give his ſolution

or

or demonstration the difficulty they pretend it wants, than to turn it into the stile of the ancients, as Sir Isaac has done his.

Admitting the too frequent use of algebra may render the mind remiss, yet it must be owned, that it is absolutely necessary in a great number of our enquiries; but I am very much in doubt whether the use of algebra renders mathematical demonstrations less difficult or not. We may look on the method of the ancients as a fatiguing, rocky, rough road, into which the geometrician leads his reader; the algebraist placed in a more elevated point of view sees, if I may use the expression, all the road, at one cast of his eye; explores every path; can conduct others into them, or keep them there, as long as he pleases.

Besides, there are some cases wherein algebra, instead of shortening demonstrations, renders them more tedious; of this number, among others, is that of comparing angles; on which several problems and theorems depend.

These angles are not to be expressed in algebra, but by their sines; these sines are often complicated, which makes their constructions and expressions difficult. Great geometricians must decide which is preferable, the method of the ancients or algebraical solutions; it is extremely difficult to give general rules with any exactness in this point.

APPLICATION *of Geometry to Algebra*. Though the Application of algebra to geometry be much more common and useful than that of geometry to algebra, yet, on some occasions, the latter takes place. As we represent geometrical lines by letters, we may, sometimes, represent numerical quantities expressed by letters in algebra, by lines in geometry; and from this sometimes results a greater facility of demonstration, in certain theorems, and an easier solution of some problems. To give a plain example, suppose we would find the square of $a + b$; it is easy to demonstrate by algebraic calculation, that this square contains the square of a plus that of b plus twice the product of a by b. But we can demonstrate this proposition geometrically too. In order to this, we need only make a square whose base and perpendicular must be divided each into two parts, one of which we will call A, the other B; afterwards drawing parallel lines through the points of division on the sides of the square, we shall divide it into four superficies, one of which will be the square of a, another that of b, and the two others will be each a rectangle formed by a and b, from whence it follows, that the square of the binomial $a + b$ contains the square of each of the two parts, plus twice the product of the first by the second. This plain example may serve to shew how geometry may be applied to algebra, that is to say, how we may sometimes make use of geometry to demonstrate theorems in algebra.

The Application of geometry to algebra is not so necessary in the example we have just mentioned, as in several others too complicated for us to make an exact enumeration of. We shall therefore only observe, that the consideration of curves of the parabolic kind, and of the course of these curves with regard to their axis, is often useful to demonstrate several theorems relating to equations and their roots with more ease. We may even sometimes apply geometry to arithmetic, that is, make use of geometry to demonstrate some certain theorems in arithmetic more easily, without any particular analysis in a general manner; as for example, let it be required to prove that a series of odd numbers 1, 3, 5, 7, 9, &c. added, shall successively give a series of squares 1, 4, 9, 16, 25, &c.

To this end make a rectangle triangle (*plate* IV. *fig*. 26.) of which let one side be horizontal and the other vertical (we mention the terms horizontal and vertical to fix the imagination) divide the vertical side A B into as many equal parts as you please, and through the points of division 1, 2, 3, 4, &c. draw the parallels 1 f, 2 g, &c. to B E, you will at first have the little triangle A 1 f; then the trapezium 1 f g 2, three times as big as the triangle; then a third trapezium 2 g h 3, 5 times as big as the triangle; so that the spaces determined by these parallels 1 f, 2 g, &c. will be represented by the following numbers 1, 3, 5, 7, &c. beginning this arithmetical progression from the triangle A 1 f.

Now the sums of these spaces will be the triangles A 1 f, A 2 g, A 3 h, &c. which are as the squares of the sides A 1, A 2, A 3, that is to say, as 1, 4, 9, &c. then the sum of the odd numbers gives the sum of the square numbers. This proposition may indeed be demonstrated algebraically, but the preceding demonstration may satisfy those who are ignorant of algebra.

APPLICATION *of Geometry and Algebra to Mechanics*. This is founded on the same principles as the Application of algebra to geometry. It consists chiefly in representing the curves which bodies describe in their motion by equations, in determining the equation between the spaces which bodies generate (when acted upon by any powers whatever) and the time they take to pass through these spaces, &c. We cannot indeed compare two things of a different nature together, such as space and time; but we may compare the proportion of time with the parts of space passed over. Time in its nature flows uniformly, and mechanics imply the same uniformity.

Further, without knowing time in itself and having any exact measure of it, we cannot represent it more clearly, with respect to its parts, than by the parts of an infinite right-line. Now the proportion between the parts of such a line, and that of the parts of space passed through by a body, moved in whatever manner, may always be expressed by an equation. Let us suppose a curve, the abscissæ of which represent the portions of time past since the beginning of the motion, the corresponding ordinates denoting the spaces passed through during these portions of time. The equation of this curve will express, not only the proportion of the time to the space, but, if we may speak so, the proportion of the proportion that the parts of time have to their unity, to that which the parts of space, passed through, have to their's; for the equation of a curve may be considered either as expressing the proportion of the ordinates to the abscissa, or as the equation between the proportion that the ordinates have to their unity, and that which the corresponding abscissa have to their's.

It is evident then, that by the bare Application of geometry and calculation we may account for the general properties of motion, varied by any law whatever, without the help of any other principle. In the article ACCELERATED *Motion*, in the Dictionary, may be seen an example of geometry applied to mechanism; the time of the descent of a gravitating body is there represented by the perpendicular of a triangle, the velocity by the base, and the spaces passed through by the area of the parts of the triangle.

APPLICATION *of Geometry and Astronomy to Geography*. This consists in three things. 1, In determining the figure of this globe we inhabit. 2, In finding, by their longitude and latitude, the situation of places. 3, In determining the situation of places near each other. Astronomy and geometry are of great use in navigation.

APPLICATION *of Geometry and Algebra to Physics*. This we owe to Sir Isaac Newton, as we may owe the Application of algebra to geometry to Des Cartes, and it is founded on the same principles. The properties of bodies in general have between each other certain proportions, which we may compare with each other, more or less distinguishable; and these we can discover by geometry or algebra. On this are founded all the physico-mathematical sciences. One single observation or experiment often demonstrates a whole science. As for example: the bare knowledge of this, that the angle of incidence is equal to the angle of reflexion, which is known to be true, contains the whole science of catoptrics. This principle of being once admitted, catoptrics becomes a science purely geometrical, because it is reduced to comparing angles with given lines of position. The thing is the same in many other cases. By the help of geometry and algebra, we can in general determine the power of one effect, which depends on another better known. This science, therefore, is almost always necessary to compare and examine the facts experiments discover to us. It must be owned however, that every subject of physics is not equally capable of the Application of geometry. Several experiments admit of no calculation at all; such are those of the magnet, electricity, and many others; in these cases we must forbear applying it. Geometricians, however, are apt to run into this fault, by advancing hypotheses on experiments, and proceeding to calculation according to these hypotheses; but these calculations ought no farther to be regarded, than as the hypotheses on which they are supported, are conformable to nature; and, therefore, observations ought to confirm them, which unfortunately sometimes does not happen. Besides, supposing the hypotheses true, they are not always sufficient. If there be in an effect a great number of circumstances owing to several causes, which act all together, and we content ourselves with considering some of these causes only, which, being more simple, can be calculated more easily; we may gain a partial effect of these causes; but it will be very different from the total effect, which would result from uniting all the causes.

APPLICATION *of a Geometrical Method in Metaphysics*.—Geometry has been sometimes abused in physics by applying the calculation of the properties of bodies to arbitrary hypotheses. A geometrical method has also been misapplied in sciences, which in their own nature submit to no calculation, I mean the method only, not the science. Several metaphysical writers, who have published certain truths, have yet, copying after the manner of geometricians, ridiculously enough, swelled their page with the pompous words axiom, theorem, corollary, &c.

The authors of these works certainly imagined that these words, by some secret charm, composed the essence of a demonstration; and that by writing at the end of a proposition, that it might be demonstrated, they should make that demonstrable which was not really so. Geometry does not owe its certainty to this method, but to the evidence and simplicity of its object: and though a treatise on geometry, when divested of its ordinary terms, may be very good; yet, a treatise on metaphysics may be often very bad, by the

the affectation of following a geometrical method. We ought even to distrust this class of writers, for the generality of their pretended demonstrations are only founded upon an abuse of words.

Those who have considered these things, know how common and easy the abuse of words is, especially in metaphysical subjects. It is in this particular the school-men have excelled pity; and it is they made no better use of their sagacity.

APPLICATION *of metaphysics to geometry.* Metaphysics are sometimes misapplied in geometry, as well as geometry in metaphysics. Geometry, like all other sciences, has a kind of metaphysics proper to itself, which is certain and incontestable; because the geometrical propositions, which result from it, afford an evidence, which demands our assent. But, as mathematical certainty arises from the simplicity of its object, its metaphysics too must be extremely simple and clear; must always be capable of being reduced to perfect ideas, without any obscurity. In short, how can the consequences of any thing be certain and evident, if the principles are not so? Yet some authors have thought themselves able to introduce into geometry a kind of metaphysics, often obscure, and, what is still worse, have affected to demonstrate, metaphysically, truths which have been already established on other principles; this surely was the way to render those truths doubtful, if they could possibly be so. The new geometry has principally occasioned this false method. By considering parts infinitely small as real quantities, and admitting some of these to be greater and some less, they have acknowledged an infinity of small particles of different classes; and looked on them as real somethings, instead of endeavouring to reduce these suppositions and calculations to simple ideas.

Another abuse of metaphysics in geometry consists in confining metaphysics to geometrical demonstrations. Admitting even the metaphysical principles we set out upon to be certain and evident, there are scarce any geometrical theorems that can be accurately demonstrated by their help alone; they almost always require lines and calculations: this manner of demonstration is very material, because it is in short the only sure and certain method; since with our pens, not metaphysical reasonings, we can make combinations and certain calculations.

This latter kind of metaphysics, which we have been speaking of, is however good to a certain degree, provided we do not confine ourselves too much: it makes us carefully examine the principia of discoveries; it furnishes us with lights; it points out to us the road; but we are not sure of being right, if we may be allowed the expression, without the staff of calculation, to point out the proper objects which we before saw confusedly.

One would think great geometricians ought always to be excellent metaphysicians; at least in the objects of their science. This is not, however, always the case. Some geometricians are like people who possess a sense of seeing, contrary to that of feeling; this proves yet more how necessary calculation is in geometrical truths. One may venture to affirm that the geometrician, who is a bad metaphysician in the objects he applies himself to, will, in others, be intolerable: though geometry, whose object is the mensuration of body and matter, may in some cases be applied to thought.

APPLICATION *of one thing to another*, is a term made use of to denote the service the first is of to understand or bring the second to perfection. Thus the Application of the cycloid to pendulums signifies the use made of the cycloid to bring pendulums to perfection.

APPORTIO'NMENT, APPORCIONMENT, or APPORTIONAMENTUM, in law, a dividing of a rent into two parts or portions, according as the land, whence it issues, is divided among two or more proprietors.

Thus if a man, having a rent-service issuing out of land, purchase a part of the land; the rent shall be apportioned, according to the value of the land. So if a man let lands for years, reserving rent, and a stranger after recover part of the lands, the rent shall be apportioned.

But a rent-charge cannot be apportioned, nor things that are intire; as if one hold land by service, to pay to his lord yearly at such a feast a horse or a rose; there, if the lord purchase part of the land, this service is totally extinct; because such things cannot be divided without hurt to the whole. But if part of the land, out of which a rent charge issues, descends to the grantee of the rent, this shall be apportioned. A man purchases part of the land where he hath common appendant, the common shall be apportioned: of common appurtenant it is otherwise; and, if by the act of the party, the common is extinct. Common appendant and appurtenant may be apportioned on alienation of part of the land to which it is appendant or appurtenant. Conditions generally are intire, and cannot be apportioned by the act of the party; a contract may not be divided or apportioned, so as to subject a man to two actions.

APPRA'ISER, one who rates, or sets, a value upon goods, &c. He must be a skilful and honest person. It is not a business of itself, but generally performed by brokers of household furniture, to which set of men the word was formerly, and I believe still is, chiefly applied; yet now also upholsterers, and other brokers, are employed, or even any person or persons who are supposed to be skilled in the commodities they are to appraise, or set a value on.

They are employed in cases of death, executions brought in upon goods, of stock to be turned over from one person to another, or divided between copartners; and have the name of sworn Appraisers, from their taking an oath to do justice between party and party.

They sometimes appraise jointly, each party agreeing to have the same Appraiser, or Appraisers; sometimes in opposition, each party chusing one, or more, of a side; and sometimes by commission, or deputation, of trustees, masters in chancery, &c.

Their manner is, each one for himself, to take an inventory of every article, and mark its value with his own private characters. When they have gone through the whole, they give their estimates in a gross sum, very rarely of particulars. When they value against one another, if they happen to differ much, they reconsider, and at length most commonly bring it to an average; and, in some cases, they are obliged to take the goods at their own valuation, if the parties shall think proper to relinquish them.

At Bourdeaux they call Appraisers (appreciateurs in French) those clerks of the custom-house and of city duties, who appraise and rate the merchandizes which are imported or exported, in order to regulate upon what footing the duties of importation or exportation ought to be paid.

The custom-house at Bourdeaux is called the convoy, and the office of the city duties is called comptablie. The city duties are such as were granted by the French king to certain cities, either to pay their debts, or for their particular occasions.

The office of those Appraisers consists in the following particulars:

1. They are obliged to keep a register, or memorandum-book, marked and numbered by the director of the office, and to transcribe and enter into it all the declarations which are delivered from day to day at the office for the receiving the city duties, without augmenting or diminishing any thing in them but by the express order of their superiors.

2. To deliver carefully as many receipts, or bills of entry, as there are articles in each declaration.

3. The merchandizes being entered, and carried into the said custom-house, according to the order of those receipts, or bills of entries, the Appraisers are obliged to open and visit them, when the merchant requires it, in order to know the quantity and quality of them; which being found to agree both with the declarations and bills of entries, the Appraisers make a true estimate, or evaluation, of each merchandize in particular, according to the market-price of them.

4. They must enter into their register their estimate both of the weight and of the quality and quantity of the merchandize, as they found them by their search, or visit. And, as to those merchandizes which are weighed in the custom-house, the Appraisers expedite them upon the report of the warehouse-keeper.

5. They are obliged, after appraising the merchandizes, to deliver a second receipt, or bill of entry, which serves the merchants to clear their merchandizes, either at the custom-house, if any duty be owing there; or at the office of the city duties; as also what may be due for brokerage.

6. They ought to write the said bills of entry upon the register of importations by sea; and, if there be grocery, they must also register them in the register of receipts designed for that purpose, that the merchants may pay the duties owing for them at the custom-house, according to the printed tariff. And, with regard to the merchandizes that come from the western isles, the said Appraisers are obliged to register them all indiscriminately, in a particular register, as well as in the register of importations by sea, with their appraised price, except sugars, which are not registered in the registers of importations by sea, nor in that of the city duties, but only in a particular register kept by the receiver of the custom-house, as well as that of the western isles.

7. As for those merchandizes which are not carried to the custom-house, as deal-boards, and other timber coming by sea, the said Appraisers expedite them upon the report, and after the examination, of the searchers of outward-bound ships. And, with regard to tar, gum, pitch, train-oil, herrings, pilchards, &c. they expedite them according to the bill of lading: and, as for green or dried fish, the Appraisers expedite it according to the report of the clerks who were present at the unloading and landing of it.

8. At the end of every quarter they draw up an alphabetical list of all the merchandizes imported by sea, that have been cleared at the custom-house.

9. Finally, with regard to the merchandizes that come by land, the Appraisers have several things to observe, viz. as to those that come from the inland country by the boats of Thoulouse, Agen, and other places, they follow the same rules

rules and methods with regard to those that come by sea, except that they do not deliver bills of entries for those merchandizes, which is done by the clerks of the office of the city duties, after receiving the declarations.

As for those that come by the stage-coaches, by carriers, by waggons, or other carriages, they clear them upon the certificates, or acquits, given by the clerks of the custom-house offices through which they passed. *Postlethwait's Dict. of Commerce.*

APPRE'NTICESHIP, the time during which apprentices are obliged to continue with the merchants or tradesmen with whom they are bound. Their indentures ought to be recorded in the register of the company, or body, to which their masters belong; and their time does not begin but from the day on which the indenture is registered. No one, in France, can be admitted a tradesman, unless he produces his indenture, and the certificates of his Apprenticeship. *Art.* 3. *of tit.* 1. *of the ordonnance of the year* 1673.

The French give the name of apprentisse to a maiden, or woman, who binds herself for a time with a mistress, before a notary-public, in order to learn her art, or trade, almost after the same manner as apprentice-boys.

And with us it is enacted, by *stat.* 8. *Ann. cap.* 9. *sect.* 32, that there shall be paid the duty of six-pence for every pound, of every sum of 50 l. or under, and twelve-pence for every twenty shillings of every sum more than 50 l. which for five years shall be paid, or agreed for, in the putting out any clerk, apprentice, or servant, to learn any profession, trade, or employment; and proportionably for greater or lesser sums, to be paid by the master or mistress.

The full sum given, or agreed to be given, with an apprentice, &c. shall be written in words, at length, in the indenture, &c. which must bear date on the day it was executed, upon pain that every master or mistress, offending in these particulars, shall, for every offence, forfeit double the sum given, or agreed to be given; one moiety to the crown, the other, with costs, to him who will sue within one year after the time limited for such clerk, or apprentice, to serve his master, &c. is expired. *Sect.* 33.

All indentures, &c. of Apprenticeships, which shall be executed in any other part of Great-Britain, shall, within two months after they are executed, be brought either to the head office, or to some collector of the stamp-duties; and the duty shall be paid; and, in case the payment be made to the receiver-general, the indenture shall be stamped; and, in case the payment be made to a collector, he shall indorse in words, at length, a receipt of the money paid to him, and subscribe his name. *Sect.* 37.

Every indenture so endorsed, if it is executed within 50 miles of London, shall, within three months after date, if executed at a greater distance, then within six months after date, be brought to the said head office where (the same beino produced with a receipt endorsed) it shall be stamped. *Sect.* 38.

Indentures wherein the full sum agreed on shall not be inserted, or the duties not paid, or not stamped, or tendered to be stamped, shall be void, and the clerk, or apprentice, shall have no privilege of freedom, or using his trade.

Money given to put out apprentices, either by parishes or public charities, shall not pay any duty. *Sect.* 39.

Forging the stamps, or any receipt for monies payable by this act, is felony, without benefit of clergy. *Sect.* 41.

No indenture, &c. shall be admitted in evidence in any suit to be brought by the parties thereunto, unless he, for whom it shall be given in evidence, first makes oath, that, to the best of his knowledge, the sum therein mentioned was all that was paid, &c. on behalf of the apprentice, for the benefit of the master, &c. *Sect.* 43.

Where any thing shall be given to a master, not being money, the duty shall be paid for the full value thereof. *Sect.* 45.

APPREHE'NSION, in metaphysics, an operation of the mind, which makes it perceive an object.

The soul according to Father Malbranche is capable of apprehension three different ways, the intellectual faculty, the imagination, and the senses. It perceives spiritual and universal things, simple ideas, and, in general, all its thoughts that arise from reflection on itself, purely from the intellectual faculty. Material things too it perceives this way, as extension with all its properties; for there is nothing, but the pure intellectual faculty can conceive a perfect circle or square, a figure of a thousand sides, and many things of a like nature. This kind of apprehension is called pure or intellectual apprehension, because it is not necessary the mind should form images in the brain, to represent all these things to itself. It perceives by imagination material beings, though absent, as if present, by forming images of them in the brain. It is in this manner we imagine all kinds of figures: these perceptions may be called imaginations; because the soul represents these objects to itself, by forming images of them in the brain; and, because we cannot form images of spiritual substances, it consequently follows, the soul cannot imagine them. In short, the soul only perceives grosser objects by the senses, which by being present make an impression on the external organs, which impression is communicated to the brain; and these perceptions are called sensations.

When Father Malbranche says, corporeal substances are represented by the imagination, and spiritual by the understanding or intellectual faculty; does he understand himself? In either case is it not equally a thought of the mind; and is it not equally employed whether it think on a mountain, which is a corporeal object, or an intelligence, which is a spiritual being? It may be answered, the operation of the mind, that acts by virtue of the impressions made in the brain by corporeal objects, is imagination, and that the operation of the mind, independent of these impressions, is purely the intellectual faculty. When the Cartesians speak of these traces in the brain, are they in earnest? With what kind of microscope have they discovered these traces in the brain which form the imagination? Admitting they had discovered them, how can they tell, whether the mind may not have occasion for them, in all her operations, even the most spiritual?

To speak more justly, let us say, the faculty of thinking is always the same, always equally spiritual, on whatever object it is employed. They by no means prove its spirituality more by one object than another; no more by what they call the intellectual faculty, than by the imagination. Do not angels think on corporeal as well as spiritual objects? Should we therefore distinguish in them the imagination from the pure intellectual faculty? Have they more occasion for traces on the brain in either case? With us it is the same: as soon as the mind thinks, it thinks absolutely, with an essential spirituality, as real, as that of purer spirits; call it which you will, imagination or intellectual faculty.

But, when a body presents itself to the mind, is it not said we form an ideal shape of it? This term in use among the ancient philosophers is nothing to the present purpose, or barely signifies the internal object of the mind, when it thinks on a body. Besides, this internal object is equally spiritual, whether it thinks on material or immaterial substances; because in either case it stands in need of the senses. We conclude, therefore, that the essential difference some are fond of establishing between the pure intellectual faculty and the imagination, is nothing more than a chimerical distinction.

APPROA'CHING, in fowling, a term used to express such devices as are contrived for the getting within shot of shy birds.

It is principally used in marshy low places. The best method of Approaching is by the means of three hoops tied together at proper distances, according to the height of the man that is to use it, and having boughs of trees tied all round it, with cords to hang it over his shoulders; a man, getting into this, conceals himself, and approaches by degrees toward his game in the form of a moving bush.

Geese, ducks, and teal, quit the waters in the evening and pass the night in the fields, but at the approach of morning they return to the water again, and even when on the water, they will retire to great distances, on the approach even of a horse or cow, so that the business of the stalking horse is of little use; but this device of Approaching by the moving bush succeeds tolerably well with them. *Dict. Rust.*

APPRO'XIMATION (*Dict.*)—Under this article in the Dictionary we have given the method of approximating the roots of equations by their limits; we shall here add the method of approximating by converging series.

If there be only two letters, x and a, in the proposed equation, suppose a equal to an unit, and find the root of the numeral equation that arises from the substitution, See APPROXIMATION in the dictionary. Multiply these roots by a, and the products will give the roots of the proposed equation.

Thus the roots of the equation $x^2 - 16x + 55 = 0$ are found to be 5 and 11. And therefore the roots of the equation $x^2 - 16ax + 55a^2 = 0$, will be $5a$ and $11a$. The roots of the equation $x^3 + a^2x - 2a^3 = 0$ are found by enquiring what are the roots of the numeral equation $x^3 + x - 2 = 0$, and, since one of these is 1, it follows that one of the roots of the proposed equation is a; the other two are imaginary.

If the equation to be resolved involves more than two letters, as $x^3 + a^2x - 2a^3 + ayx - y^3 = 0$, then the value of x may be exhibited in a series, having its terms composed of the powers of a and y, with their respective co-efficients; which will "converge the sooner the less y is in respect of a, if the terms are continually multiplied by the powers of y, and divided by those of a." Or, "will converge the sooner the greater y is in respect of a, if the terms be continually multiplied by the powers of a, and divided by those of y." Since, when y is very little in respect of a, the terms y, $\frac{y^2}{a}$, $\frac{y^3}{a^2}$, $\frac{y^4}{a^3}$, $\frac{y^5}{a^4}$, &c. decrease very quickly, If y vanish in respect of a, the second term will vanish in respect of the first, since $\frac{y^2}{a} : y :: y : a$. And after the same manner $\frac{y^3}{a^2}$ vanishes in respect of the term immediately preceding it.

But, when y is vastly great in respect of a, then a is vastly great in reſpect of $\frac{a^3}{y}$, and $\frac{a^3}{y}$ in reſpect of $\frac{a^3}{y^2}$; ſo that the terms a, $\frac{a^2}{y}$, $\frac{a}{y^2}$, $\frac{a^4}{y^3}$, $\frac{a^5}{y^4}$, &c. in this caſe decreaſe very ſwiftly. In either caſe, the ſeries converge ſwiftly that conſiſt of ſuch terms; and a few of the firſt terms will give a near value of the root required.

If a ſeries for x is required from the propoſed equation that ſhall converge the ſooner the leſs y is in reſpect of a; to find the firſt term of this ſeries, we ſhall ſuppoſe y to vaniſh, and extracting the root of the equation $x^3 + a^2x - 2a^3 = 0$, conſiſting of the remaining parts of the equation that do not vaniſh with y, we find, that $x = a$; which is the true value of x when y vaniſhes, but is only near its value when y does not vaniſh, but only is very little. To get a value ſtill nearer the true value of x, ſuppoſe the difference of a from the true value to be p, or that $x = a + p$. And, ſubſtituting $a + p$ in the given equation for x, you will find

$$\left.\begin{aligned} x^3 &= a^3 + 3a^2p + 3ap^2 + p^3 \\ +a^2x &= a^3 + a^2p \\ -2a^3 &= -2a^3 \\ +ayx &= a^2y + apy \\ -y^3 &= -y^3 \end{aligned}\right\} = 0$$

$$\left.\begin{aligned} = 4a^2p + 3ap^2 + p^3 \\ a^2y + apy - y^3 \end{aligned}\right\} = 0.$$

But ſince, by ſuppoſition, y and p are very little in reſpect of a, it follows that the terms $4a^2p$, a^2y, where y and p are ſeparately of the leaſt dimenſions, are vaſtly great in reſpect of the reſt; ſo that, in determining a near value of p, the reſt may be neglected: and from $4a^2p + a^2y = 0$, we find $p = -\frac{1}{4}y$. So that $x = a + p = a - \frac{1}{4}y$, nearly. Then to find a nearer value of p, and conſequently of x, ſuppoſe $p = -\frac{1}{4}y + q$, and ſubſtituting this value for it in the laſt equation, you will find

$$\left.\begin{aligned} p^3 &= -\tfrac{1}{64}y^3 + \tfrac{3}{16}y^2q - \tfrac{3}{4}yq^2 + q^3 \\ 3ap^2 &= \tfrac{3}{16}ay^2 - \tfrac{3}{2}ayq + 3aq^2 \\ 4a^2p &= -a^2y + 4a^2q \\ ayp &= -\tfrac{1}{4}ay^2 + ayq \\ a^2y &= a^2y \\ -y^3 &= -y^3 \end{aligned}\right\} = 0 =$$

$$\left.\begin{aligned} = -\tfrac{65}{64}y^3 + \tfrac{3}{16}y^2q - \tfrac{3}{4}yq^2 + q^3 \\ -\tfrac{1}{16}ay^2 - \tfrac{1}{2}ayq + 3aq^2 \\ +4a^2q \end{aligned}\right\} = 0.$$

And ſince, by the ſuppoſition, q is very little in reſpect of p, which is nearly $= -\frac{1}{4}y$, therefore q will be very little in reſpect of y; and, conſequently, all the terms of the laſt equation will be very little in reſpect of theſe two, viz. $-\frac{1}{16}ay^2 + 4a^2q$, where y and q are of leaſt dimenſions ſeparately; particularly the term $-\frac{1}{2}ayq$ is little in reſpect of $4a^2q$, becauſe y is very little in reſpect of a; and it is little in reſpect of $-\frac{1}{16}ay^2$, becauſe q is little in reſpect of y.

Neglect therefore the other terms, and ſuppoſing $-\frac{1}{16}ay^2 + 4a^2q = 0$, you will have $q = \frac{1}{64} \times \frac{y^2}{a}$; ſo that $x = a - \frac{1}{4}y + \frac{1}{64} \times \frac{y^2}{a}$. And by proceeding in the ſame manner you will find $x = a - \frac{y}{4} + \frac{y^2}{64a} - \frac{131y^3}{512a^2} + \frac{509y^4}{16384a^3}$, &c.

When it is required to find a ſeries for x that ſhall converge ſooner, the greater y is in reſpect of any quantity a, you need only ſuppoſe a to be very little in reſpect of y, and proceed by the ſame reaſoning as in the laſt example of the ſuppoſition of y being very little.

Thus, to find a value for x in the equation $x^3 - a^2x + ayx - y^3 = 0$, that ſhall converge the ſooner the greater y is in reſpect of a. Suppoſe a to vaniſh, and the remaining terms will give $x^3 - y^3 = 0$, or $x = y$. So that, when y is vaſtly great, it appears that $x = y$ nearly.

But, to have the value of x more accurately, put $x = y + p$, then

$$\left.\begin{aligned} x^3 &= y^3 + 3y^2p + 3yp^2 + p^3 \\ -a^2x &= -a^2y - a^2p \\ +ayx &= ay^2 + ayp \\ -y^3 &= -y^3 \end{aligned}\right\} = 0 =$$

$$\begin{aligned} = +3y^2p + 3yp^2 + p^3 - a^2y - a^2p \\ + ay^2 + ayp. \end{aligned}$$

Where the terms $3y^2p + ay^2$ become vaſtly greater than the reſt, y being vaſtly greater than a or p; and conſequently $p = -\frac{1}{3}a$ nearly.

Again, by ſuppoſing $p = -\frac{1}{3}a + q$, you will transform the laſt equation into

$$\left.\begin{aligned} -\tfrac{1}{27}a^3 + 3y^2q + 3yq^2 + q^3 \\ -a^2y - ayq - aq^2 \\ -\tfrac{1}{3}a^2q \end{aligned}\right\} =$$

where the two terms $3qy^2 - a^2y$ muſt be vaſtly greater than any of the reſt, a being vaſtly leſs than y, and q vaſtly leſs than a, by the ſuppoſition; ſo that $3qy^2 - a^2y = 0$, and $q = \frac{a^2}{3y}$ nearly. By proceeding in this manner, you may correct the value of y and find that $x = y - \frac{1}{3}a + \frac{a^2}{3y} + \frac{a^3}{81y^2} - \frac{8a^4}{243y^3}$, &c. which ſeries converges the ſooner the greater y is ſuppoſed to be taken in reſpect of a.

In the ſolution of the firſt example thoſe terms were always compared in order to determine p, q, r, &c. in which y and thoſe quantities p, q, r, &c. were ſeparately of feweſt dimenſions. But, in the ſecond example, thoſe terms were compared in which a and the quantities p, q, r, &c. were of the leaſt dimenſions ſeparately. And theſe always are the proper terms to be compared together, becauſe they become vaſtly greater than the reſt, in the reſpective hypotheſis.

In general; to determine the firſt, or any term in the ſeries, ſuch terms of the equation are to be aſſumed together only, as will be found to become vaſtly greater than the other terms; that is, which gave a value of x, which, ſubſtituted for it in all the terms of the equation, ſhall raiſe the dimenſions of the other terms all above, or all below, the dimenſions of the aſſumed terms, according as y is ſuppoſed to be vaſtly little, or vaſtly great in reſpect of a.

Thus, to determine the firſt term of a converging ſeries, expreſſing the value of x in the laſt equation $x^3 - a^2x + ayx - y^3 = 0$, the terms ayx and $-y^3$ are not to be compared together, for they would give $x = \frac{y^2}{a}$, which ſubſtituted for x, the equation becomes $\frac{y^6}{a^3} - ay^2 + y^3 - y^3 = 0$, where the firſt term is of more dimenſions than the aſſumed terms $ayx - y^3$: and the ſecond of fewer; ſo that the two firſt terms cannot be neglected in reſpect of the two laſt, neither when y is very great nor very little, compared with a. Nor are the terms x^3, ayx, fit to be compared together in order to obtain the firſt term of a ſeries for x, for the like reaſon.

But x^3 may be compared with $-a^2x$, as alſo $-a^2x$ with $-y^3$, for that end. Theſe two give the firſt terms of a ſeries that converges the ſooner the leſs y is; as $x^3 = y^3$ gives the firſt term of a ſeries that converges the ſooner the greater y is.

The comparing x^3 with $-a^2x$ gives theſe two ſeries,

$$x = a - \tfrac{1}{2}y - \frac{y^2}{8a} + \frac{7y^3}{16a^2} - \frac{59y^4}{128a^3}, \text{ \&c.}$$

$$x = -a + \tfrac{1}{2}y + \frac{y^2}{8a} + \frac{9y^3}{16a^2} + \frac{69y^4}{128a^3}, \text{ \&c.}$$

The comparing $-a^2x$ with $-y^3$ gives

$$x = -\frac{y^3}{a^2} - \frac{y^4}{a^3} - \frac{y^5}{a^4} - \frac{y^6}{a^5} -, \text{ \&c.}$$

And theſe ſeries give three values of x, when y is very little; the laſt of which is itſelf alſo very little in that caſe, as it appears indeed from the equation, that, when y vaniſhes, the three values of x become $+a$, $-a$, and 0, becauſe, when y vaniſhes, the equation becomes $x^3 - a^2x = 0$, whoſe roots are a, $-a$, 0.

A'PRICOCK. See ARMENIACA.

A'PSIS (*Dict.*)— Some mechanic philoſophers conſider the motion of a plant from one Apſis to the other, as vibrations of a pendulum: for example, the motion of the moon from her perigee to her apogee, and from her apogee to her perigee; and apply the laws of vibration to this motion; from whence they infer, that theſe oſcillations of the heavenly bodies will ceaſe on the reſtoration of the equilibrium, which will one day return.

Others are of opinion there is ſomething not mechanical in this motion; they aſk why was the equilibrium deſtroyed; and why have theſe vibrations taken place? Why is not the equilibrium reſtored; and why continue theſe vibrations to interrupt it? See *Memoires de Trev. April* 1730, *p.* 709 *& ſeq.*

Theſe queſtions they look on as unanſwerable; which only proves they were ſtrangers to the Newtonian philoſophy. See *Newton's Principia, lib.* 1. *ſect.* 9. *Herman. Phoron. lib.* 1. *cap.* 4.

Among the authors who have compared theſe vibrations to that of a pendulum, one of the moſt celebrated is Bernouilli, late profeſſor of mathematics at Baſe, in a piece intitled, 'New Thoughts on the Carteſian Syſtem, with the Manner 'of reducing the Orbits and Aphelia of the Planets from it.' This carried the prize at the Royal Academy of Sciences at Paris in the year 1730. In it he endeavours to explain, how it might happen, even in the ſyſtem of vortices, that a planet muſt not neceſſarily be always at the ſame diſtance from the ſun, but alternately approach nearer to it, or recede farther from it. But in natural philoſophy it is not ſufficient to give a plauſible explication of a particular phænomenon. The hypotheſis we lay down for explaining this phænomenon, muſt be conſiſtent with itſelf, and what depends on it. Now, if we examine the explanation given by Bernouilli, it will appear difficult to conceive how he can ſhew it poſſible a plant ſhould deſcribe an ellipſis round the ſun, and the ſun poſſeſs one focus of that ellipſis; and yet the area of the diſtances, deſcribed round the ſun, be proportionable to the time

time of its revolution, as deduced from obſervations. See, on this ſubject, a Memoir of Monſieur Bouguer, Member of the Academy, publiſhed in 1731, on the curvilinear Motion of Bodies in the Mediums wherein they move.

If the line of the greateſt diſtance of a planet, and that of the leaſt diſtance, be not ſituated in a right line, but form an angle more or leſs than 180 degrees, it is called the motion of the line of the Apſides, or the motion of the Apſides. And, if the angle be leſs than 180 degrees, we ſay the motion of the Apſides is contrary to the order of the ſigns: on the contrary, if the angle be more than 180, we ſay it is according to the order of the ſigns. As to a method of determining the poſition of the Apſides, ſeveral ways have been made uſe of. The antients, who thought the planets deſcribed perfect circles, of which the ſun was not the center, made uſe of a method to determine the Apſides, explained by Keil in his Aſtronomical Inſtitutions. Since it has been diſcovered that the planets deſcribe ellipſes, of which the ſun poſſeſſes one of the foci, new methods have been diſcovered to determine the ſituation of the Apſides in their orbits. Halley has propoſed one which requires only the time of the revolution of the planet to be given. Seth Ward has laid down another, which ſuppoſes three different obſervations of the planet to be made in any three different parts of its orbit; but this is founded on an hypotheſis not exactly true, and the celebrated Mr. Euler has publiſhed a far better method in the 7th vol. of the Memoirs of the Academy of Peterſburgh; all theſe different methods, except the laſt, may be ſeen in Keil's Aſtronomy. See Halley's method under APHELION.

Sir Iſaac Newton has given a curious method for determining the motion of the Apſides in his Principia, by ſuppoſing the orbit deſcribed by the planet to be little different from a circle, as almoſt all the planetary orbits are. This great philoſopher has ſhewn, that if the ſun were fixed, and all the planets gravitated towards him in an inverſe ratio of the ſquare of their diſtances, there would be no motion of the Apſides; that is, the lines of the greater and leſſer diſtance would be exactly 180 degrees diſtant from each other; and, conſequently, form a right line. The reaſon, therefore, why the two points of the Apſides are not always exactly in a right line with the ſun, is, becauſe the reciprocal tendence of the planets towards each other, and their gravitation towards the ſun, is not exactly in an inverſe ratio to the ſquare of their diſtances. Sir Iſaac gives a very nice method of determining the motions of the Apſides, by ſuppoſing we knew the force added to the gravitation of the planet towards the ſun, and that this additional force always has its direction towards the ſun.

APUI', or APPUI, in the manage, q. d. reſt or ſtay upon the hand, the reciprocal effort between the horſe's mouth and the bridle-hand; or the ſenſe of the action of the bridle on the hand of the horſeman.

A juſt Appui of the hand, is the nice bearing up or ſtay of the bridle; ſo that the horſe, being awed by the ſenſibility and tenderneſs of the mouth, dares not reſt too much upon the bit-mouth, nor check or beat upon the hand to withſtand it.

A dull, obtuſe Appui, is when a horſe has a good mouth, but his tongue ſo thick, that the bit cannot work, or bear upon the bars; the tongue not being ſo ſenſible as the bars: though the like effect is ſometimes owing to the thickneſs of his lips. A horſe is ſaid to have no Appui, when he dreads the bit-mouth, is too apprehenſive of the hand, and cannot bear the bit. He is ſaid to have too much Appui, when he reſts or throws himſelf too much, too hardily upon the bit. Horſes, deſigned for the army, ought to have a full Appui upon the hand.

A'PUS, in aſtronomy, a conſtellation in the ſouthern hemiſphere placed near the pole, between the triangulum auſtrale and the chameleon, ſuppoſed to repreſent the bird of paradiſe. *Keil, Aſtron. laſt.*

The Apus is ſuppoſed one of thoſe birds called apodes, as having no feet.

There are four ſtars of the ſixth, three of the fifth, and four of the fourth magnitude, in the conſtellation Apus.

Dr. Halley, in 1677, obſerved the longitude and latitude of the ſtars in Apus, which Hevelius, in his Prodromus, reduced, with ſome alteration, to the year 1700.

P. Noel has alſo given the places of theſe ſtars, with their right aſcenſions and declinations for the year 1687: but his obſervations differ widely from thoſe of Dr. Halley. Hevelius has repreſented the figure of Apus, and its ſtars, in his Firmamentum Sobieſcianum, according to Halley's account; Noel has done the like, according to his own account. Wolfius, with what juſtice we ſhall not pretend to ſay, gives the preference to this laſt.

APU'TTASY, in botany, a name given by the people of Guinea to a tree, a decoction of which is in great uſe among them for waſhing the mouth to cure the ſcurvy in the gums, and preſerve the teeth; the leaves of this tree ſtand very irregularly; ſometimes in pairs, ſometimes alternately, and ſometimes at ſmaller, ſometimes at greater diſtances from one another. They have ſcarce any pedicle; they are broad at the baſe, and narrow at the point; ſmooth and gloſſy above, and whitiſh and ſomewhat hoary underneath; eſpecially the large ribs, which, being obſerved againſt the light, are clouded; the largeſt leaves are two inches and a half long and about one inch broad; the tree is large and ſpreading. *Phil. Tranſ.* Nº. 232.

A'QUA-FO'RTIS *(Dict.)*—The diſtillation of Aqua-fortis is as follows, viz.

Put vitriol into an earthen or iron pot: if you make a fire under it, the vitriol begins to melt and ſmoak; by increaſing the fire gradually, it thickens, and aſſumes an aſh colour. Let it be ſtirred with a twig before it becomes ſolid, till it be perfectly dry; but let it be taken as yet boiling out of the pot, for, if it grows cold therein, it will ſtick ſo faſt that you will hardly be able to get it out. Pound to a ſubtile powder three pounds weight of this calcined vitriol, and mix them well with four pounds of nitre well dried, and pulverized very fine. Put theſe together in a cucurbit, or retort, or an iron pot, and then put it in a furnace.

At firſt, let the fire be made not much greater than is neceſſary to boil water. When the recipient grows warm, continue the ſame degree of fire, till all the phlegm is expelled, which you will know from the diminution of the heat of the recipient: increaſe the fire gradually, till you ſee a few yellow vapours ariſe. Keep up the ſame fire for an hour or two, and make it ſo ſtrong as to warm the veſſels moderately. Continue this for ſome hours, and, letting the veſſels cool, pour the liquor, now emitting reddiſh fumes, out of the recipient into a glaſs veſſel, having a glaſs ſtopple: this liquor thus prepared is your Aqua-fortis.

Remarks.

1. In this operation you muſt always proportion the duration of the degrees of your fire to the quantity of the matter to be diſtilled.

2. For ſecurity's ſake, you muſt leave, in the cloſure of the recipient and veſſel that contains the matter to be diſtilled, a hole, which may be ſtopped and opened with a wooden peg: for, if you happen to exceed the juſt degree of fire, eſpecially in the beginning of the operation, the firſt and more ſubtile ſpirits, which are very elaſtic, come forth; the opening, therefore, of the hole may give them a paſſage, leſt the veſſels ſhould burſt, which would be very dangerous.

3. The better your nitre is refined, the better will the Aqua-fortis be. Avoid carefully the mixture of ſea-ſalt therewith, for the reaſon we ſhall give, when we treat of Aqua-regia.

4. There are many other ingredients uſed in the making of Aqua-fortis, ſuch as burnt allum, ſand, and the like; the reaſon whereof is, to hinder the ſpecies, which may happen not to be ſufficiently calcined, from fuming, and from breaking the veſſel with great violence. But, when theſe ſpecies are duly calcined and dried, theſe additions are quite needleſs; and, indeed, by overſwelling the maſs to be diſtilled, require veſſels of a ſize proportionable.

5. There are many other needleſs and noxious ingredients uſed by ſome in making Aqua-fortis. Theſe are blood-ſtones, unſlaked lime, plume allum, &c. all which ſhould be avoided, they making a much worſe, as well as a more expenſive Aqua-fortis. Water thus made, therefore, ſhould never be uſed in docimaſtical operations, before it has been accurately tried; for, Aqua-fortis being tainted with theſe heterogeneous matters, the major part of it conſumes away, and becomes frequently ſo fixed, that the ſtrongeſt fire is hardly able to take off any of it. Nothing ſhould be uſed beſides calcined vitriol, intimately mixed with nitre, there being no need of any thing elſe.

6. However, bole, clay, and brick-duſt expel Aqua-fortis out of nitre, which then is called the ſpiritus nitri; but you muſt add four times as much of theſe, in proportion to the nitre: conſequently, this method, requiring larger veſſels and more fire, cannot be ſo profitable, as without theſe ingredients.

7. As the extracted ſpirits of nitre are with difficulty condenſated into drops, eſpecially in ſultry weather, it will be proper, by reaſon of the calcined ingredients, to pour into the recipient one quarter part of pure water, or rather of the phlegm, extracted out of the Aqua-fortis; by which means the ſpirits will be much eaſier received.

The beſt Aqua-fortis is often tinged with a greeniſh colour, which happens if, Aqua-fortis having been expoſed ſome days to the air, and loſt its red fuming ſpirit, there be mixed with it ſome freſh ſtrong Aqua-fortis ſtill emitting its fumes, or if Aqua-fortis be diluted with water. As this colour may, however, proceed from copper diſſolved in it, to be certain that it does not, a little is to be poured into a cucurbit, and as much of ſome alcaline liquor to be added to it as will ſaturate the acid. Then, if there be ever ſo little copper in it, the colour becomes a deep blue, and there is a cloudy precipitation made, becauſe the nitre has been regenerated by this proceſs, and does not diſſolve copper, ſo much as Aqua-fortis does: but, if there be no copper in the Aqua-fortis, the colour diſappears.

The nice aſſayer, after having carefully proved this Aqua-fortis, muſt concentrate it to a certain degree; for, if too weak, it often retards the ſolution, and ſometimes does not even

even affect the silver; but this concentration is only to be in a certain degree; for, if carried too far, and the Aqua-fortis made too strong by it, it vanishes into fumes, which rush violently out of the receiver, or vessel the solutions are made in, though sufficiently high, and carries away a part of the silver with it in vapours; and if there is any thing of gold in the silver, it will be corroded into a fine dust, which it proves very difficult afterwards to collect together. *Cramer's Art of Assaying.*

When Aqua-fortis is too weak, it is to be put into a deep cucurbit, and the watery part is to be drawn from it, by a gentle fire, till yellow fumes begin to arise. To find out whether it be too strong, the following method is to be used: melt together one part of gold, and four parts of silver; of this make a flat plate, which cut into three or more parts; roll up up each part, that it may be conveniently put into the neck of a cucurbit: when rolled up, and gently heated at the fire, put it into a cucurbit, pour upon it three times its weight of Aqua-fortis, and set it into a gentle heat: if the silver be eroded from the gold, and the gold retain the same figure of a piece of plate rolled up, and there appear no reddish dust at the bottom of the vessel, then the Aqua-fortis has its proper degree of strength: but, if the dissolution has been made with so much violence, that the gold was eroded, or the plate almost broken, then the Aqua-fortis was too strong. It must then be diluted with a tenth, or an eighth part, of Aqua-fortis phlegm; or, if that is not at hand, with the same quantity of common water. This done, the trial is to be repeated, by the dissolution of a like plate rolled up; and this several times over, till the silver be dissolved, without the least diminution of the gold. By this the assayer is assured of a due degree of strength in his menstruum, for all the purposes he requires it for. *Cramer's Art of Assaying.*

AQUA MARINA, *(Dict.)*— This precious stone, is of a colour compounded of green and blue, nearly resembling that of sea-water, from whence the name.

It seems very probable that the ancients knew it under the name of the beryl-stone; for Pliny observed that the most beautiful beryls were those that imitated the colour of sea-water; he likewise distinguishes several sorts of beryls, which bear no resemblance with our Aqua marina; as the chrysoberyls, which were of a golden colour. Whatever the ancients called the Aqua-marina, we are now to endeavour to find out a sure means to distinguish this precious stone from all others. The colour being a mixture of green and blue, we cannot confound it either with green or blue stones as the emeralds and the saphires: for if we suppose the emerald of a pure green without any tincture of blue, and the saphire blue as indigo, and free from any tincture of green, we may easily discover that all stones, compounded of a green and blue, can neither be emeralds nor saphires. This mixture of an emerald-colour with that of a saphire, that is, of green and blue, describes so well the Aqua marina, that it seems impossible to be mistaken. Not but that there are some of these stones, where the green is more predominant than the blue; as well as others, where the blue is more powerful than the green. These stones are very different from each other, with respect to their hardness. The oriental are reckoned the hardest, and bear the finest polish; and, consequently, are more beautiful, more scarce, and dearer than the occidental.

The most beautiful Aqua marina's come from the East-Indies; and it is said that some of them are found on the borders of the Euphrates and at the foot of Mount Taurus. The occidental ones come from Bohemia, Germany, Sicily, the Isle of Elba, &c. And it has been affirmed that some of them have been found on the sea-shore.

AQUA-*Regia* *(Dict.)*—This menstruum is made in the following manner:

Take one pound of common salt: melt it in a clean crucible, or iron ladle: pour it out into an iron mortar; and when cold, break into little bits of the size of pease. Put these into a retort, and pour upon them twice their weight of good Aqua-fortis. Set the retort in a sand-furnace; lute on a recipient, and apply a gradual fire, till no more liquor drops from the nose of the retort.

An Aqua-regia may likewise be made, by mixing one part of spirit of salt with three of Aqua-fortis; or by dissolving the same quantity of sal armoniac in it: but this should be done slowly, and by degrees; otherwise great quantity of offensive fumes will arise.

Aqua-regia dissolves perfectly iron, copper, tin, gold, mercury, regulus of antimony, bismuth, and zink. It even dissolves lead more than spirit of salt does; however, it becomes somewhat troubled in the operation. If it has its requisite degree of strength, it does not dissolve silver: but if you have put in the mixture a quantity of sal-armoniac, or of marine salt, or of spirit of common salt, not sufficient, it then corrodes silver, nay, it even dissolves it in part, this Aqua-regia being imperfect.

The reason is then self-evident, why, in the separation of silver and gold by Aqua-regia, it is better to use a quantity of spirit of salt, or of marine salt, or of sal-armoniac, exceeding, than one short of the right measure. Nor is it less evident thence, why an exact separation of silver and gold is better effected with Aqua-fortis than with Aqua-regia; as the former never corrodes gold, whereas the latter corrodes silver frequently.

AQUIFO'LIUM, *the holly-tree*, in botany, a genus of trees, whose characters are:

The leaves are set about the edges with long sharp stiff prickles: the berries are small, round, and, for the most part, of a red colour, containing four triangular striated seeds in each.

Botanical authors enumerate thirty-three species of this tree. These trees were formerly in much greater request than at present, and there was scarcely a small garden of any worth, but was filled with these trees, which were clipped either into pyramids, balls, or some other figures; but as this was crouding a garden too much with one sort of plant, and the fashion of clipping greens going off, they are now almost wholly neglected: such are the changes in men's tempers and fancies, that what is one year esteemed, is the next despised.

The manner of raising the common hollies, is, by sowing the berries, which, if sown as soon as ripe, will lie two years in the ground, that is, until the spring-twelvemonth after; you may therefore mix the berries with dry sand, and put them in a large garden-pot, burying it in the ground till next August or September; and take them out, and sow them on a bed of common earth, covering the seeds about a quarter of an inch with light mould, and the spring following the plants will appear above-ground: but as this is a tedious method, and the young plants making but small progress for the two or three first years, I would rather advise the purchasing of young stocks, of about three or four years growth, of some nursery-men, who raise them for sale, and these will be fit to bud or graft the second year after they are planted; or you may purchase such young plants, of several kinds, as have been budded or grafted two years, which are generally sold very reasonably in the nurseries; than to hazard the budding them yourself, especially if you are not sure of being provided with cuttings very near you.

Hollies are also planted for hedges, and have been by some very much esteemed for that purpose; but the leaves being very large, when these hedges are clipped, they are generally cut in pieces, and appear very ragged; otherwise they make a very durable strong hedge, and very proper for an outside fence of a green-garden.

The great variety of variegated hollies, which were so much cultivated in the nurseries some years ago, and were sold for large prices, are now almost entirely neglected, few persons caring to plant them in their gardens; nor indeed are they so beautiful as the common green holly, which is also much more hardy than the variegated sorts, which in severe winters are often greatly injured, and sometimes killed, by frost.

The Dahoon holly is a native of Carolina, from whence the plants have been procured. This sort hath smooth shining-green leaves, which are a little indented on their edges; the leaves are as large as those of the bay-tree, and its having a beautiful green renders it one of the best kinds of ever-green trees: the berries are produced in large clusters close to the branches, which are of a bright red colour, and make a fine appearance when they are ripe. *Miller's Gardener's Dictionary.*

A'QUILA, *the eagle*; the general characters of these birds are, that they are birds of prey, flying about in the day-light, not like the owl kind in the night, very large in size, extremely bold and fierce, and have beaks growing crooked, immediately from their insertion at the head. The eagle differs from the hawk in size, and from the vulture in the crookedness of his whole beak. *Willoughby's Ornithol.* See *Plate* IV. *fig.* 27.

AQUILA *marina*, the sea-eagle, in ichthyology, the name of a species of cartilaginous flat-fish, of the pastinachia marina kind. It is generally found small, but sometimes grows to a very large size. Its head is large for a fish of this genus, and somewhat resembles a toad's in shape; its eyes are large and prominent: its mouth is placed in the under part of the head, and is large, and furnished with strong teeth. It sides are broad and thin, and represent the expanded wings of an eagle, whence it had its name. *Salvian de Aquat.* See *Plate* IV. *fig.* 28.

AQUILE'GIA, in botany. See COLUMBINE.

ARABE'SQUE, or ARABESK, something done after the manner of the Arabians.

A'RABIC, *Arabicus*, something that relates to Arabia, or the Arabs.

ARABIC, or ARABIC *Tongue*, is a branch or dialect of the Hebrew.

Father Angelo de St. Joseph speaks much of the beauty and copiousness of the Arabic. He assures us it has no less than a thousand names for a sword; five hundred for a lion; two hundred for a serpent; and eighty for honey.

ARABIC *Figures* *(Dict.)*— The origin of these characters, has been a subject of dispute in the republic of letters.

The learned are generally of opinion, that the Arabic figures were first taught us by the Saracens, who borrowed them from the Indians. Scaliger was so satisfied of their novelty, that he immediately pronounced a silver medallion, he was consulted about, modern, upon his seeing of the numeral figures 2 3 4, 2 3 5, on it. The common opinion is, that Planudes, who lived towards the close of the thirteenth century, was the first Christian who made use of them. Father Mabillon even assures us, in his work de Re Diplomatica, that he has not found them any where earlier than the fourteenth century.

Yet Dr. Wallis insists on their being of a much older standing; and concludes they must have been used in England, at least as long ago as the time of Hermannus Contractus, who lived about the year 1050; if not in ordinary affairs, yet at least in mathematical ones, and particularly astronomical tables. *Vid. Wall. Algebr.*

The same author gives us an instance of their antiquity in England, from a mantle-tree of a chimney in the parsonage house of Helmdon in Northamptonshire, wherein is the following inscription in basso relievo, M°. 133, being the date of the year 1133. *Philos. Transact.* N°. 255.

Mr. Luffkin furnishes a yet earlier instance of their use, in the window of a house, part of which is a Roman wall, near the market-place in Colchester; where between two carved lions stands an escutcheon, containing the figures 1090. *Philos. Transact.* N°. 255.

Mr. Huet is even of opinion, that these characters were not borrowed from the Arabs, but from the Greeks; and that they were originally no other than the Greek letters, which we all know that people made use of to express their numbers by.

ARA'BIAN *Philosophy*, or *the state of philosophy among the ancient* ARABIANS. Authors of great antiquity inform us, that the ancient Arabians applied themselves very much to philosophy, and distinguished themselves by a peculiar and superior sagacity: but all they say on this head seems very uncertain. Indeed, after Islamim, learning and the study of philosophy were greatly esteemed among this people; but this has no place in history till we come to the philosophy of the middle age; and, consequently, proves nothing with regard to the philosophy of the ancient inhabitants of Arabia Felix.

Some men of letters have asserted, that the ancient Arabs applied themselves to philosophical speculations; and to maintain their opinion, raise imaginary systems which they attribute to them, and draw in the religion of the Sabeans to their aid, which they pretend to have been the offspring of philosophy. But all they advance in favour of this opinion, is founded on assertions and conjectures; and what are these where proof and testimony are wanting? They are even forced to acknowledge, that the Greeks were of another opinion, looking on them as a most barbarous and ignorant people without the least tincture of learning. If credit may be given to Abulfaragius, the Arabian writers themselves confess, that before Islamim they were sunk into the deepest ignorance. But these reasons do not seem strong enough to those on the other side of the question, to induce them to retract their opinion of the philosophy they attribute to the ancient Arabs. The contempt the Greeks express for this nation, say they, proves the pride of the Greeks, not the barbarianism of the Arabians. But what authority can they produce, or what writers can they quote, in favour of their opinion concerning the philosophy of the ancient Arabians? They agree with Abulfaragius, that there are none; this opinion therefore stands on a very weak foundation. Joseph Peter Ludewig has signalized himself most in this dispute, and seems to have had the honour of the ancient Arabians very much at heart. He sets out in this manner: "Pythagoras, says he, as Porphyry relates, in his travels to improve his learning, did the Arabians the honour of a visit; staid some time among them, and learned of their philosophers divination by the chirping and flight of birds; an art in which they excelled. Moses himself, instructed in all the learning of the Egyptians, chose Arabia for a retreat in his exile, preferable to other countries. Can one imagine the great legislator of the Hebrews would have chose this retreat, if the people had been barbarous, stupid, and ignorant? Besides, their origin leaves no room to doubt of the improvement of their mind: they boast of their lineage from Abraham, whom no one can deny to have been a great philosopher. By what strange accident is that spark of philosophic spirit extinguished which they inherited from their common father Abraham? But what appears yet a stronger argument, is this, that the holy writings, to give a more exalted idea of Solomon's wisdom, place it in opposition to the wisdom of the wise men of the East; which is certainly Arabia. From this same Arabia came the queen of Sheba to admire the wisdom of the philosopher, invested with a diadem; this has been the constant opinion of all men of erudition. It is easy to prove that the Magi who came out of the East to worship our Saviour, were Arabians. In short, Abulfaragius is obliged to agree, that, before the time of Islamim, to whom the revival of learning in that country is owing, they were perfect masters of their own language, good poets, excellent orators, and able astronomers. Is not this enough to give them a right to the title of philosophers"? No, it may be replied, the Arabians might have polished their language, have succeeded in composition, have been skilful in the solution of riddles, and interpretation of dreams; nay, though it be admitted they had some knowledge of the courses of the stars, it will not follow they were philosophers; for all these arts, if they merit the name, tend more to increase and encourage superstition, than to discover truth, or divest the soul of the passions which enslave it. As to what concerns Pythagoras, nothing is more uncertain, than whether he travelled into the East or no: but, admitting he did, what are we to conclude, but that he learned from the Arabians all those superstitions and extravagant notions he was so extremely fond of. It is needless to quote Moses here; if this great man went into that country, and settled there, by marrying one of Jethro's daughters; it certainly was not with a design of studying and incouraging them in their foolish curiosity in philosophical systems. Providence permitted this retreat of Moses among the Arabians, to carry among them the knowledge of the true God, and his religion. The philosophy of Abraham, from whom they boast their descent, by no means proves their having cultivated this science. Abraham might have been their primogenitor, and a great philosopher; but their philosophy is no necessary consequence of this. If they lost the thread of those most valuable truths they had learned from Abraham; if their religion degenerated into gross idolatry; why might not their philosophy, admitting Abraham to have taught it them, have been lost also, in course of time? Besides, it is not certain that these people descended from Abraham. This is a traditionary tale, that seems to have taken birth with Mahometanism. The Arabians, like the Mahometans, to give the sanction of authority to their errors, have pretended to deduce their origin from the father of the faithful. Another thing that overturns Ludewig's hypothesis, is, that Abraham's philosophy is a mere device of the Jews, who would fain persuade us that the origin of all arts and sciences is to be found among them. What they say in support of the queen of Sheba's coming to visit Solomon on the fame of his wisdom, or of the wise men who came out of the East to Jerusalem, will prove nothing more than has been advanced before. Let it be granted this queen was born in Arabia; is it proved she was of the sect of the Sabians? No one will pretend to deny her to have been the most expert and sagacious woman of her time, and that she frequently puzzled all the kings of the East with her wise questions; because the sacred writings has given this account of her. But what has this to do with the philosophy of the Arabians? We acknowledge very freely, that the Magi who came out of the East were Arabians; that they were not without some knowledge of the courses of the stars; we do not absolutely exclude the Arabians from this science, but admit they spoke their native language well; succeeded in some works of invention, as oratory, and poetry; but we are not to infer from hence that they were philosophers, and had applied themselves strongly to the cultivation of this part of literature.

A second argument in favour of the philosophy of the ancient Arabians, and which is urged as a very forcible argument too, is the history of Sabianism, which necessarily implies philosophical knowledge, supposing all to be true which is said about it. We cannot conclude any thing from thence in favour of this opinion: for Sabianism is in itself a mixture of shameful idolatry and ridiculous superstition; much more likely to subvert and extinguish reason, than propagate true philosophy; besides, it is not agreed in what age this sect first appeared. Men of the greatest eminence for learning, who have laboured to give light to this passage in history, as Hottinger, Hyde, Pocock, and especially the learned Spencer, confess that there is no mention made of this sect either by the Greeks or Romans.

We must take care not to confound these Sabians of Arabia with those mentioned in the annals of the ancient eastern church, which were half Jews, half Christians; and boasted of being the disciples of St. John the Baptist; great numbers of which, even to this day, inhabit the city of Bassora, near the banks of the Tigris, and the neighbourhood of the Persian sea. The famous Moses Maimonides has extracted a large account of this sect from the Arabic writers, and by examining their extravagant and superstitious ceremonies with attention, has very ingeniously justified the laws of Moses in general; which at first might give offence to delicacy, if the wisdom of those laws was not shewn by their opposition to the laws of the Sabians. A stronger barrier could not be put between the Jews and Arabians, who were their neighbours. On this subject consult Spencer's Oeconomy of Moses.

The name of this sect is no less a point of controversy than its age; Pocock asserts they were so called from צבא, which in Hebrew signifies the stars or hosts of heaven; because the religion of the Sabians consisted principally in the adoration of the stars. But Scaliger thinks, that this name was originally given to the Chaldeans, because they were orientals.

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He has been followed in this opinion by many men of learning, and, among others, by Spencer. This signification of the word Sabian seems so much more plausible, because the Sabians pretend to draw their origin from the Chaldeans, and make Seth the founder of their sect. But it seems very indifferent which side of the question is taken, in a matter of so little importance. If we mean, by the Sabians, all those people of the East, who worshipped the stars; which seems to be the opinion of some Arabian as well as Christian writers; the name cannot properly be applied to any particular sect, but to all those who were guilty of idolatry. But it seems this name has always been thought to denote a particular sect. We do not see it given to all the people who joined the worship of fire to the adoration of the stars. If we might venture to attempt removing this darkness diffused over the history of the Sabians in general, by the light of conjecture, it seems probable that Sabianism is nothing but a mixture of judaism and paganism; that among the Arabians it was a particular religion distinct from all others; that its professors, to exalt themselves above every other sect that flourished in their time, not only affected to be very ancient, but carried back their origin even as high as the son of Seth: in which they affected to excel the Jews, who pretended to go no farther back than Abraham. We cannot think them to have been called Sabians, on account of their being orientals; because the Magi and Mahometans, who inhabit the eastern parts of Asia, have never been called by this name. Whatever be the original of the Sabians, this is certain, it is by no means so ancient as the Arabians pretend. Nay, they are far from being agreed among themselves, on this subject; some go back as far as Seth, others are contented to stop at Noah, and some even at Abraham. Eutycheus, an Arabian author, on the credit of the traditions of his country, maintains Zoroaster to have been the author of this sect, who was born in Persia, or perhaps in Chaldea; though Eutycheus observes, some of his contemporaries gave Juvan the honour of having been their founder (he doubtless means Javan) that the Greeks very eagerly embraced this opinion, because it flattered their pride, Javan having been of their kings; and that, in order to spread this doctrine, they had composed several books on the science of the stars, and the motions of the celestial bodies. Some were even of opinion, that the founder of the sect of the Sabians was one of those employed in building the tower of Babel. But by what is all this supported? If the sect of the Sabians be as ancient as they pretend, why have not the Greeks mentioned it? Why do we read nothing in scripture concerning it? To answer this objection, Spencer thinks it sufficient to say, that Sabianism, considered as a religion which teaches the worship of the sun and stars, took its origin from the ancient Chaldeans and Babylonians, and preceded the time of Abraham many ages. This he endeavours to prove from the testimonies of the Arabians, who all concur in the antiquity of Sabianism, and from the similarity between the doctrines of the Sabians and Chaldeans. But the question is not whether the worship of the sun and stars be very ancient, no doubt it is; as we shall shew under the article CHALDEANS. The difficulty consists in knowing whether the Sabians received this worship in such a manner from the Chaldeans and Babylonians, that we may be assured Sabianism first took its birth among these people. If we observe strictly, Sabianism will be found not only to consist in the worship of the sun, stars, and planets; but also to contain a form of ceremonies particular to itself, which distinguish it from any other religions; and, when we consider this, its antiquity cannot be maintained. Spencer himself, subtil as he is, and refined in his reasonings, has been forced to agree that Sabianism, considered religiously, that is, with regard to its forms and ceremonies, contains many things much more modern than the ancient Chaldeans and Babylonians. This, however, he ought to have proved at his first setting out, for if Sabianism, considered in this light, betrays a want of antiquity to carry it back beyond Abraham: how will he prove that several laws of Moses were established by divine authority in direct opposition to the superstitious ceremonies of Sabianism?

There is no sect without books, to support its particular opinions; and we find the Sabians had theirs, which were attributed to Hermes and Aristotle by some, to Seth and Abraham by others. These books, according to the account of Maimonides, contained a heap of ridiculous stories relating to the old patriarchs, Adam, Seth, Noah, and Abraham; in a word, like the fables of the Alcoran. They treated at large of dæmons and idols, the stars and planets, the culture of the vine, the sowing of corn, and every thing that concerned the worship paid to the sun, the fire, the stars, and planets. Any one, curious of these matters, may consult Maimonides. We should tire the reader to trouble him with such ridiculous fables. This reason is sufficient for us to condemn these books as apocryphal, and unworthy of credit. Indeed, they seem to have been composed about the birth of Mahomet, and by authors who had a tincture of idolatry, and the follies of modern Platonism.

The absurd notions of the Sabians will appear best by quoting some of their opinions; they held the stars were so many deities, whereof the sun was chief. These they celebrated with two kinds of worship, one performed every day, another every month; they worshipped dæmons under the form of he-goats; fed on the blood of the sacrifices which yet they held in abomination, thinking, by that means, they should have a more intimate intercourse or communication with the dæmons; they paid adoration to the rising sun, with a strict observance of ceremonies; a most surprising contrast of which we see, in general, throughout the whole law of Moses; for God, according to some learned men, chose to give the Jews laws directly opposite to those of the Sabians, in order to turn the former from the extravagant superstitions of the latter.

The Arabian philosophy, before Mahomet, was, therefore, entirely Sabian, and included the system and ceremonies of that sect of idolaters. This it was that Mahomet set himself to decry; and he is even said by some to have carried his opposition so far, as to prohibit, if not punish, all study of philosophy. But his followers, by degrees, got over this restraint; the love of learning increased; till, under the memorable caliphate of Al-Mamon, Aristotle's philosophy was introduced and established among them; and from them propagated, with their conquests, through Egypt, Africa, Spain, and other parts. Avicenna only flourished in the eleventh century, and Averrhoes a hundred years after him; so that the honour of translating the Greek philosophy, by many attributed to these authors, is not justly due to them: though they were the chief propagators of it through the counties of Europe.

Their method of philosophising was faulty; they followed Aristotle implicitly, and, in astrology, run into strange superstitions. They founded schools and academies, gave themselves much to subtilties and disputation, and divided into several sects.

As they chose Aristotle for their master, they chiefly applied themselves to that part of philosophy called λογικη, and thus became proficients in the knowledge of words, rather than things. Whence they have been sometimes denominated masters of the wisdom of words, sometimes the talking sect. Their philosophy was involved in quaint arbitrary terms and notions, and their demonstrations drawn from thence, as from certain principles, &c.

ARABIAN *Poetry*, may be divided into two ages. The antient, according to Vossius, was no other than rhiming; was a stranger to all measure and rule; the verses loose and irregular, confined to no feet, number of syllables, or any thing else, so they rhimed at the end; oftentimes all the verses in the poem ended in the same rhime. It is in such verse that the alcoran is said to be written.

The modern Arabian poetry takes its date from the caliphate of Al-Raschid, who lived towards the close of the eighth century: under him poetry became an art, and laws of prosody were laid down: but in this there is no proper distinction of long and short syllables, but the whole depends on rhime, a certain number of letters, and in the observation of certain cæsuræ, which are found, by carefully distinguishing the moveable consonants from the quiescent. A syllable to which a quiescent letter is added at the end, becomes long by position, as that where this is wanting, becomes short by position. *Bibl. Univ. t.* 9. *p.* 231. *& seq. Clark, Prosod. Arab. c.* 1.

Samuel Clark has published an express treatise on the Arabic prosody.

Renaudot adds, that the Arab compositions in verse are still wild and irregular, being neither epic, dramatic, lyric, or reducible to any other kind. Their hymns to God, and their tales and jocular stories, are in the same style.

Their comparisons, in which they abound, are taken, with little choice, from tents, camels, hunting, and the antient manners of the Arabs.

ARABIAN *Logic*, was that of Aristotle, as explained by Avicenna and Averrhoes. Those commentators had taken immense pains to illustrate their author; but the latter being born in Spain, and both of them utterly unacquainted with the Greek tongue, they had nothing but a faulty mutilated translation to go by, which frequently misrepresented the author's real sense, so that it is no wonder they made no greater advances in the art.

ARABIAN *Physic*, and *Physicians*, succeeded the Grecian, and handed down the art to us, having made considerable improvements, chiefly in the pharmaceutical and chemical parts.

Schelhammer observes, that, besides a number of observations relating to the causes and history of diseases, they greatly enlarged the list of simple medicines, adding much to the advantage of the practice of physic. It is certain, we owe to them most of our spices and aromatics, as nutmegs, cloves, mace, and other matters of the produce of India. We may add, that most of the gentler purgatives were unknown to the Greeks, and first introduced by the Arabs, as manna, sena, rhubarb, tamarinds, cassia, &c. It was they, likewise,

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who brought sugar into use in physic, where, before, only honey was used. They also found the art of preparing waters and oils, of divers simples, by distillation and sublimation.

The first notice of the small-pox, and the measles, is, likewise, owing to them. Lastly, the restoration of physic in Europe took its rise from their writings.

ARACHNOI'DES, in natural history, the name of one of the genera of the echini marini, the distinguishing characters of which are, that it is of a circular circumference, but variously broken in at the edges. The mouth is round and placed in the center of the base, and the aperture for the anus is quadrangular, and situated in one of the sides, on the upper superficies, but near the edge. *Klein, Echin.* See *plate* IV. *fig.* 29.

ARA'CHIS, earth, or ground-nut, in botany, a genus of plants, whose characters are: it has a pea-bloom flower; the empalement is divided into two parts; the flower is succeeded by a rough cylindrical pod, containing one or two cylindrical seeds. We have but one species of this plant, viz. Arachis. Lin. The native country of this plant, I believe, is Africa, though, at present, all the settlements of America abound with it; but many persons, who have resided in that country, affirm, they were originally brought with the slaves from Africa there, where they have been spread all over the settlements.

It multiplies very fast in a warm country; but, being impatient of cold, it cannot be propagated in the open air in England; therefore, whoever has an inclination to cultivate this plant, must plant the seeds on an hot-bed in the spring of the year, keeping it covered with glasses till the end of June; after which time, if the weather proves warm, they may be exposed to the open air. The branches of this plant trail upon the ground; and the flowers (which are yellow) are produced single upon long footstalks; and, as soon as the flower begins to decay, the germen is thrust under-ground, where the pod is formed and ripened; so that, unless the ground is opened, they never appear; the negroes keep this a secret among themselves, therefore could supply themselves with these nuts unknown to their masters. The roots of these plants are annual; but the nuts under-ground sufficiently stock the ground in a warm country, where they are not very carefully taken up. In South Carolina there are great plenty of these nuts, which the inhabitants roast, and make use of as chocolate.

This was, by former botanists, called arachidna; and by some it hath been ranged with the vetches. *Miller's Gard. Dict.*

ARBITRA'TION, in matters of the foreign exchange, is the most beneficial, as well as most delicate, branch of exchange, to be thoroughly informed of.

Before any one applies himself to the study of this subject, it is necessary that he should be well skilled in all the practical operations, in regard to the reducing of the sterling money of England into the foreign monies of exchange, and of account of all places throughout Europe, according to the direct courses of exchange, established for these purposes, and vice versâ. Also,

2. That he should be acquainted with the methods of converting sterling money into the monies of exchange, and of account of all other places of commerce, wherewith England has no direct established courses of exchange, but is under the necessity of making use of the intermediate exchange of other places: together with the nature of the agios, and the manner of converting their bank monies into current, and the reverse.

3. The manner of calculating all the foreign monies throughout Europe into those of every other distinct country, either according to the direct, or intermediate exchange; which makes a much greater variety of cases, than those, who are not thoroughly acquainted with this extensive subject, can imagine. See EXCHANGE, *Dict.* and *Sup.*

4. It is previously necessary, also, to the entering upon a knowledge of the Arbitration of exchanges, to know the intrinsic value of foreign monies, according to the most accurate assays, which have been made for that purpose.

5. Lastly, It is requisite to understand the general natural causes of the rise and fall of the course of exchange between nation and nation, or between one trading city and another in the same nation.

That I may communicate my meaning with the greater perspicuity, it may be proper, for the satisfaction of others, as well as practical merchants and remitters, to premise, that as the advantages to be made by understanding how to arbitrate the exchange at all times, and in respect to all places, depend on the general rise and fall of the prices of exchange between one nation and another; so that rise and fall depends on the balance of trade being either in favour, or against a nation.

That the course of exchange is the criterion of the balance of trade, has been allowed, not only by great statesmen and speculative politicians, but by the most skilful and sagacious practical traders.

As this matter is put in a very rational and familiar light by those able and distinguished merchants of the city of London, who were instrumental, in conjunction with the late ever memorable earls of Hallifax and Stanhope, in defeating the French treaty of commerce, in the year 1712; I shall quote their reasoning upon this point, from the British Merchant. In consequence of which, the practical Application of the intricate subject under consideration, will appear the more intelligible:

'Suppose, say they, the tenant in Wiltshire is to pay for rent 100 l. to his landlord in London; and the woollen-draper in London is to pay the like sum to his clothier in Wiltshire: both these debts may be paid, without transmitting one farthing from one place to the other, by bills of exchange, or by exchanging one debtor for the other, thus: that is, the tenant may receive the landlord's order to pay 100 l. to the clothier in the country; and the woollen-draper may receive his clothier's order to pay the like sum to the landlord in town.

These two orders are properly called bills of exchange; the debts are exchanged by them; that is, the woollen-draper in town, instead of the tenant in the country, is become debtor to the landlord; and the tenant in the country, instead of the woollen-draper in town, is become debtor to the clothier: and, when these orders are complied with, the two debts between London and the country are discharged, without sending one shilling in specie from the one to the other.

In like manner, a warehouse-man in London is indebted 100 pounds for stuffs to the weaver in Norwich; and the linen-draper in Norwich is indebted in the like sum to the Hamburgh merchant in London; both these debts may be paid by bills of exchange; or by the exchange of one debtor for the other, by placing one debtor in the other's stead; that is, the warehouse-man may receive the order of his weaver, to pay 100 l. to the Hamburgh merchant; and the linen-draper may receive the order of the Hamburgh merchant, to pay the like sum to the weaver.

These orders are bills of exchange; the debtor in one place is changed for the debtor in another: and thus both debts may be paid, without sending one single shilling in specie, from the one city to the other.

But, if the debts due from both places are not equal, then only the same quantity of debts on both sides can be paid by bills of exchange. The balance must be sent in money from the city, from whence the greatest sums are due. For example:

If, by the trade between London and Norwich, the former owes 10,000 l. to the latter, and the latter no more than 9000 l. to the former; it is manifest, that only the debts of 9000 l. on each side can be discharged by bills of exchange; the balance of 1000 l. must be sent either from London, or some other place indebted to London, to even the account between both the cities.

Let us suppose then, that to send and insure 1000 l. in specie to Norwich would cost 5 l. or 10 s. per cent. which of the debtors in London would be willing to be at this charge: it is natural to believe, that every one will endeavour to shift it off from himself, that every one will endeavour to pay his money by a bill of exchange; it is natural to believe that every one, rather than stand the cost and hazard of sending 100 l. in specie, would pay 100 l. 5 s. in London for a debtor in Norwich, upon condition that the Norwich debtor should pay an 100 l. for him in that city.

By which means the Norwich debtor would pay his debt of 100 l. in London with less than that sum, while the London debtor would be obliged to give more than that sum for the payment of an 100 l. in Norwich. And, if such for years together were the courses of exchange between London and Norwich, there could be no question to which of the two cities a sum must be sent in specie to pay the balance; that city undoubtedly pays the balance, that gives more than the par; that undoubtedly receives the balance, that gives less than the par for bills of exchange.

The course of exchange, in this case, would sufficiently decide that the balance of trade is on the side of that city, that procures bills of exchange upon the most easy terms.

I have taken examples from two English cities, where the money is of the same denomination, and the same quantities are equally at par in both. But the case is the very same between two cities, where the denominations of the money are different, as long as any certain quantity of money in the one can be reduced to a par or equality with any certain quantity of money in the other.

For example, the old French crown was just equal or par to 54 pence English; and 444$\frac{4}{9}$ of these crowns were just par or equal to an 100 l. sterling; every farthing given more or less than 54 d. for a crown, in a bill of exchange between London and Paris, amounts to 9 s. 3 d. upon 444 crowns, or upon so many times 54 pence.

Suppose then the course of exchange between London and Paris stood thus heretofore. If a man in Paris, indebted to London, paid a farthing less than the par for a bill of exchange upon London to pay 54 d. there; the Parisian paid his debt to London of 100 l. by a bill of exchange that cost him in Paris 9 s. 3 d. less than that sum: and if a merchant

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in London gave a farthing more than the par for a bill of exchange upon Paris, to pay a French crown, the Londoner gave 9 s. 3 d. more than 100 l. for a bill of exchange, to pay that sum in Paris.

If such was the course of exchange between London and Paris; if the first gave above the par, and the second less than par, for bills of exchange to pay their respective debts, there can be no doubt that bills of exchange were more easily to be had at Paris than at London; and, consequently, that greater sums were due from the latter than the former; and that we paid a balance upon our trade to that kingdom. And, as the price rose here to a penny or two pence above the par, or fell there so much below it, it shewed so much the greater scarcity here, and the greater plenty there of bills of exchange; and that so much the greater balance of bullion was going hence, by means of our trade to that country'.

ARBU'TUS, *the Strawberry-tree*, in botany, a genus of trees, whose characters are these: it is ever green: the leaves are oblong, and serrated on the edges: the flower consists of one leaf, and are shaped like a pitcher; the fruit is of a fleshy substance, and, in its outward appearance, very like a strawberry, but is divided into five cells, in which are contained many small seeds. The species are:

There are three species, which are 1. The common strawberry-tree. 2. The strawberry-tree with longer flowers, and egg-shaped fruit, and 3. the strawberry-tree with double flowers.

This tree has its name from the resemblance the fruit bears to that of a strawberry, but is of an austere sour taste; though I have been informed, that in Ireland, where this tree abounds, the fruit is sold and eaten. In England they are chiefly brought to the markets with small branches of the tree, having small branches of flowers upon them, and made up into nosegays, with other flowers, and some sprigs of the amomum Plinii, or winter-cherry; which, at that season, is very acceptable, when there are few flowers to be had.

The time of this fruit being ripe is in the months of October and November; at which season the flowers are blown for the next year's fruit; so that, from the time of flowering to the ripening of the fruit, is one whole year.

The best method of propagating these trees is by sowing their seeds, which should be preserved in dry sand till March: at which time you should sow them upon a very moderate hot-bed (which greatly promotes its vegetation) covering it about a quarter of an inch with light earth, and screening it from frosts, or great rains. Towards the latter end of April your young plants will appear; you must therefore keep them clear from weeds, and give them frequent waterings, as the season may require, and shade them in hot weather; and, if your plants have done well, they will be, by autumn, about five or six inches high: but as these trees are subject to receive damage from frosts, especially while they are young, therefore you must hoop the bed over, that, when bad weather comes, you may cover it with mats and straw to keep out the frost.

The beginning of April following you may transplant these trees, each into a small pot; but, in doing of this, be very careful to take them up with as much earth to their roots as possible; for they are bad rooting plants, and very subject to miscarry on being removed; and it is for this reason I advise their being put into small pots; for, when they have filled the pot with roots, they may be turned out into large pots, or the open ground, without any hazard of their dying.

When you have put your young plants into the small pots, you should plunge them into another very moderate hot-bed, to encourage their taking new root, shading them from the sun in the middle of the day, and giving them water as they may require: in this bed it will be proper to let the pots remain most part of the summer; for if the pots are taken out, and set upon the ground, the smallness of their size will occasion the earth to dry so fast, that watering will scarcely preserve your trees alive; but, if they are kept growing all the summer, they will be near a foot high by the next autumn: but it will be adviseable to screen them from the frost, during their continuance in pots, by plunging them into the ground in a warm place, and covering them with matts in bad weather.

When your trees are grown to three or four feet high, you may shake them out of the pots into the open ground, where they are to remain: but this should be done in April, that they may have taken good root before the winter; which would be apt to damage them, if newly planted. *Miller's Gard. Dict.*

ARCA'DIANS, the name of a society of learned persons, who formed themselves into a body at Rome, in the year 1690, with a design to preserve learning and carry Italian poetry to perfection.

They took the name of Arcadians partly from the rules of their society, and partly, because every new member, on his admission into this academy, assumed the name of some shepherd of ancient Arcadia. Once in four years they elected a president, to whom they gave the title of guardian, and appointed him every year twelve fellows, who decided all affairs of the society.

This society was founded by fourteen men of eminent learning, whom a similitude of sentiments, taste, and study, had drawn to the court of Christina queen of Sweden, who became their patroness. After her death, M. Gravina, in 1696, reduced their laws to ten in number, and wrote them in the language and stile of the twelve tables, which are yet to be seen in the serbatojo, a room used as a repository for the archives of the academy, on two fine pieces of marble. In this room are also the pictures of the most celebrated persons who have been of this academy, at the head of which is pope Clement the Eleventh, with his pastoral name Alnano Melleo. The society had for its arms a flute crowned with pine and laurel. Branches from this society, under different names, have spread themselves, through the principal cities of Italy; those of Aretio and Macerata call themselves la Forzata, those of Bologna, Venice, and Ferrara, l'Animosa, that of Sienna la Physica Critica, that of Pisa l'Alphaia, that of Ravenna the members of which are all ecclesiastics, is called la Camaldunensis. They have each a vice-guardian; they meet seven times in a year, either in a wood, a garden, or meadow, as is most convenient. Their first meetings were held on mount Palatine, but at present in the gardens of prince Salviati. At the six first meetings they read the performances of the Arcadians of Rome. The Roman ladies of the Arcadian society have their works read by gentlemen of the same academy: the seventh meeting is entirely devoted to the reading of foreign associated Arcadians. Every candidate must be eminent for accomplishments and genius, or, as the Arcadians express themselves, be possessed of nobility either by merit or birth, and be twenty-four years of age complete. The talent of poetry only gave admission to a lady into this society. Candidates are admitted into this academy, either by acclamation, enrollment, recommendation, surrogation, or destination; acclamation is the universal concurrence of all the votes without any deliberation; this is a compliment paid to cardinals, princes, and ambassadors. Ladies and foreigners are admitted by enrollment; young noblemen by the recommendation of the colleges wherein they are educated. A man of letters who follows, an academician after his death, in the same province, is said to be introduced by surrogation; what they mean by destination is this, if any person by his performances has merited the honour of being an Arcadian, the academy on his application engage to elect him on the first vacancy; they reckon by olympiads, and celebrate their festivals of wit every fourth year.

ARCH-*Angel* *, in theology, an intellectual being, or angel, of the second order in the celestial hierarchy.

* The word is compounded of the Greek ἀρχὸς, chief or principal, and ἄγγελος, an angel.

St. Michael is considered as the prince of angels, and generally stiled St. Michael the Arch-angel.

ARCH-*Angel*, in botany, a medicinal plant, called, by botanists, lamium. It is of some use as a balsamic, &c.

There are two kinds of it, viz. the white Arch-angel, lamium album; and red, whose flowers are reputed soft and lubricating, and, as such, administred in some female weaknesses, as the whites, and difficulty of urine. A conserve of them is also made in the shops, but seldom prescribed. *Quinc. Dispens.*

ARDA'SSES, in commerce, the coarsest of all the silks of Persia, and, as it were, the refuse of each kind. In this sense they say, the legis, the housets, the choufs, and the payas Ardasses, to signify the worst of those four sorts of Persian silks.

ARDASSI'NES, a very fine sort of Persia silks, little inferior in fineness to the fourbastis, or rather cherbassis. And yet it is little used in the European manufactures of silk, because it will not bear hot water in the winding of it.

A'REB, a money of account used in the dominions of the great Mogul, particularly at Amadabat. Four Arebs make a crow. A crow is worth a hundred lacs, and a lac 100000 rupies.

ARE'CA, or ARECK, a famous fruit in the East-Indies, wherein they drive an incredible trade, and make a prodigious consumption thereof, there being scarce any person, even from the richest to the poorest, who does not make use of it.

The tree which bears the areck is tall, straight, thin, and round. It is of the palm kind, and has no branches; but its leaves are charming to the sight; they form a round tuft at the top of the trunk, which is as straight as an arrow. It grows to the height of 25 or 35 feet, and is a great ornament in gardens. The shell which contains the fruit is smooth without, but rough and hairy within, in which it pretty much resembles the cocoa-nut. It is equal to that of a pretty large walnut. Its kernel is as big as a nutmeg, to which it bears a great resemblance without, and has also the same whitish veins within, when cut in two.

In the center of the fruit, when it is soft, is contained a greyish and almost liquid substance, which grows hard in proportion

proportion as it ripens. The fruit, when ripe, is aſtringent, but not unpalatable, and the ſhell is yellowiſh.

The chief uſe that is made of areck, is to chew it with the leaves of betle, mixing with it a chalk in a red paſte, made of ſea-ſhells. In order to chew it, they cut the areck into four quarters, and take out one quarter of it, which they wrap up in a leaf of betle, over which they lay a little of that chalk: afterwards they tie it, by twiſting it round. This bit prepared for chewing, or maſtication, is called pinang, which is a Malayan word, uſed all over the Eaſt-Indies. The pinang provokes ſpitting very much, whether it be made with dried or freſh areck: the ſpittle is red, which colour the areck gives it. This maſtication cools the mouth, and faſtens the teeth and gums. When they have done chewing the pinang, they ſpit out the groſs ſubſtance that remains in the mouth. They are under a miſtake who imagine that freſh areck melts intirely in the mouth. Nor is it leſs a miſtake to think that the teeth continue always of a red hue. As ſoon as they have done chewing the pinang, they waſh their mouth with freſh water, and then their teeth are white again. The Europeans who live at Batavia, at Malacca, and in the Sunda and Molucca iſlands, uſe pinang as much as the Indians do; and, by waſhing their teeth, they preſerve them white.

Some pretend that areck ſtrengthens the ſtomach, when the juice of it is ſwallowed, as moſt of the Indians do. Another property, aſcribed to it, is its curing, or carrying off, all that might be unwholeſome or corrupt in the gums.

The Siameſe call areck plou, in their language.

The beſt areck of the Indies comes from the iſland of Ceylon.

The Dutch Eaſt-India company ſend a great deal of it in their ſhips into the kingdom of Bengal. There grows in Malabar a ſort of red areck, which is very proper for dying in that colour. The ſame company ſend ſome of it from time to time to Surat and Amadabat, for the uſe of the dyers in the dominions of the great Mogul. Under the ſpecies of areck are comprehended ſix different ſorts, two of which are the beſt for maſtication.

A'REM, or AL-AREM, a vaſt mound, or dam, which formed a ſtupendous reſervoir above the city Saba, whoſe rupture cauſed an inundation, famous in eaſtern writers.

The Arem was built by Abdſhems, ſurnamed Saba, who, having built the city of that name, built this wall, or mound, to ſerve as a baſon, or reſervoir, to receive the water which came down from the mountains, not only for the accomodations of the inhabitants of that city, and the watering their lands, but alſo to keep the country better in ſubjection, by being maſter of their water. The Arem ſtood like a mountain above their city, almoſt eighty fathoms high, and was built ſo ſtrong, that there were no apprehenſions of its ever falling: but it gave way, at length, in the night, and carried away the whole city, with all the towns and people in the country.

AREOPA'GUS (*Dict.*)— Authors are divided, as to the reaſon and origin of the name: ſome imagine Areopagus the proper name of the court of juſtice, which was ſituated on a hill, in Athens; and that in this court the ſenate of that illuſtrious city aſſembled.— Others ſay, that Areopagus was the name of the whole ſuburbs of Athens, wherein ſtood the hill on which the court was built: and the name Areopagus ſeems to countenance this laſt opinion; for it ſignifies literally, the hill or rock of Mars, from πάγος, hill, and Ἄρης, the god Mars. In effect, the denomination might either ariſe hence, that the Areopagus was built in a place where had been a temple of Mars; or, becauſe the firſt cauſe pleaded there was that of this god, who was accuſed of killing Halirorrothius, the ſon of Neptune, and tried here before twelve gods, being acquitted by a majority of ſix voices: or becauſe the Amazons, whom the poets feign to be the daughters of Mars, when they beſieged Athens, pitched their tents, and offered ſacrifices to the god of war in this place.

This tribunal was in great reputation among the Greeks; and the Romans themſelves had ſo high an opinion of it, that they truſted many of their difficult cauſes to its deciſion. Authors are not agreed about the number of the judges who compoſed this auguſt court.—Some reckon thirty-one, others fifty-one, and others five hundred: in effect, their number ſeems not to have been fixed, but was more or leſs every year.— By an inſcription quoted by Volaterranus, it appears they were then three hundred.

At firſt this tribunal only conſiſted of nine perſons, who had all diſcharged the office of archons, had acquitted themſelves with honour in that truſt, and had likewiſe given an account of their adminiſtration before the logiſtæ, and undergone a very rigorous examination.— Their ſalary was equal, and paid out of the treaſury of the republic: they had three oboli for each cauſe.

The Areopagites were judges for life.— They never ſat in judgment but in the open air, and in the night-time, to the intent that their minds might be more preſent and attentive, and that no object, either of pity or averſion, might make any impreſſion on them.— All pleadings before them were to be in the ſimpleſt and moſt naked terms, without exordium, epilogue, paſſions, &c.

At firſt they only took cognizance of criminal cauſes, but in courſe of time their juriſdiction became of greater extent.— Mr. Spon, who examined the antiquities of that illuſtrious city, found ſome remains of the Areopagus ſtill exiſting, in the middle of the temple of Theſeus, which was heretofore in the middle of the city, but is now without the walls.

The foundation of the Areopagus is a ſemicircle, with an eſplanade of 140 paces round it, which properly made the hall of the Areopagus. There is a tribunal cut in the middle of a rock, with ſeats on each ſide of it, where the Areopagites ſat, expoſed to the open air.

This court is ſaid by ſome to have been inſtituted by Solon; but others carry it much higher, and aſſert it to have been eſtabliſhed by Cecrops, about the time that Aaron died, viz. in the year of the world 2553, maintaining withal, that Solon only made ſome new regulations in it, increaſed its power and privileges, and made it ſuperior to the Ephetæ, another celebrated court inſtituted by Draco.— In effect, Demoſthenes himſelf, in his oration againſt Cteſiphon, owns himſelf at a loſs on the point: the inſtitutors of this tribunal, ſays he, whatever they were, whether gods or heroes.

ARETHU'SA, in mythology, a fountain in the iſland Ortygia.

They tell us that Arethuſa, before ſhe was a fountain, was a virgin and a follower of Diana; that the river god Alpheus ſaw her one day bathing, grew enamoured of her charms, and would have enjoyed her. She, to avoid his purſuit, implored the help of Diana, who transformed her into a fountain. Alpheus knew her under this diſguiſe, and immediately mixed his ſtreams with her's. Cicero tells us, that in his time the fountain was quite ſwallowed up by the ſea, and no traces of it left. Pliny, and many of the ancients, ſeem to have thought that the river Alpheus, continuing his courſe under the ſea roſe again in Sicily, and that what was thrown into this river in Arcadia, was found again ſwimming in the Ortygian river. But Strabo, far from believing ſo ridiculous a ſtory, takes the tale of a cup's being found in the Sicilian river, that was thrown into the Alpheus, for a fiction; and does not ſcruple to ſay, that this, like other rivers, loſes itſelf in the ſea. Pliny, however, is ſo fond of the fable as to tell us, that the waters of Arethuſa ſmelt of dung, being the time of the olympic games, as if it proceeded from a mixture of the waters of the Alpheus, into which was thrown the dung of the victims, and of the horſes which ran the races at the celebration of theſe games.

ARGEMO'NE, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roraceous kind, or compounded of ſeveral leaves, arranged in a circular form. From the center of the flower there ariſes a piſtil, which finally becomes an unicapſular ſeed-veſſel, of an oval figure, with ſeveral ribs running from its baſe to its apex, the intermediate ſpaces being occupied by valves, which finally open their tops; and from every rib there runs out a placenta, which is loaded with ſeeds, uſually of an orbicular figure. *Tourn. Inſt.*

There is only one known ſpecies of Argemone, which is the plant uſually called, by botanical writers, the thorny Mexican poppy.

The rough-headed poppies, called Argemones by ſome writers, are by no means of this genus, but properly of the corn-poppy kind.

ARGENTA'RIA *Creta*, ſilver chalk, in natural hiſtory, a name given to an earth, not properly a chalk, but a kind of tripela. It is a very beautiful earth, of a looſe friable texture, and perfectly pure white. While in the ſtratum, it is dry, friable, and duſty, and flies from the pickax in large irregular maſſes, of an obſcurely plated, or laminated ſtructure; and ſplits more readily into flat pieces, than in any other direction; but its laminæ are always very irregular; when dry, it becomes ſomething harder, and retains the ſame chalky whiteneſs, and is of a looſe, ſpongy texture, very light, and of a rough, uneven, duſty ſurface. It adheres very ſlightly to the tongue, is hard and harſh to the touch, breaks eaſily between the fingers, and a little ſtains the hands. It makes no efferveſcence with acids, and ſuffers very little change in the fire. It is dug in Pruſſia, and is much eſteemed for cleanſing plate. It has alſo been found in France, and of late in Ireland. *Hill's Hiſt. of Foſſ.*

ARGETE'NAR, in aſtronomy, a ſtar of the fourth magnitude, in the flexure of the conſtellation Eridanus.

Argetenar is repreſented, in Bayer, by the Greek letter ρ. Its longitude according to Hevelius, in 1700, was 5°. 53'. 22". and its latitude 38°. 28'. 47". ſouth.

A'RGIL, or ARGILLA, potter's-earth, a fat and gluiſh kind of earth, or clay, which potters uſe to make ſeveral ſorts of their works. Carvers and ſilver-ſmiths uſe it alſo for mouldings. It is alſo uſed by thoſe who make conduits, baſons, and reſervoirs: they lay over with this ſort of earth the bottom of the baſons, in order to make them hold water. This earth is commonly grey, and ſometimes red. It is to be met with almoſt every-where, and is of a barren nature, as being very fat and glutinous.

AR'GONAUTS (*Dict.*)—The number of the Argonauts is thought to have been about 54, besides attendants. Jason was their chief; the others, of most note, were Hercules, Castor, and Pollux; Laertes, the father of Ulysses; Oileus, the father of Ajax; Peleus, the father of Achilles; Theseus and his friend Pirithous. They set out from Cape-Magnesia, in Thessaly; failed first to Lemnos, from thence to Samothracia, through the Hellespont; and, coasting Asia Minor, arrived through the Euxine Sea, at Æa, the capital of Colchis; from whence, after having carried away the golden fleece, they returned into their own country, through a thousand dangers, which they surmounted. This expedition, according to some, was thirty years before the Trojan war; according to others, ninety years before that event. See CHRONOLOGY in the Dictionary and Supplement.

Opinions are various concerning the object that drew the Argonauts to Colchis. Diodorus Siculus thinks this golden fleece, so much talked of, to have been only the skin of a sheep, which had been sacrificed by Phrixus; and was kept very carefully, on account of an oracle, which had foretold, that whoever stole it away, should murder the king Strabo. And Justin thinks the fable of the fleece to have taken its rise from this, that gold was found in the sands of some rivers of Colchis, which they gathered up by the means of sheep skins, with the wool on; and that a fleece, well filled with the dust it had collected in this manner, might be called a golden fleece, with propriety. The same method is now in practice about Fort Louis, where gold dust is collected in the same manner. Varro and Pliny think this story proceeded from the fine wool of this country; and that a voyage some Greek merchants made thither, on this account, gave birth to the fiction. We may add, that, as it is notorious the Colchians were eminent for their merchandize in skins of all kinds, this might have been one motive why the Argonauts undertook this voyage.

Palæphatus has pretended, but nobody knows on what foundation, that, by the emblem of the golden fleece, was meant a fine golden statue, which the mother of Pelops had caused to be made, and Phrixus carried with him to Colchis. Suidas apprehends this golden fleece to have been a volume book, which contained the secret of making gold. Tollius would fain have revived this opinion; and the alchymists have, in general, embraced it.

ARISA'RUM, *friars-cowl*, in botany, the name of a genus of plants, whose characters are: the fruit, and inner part of the flower are the same with those of the arum and dragons; but the flower itself is hooded, or shaped like a friar's-cowl.

There are five species of Arisarum, enumerated by Tournefort and Miller.

The leaves and flowers of Arisarum are detersive and vulnerary, and applied either in the form of ointment, or decoction, they cure malignant ulcers. Its root, taken in powder, is esteemed against the plague; the dose being from a scruple to a drachm. Of the root also are made collyria; which are effectual in curing fistula's of the eyes; by collyria, Diascorides does not mean what we call so, but tents made in the shape of a collyrium. It corrupts the pudendum of any animal whatever, if introduced into it. *Lemery des Drog.*

ARISTO'CRACY (*Dict.*)—With regard to the laws relative to Aristocracy, we cannot, possibly, attain a better idea of them., than by consulting that excellent work of M. Montesquieu; from whence the following were extracted:

1. As the body of the nobility give their votes in an Aristocracy, these votes cannot be very secret.

2. The suffrage must not be given by lot, for this would produce many inconveniencies. In short, when distinctions, which raise one citizen above another, are once established, were the choice determined by lot, the man would not become less odious; it is not the magistrate, but the nobleman, becomes the mark of envy.

3. When the nobility is numerous, there must be a senate to regulate affairs, which the body of the nobility could not determine, and prepare such as it does determine, for the dispatch of business. In this case, we may say the Aristocracy, in some measure, resides in the senate; a democracy in the body of the nobility; and that the people are nothing.

4. It will be very happy, in an Aristocratical government, if the people, by some indirect method, are admitted to bear some degree of weight: as, at Genoa, the bank of St. George, which is directed by the people, gives them an influence over the state; which makes all their happiness.

5. The senators ought not to have the power of bringing in whom they please into their body, as members drop off; but this power should be invested in censors, to prevent corruption.

6. That is the best Aristocracy, wherein the people have so small a share of riches, or power, as not to make it the interest of the ruling party to oppress them.

7. The most imperfect Aristocracy is where that part of the people, which obeys, is under the civil bondage of that which commands it.

8. If the people under an Aristocracy are virtuous, they will enjoy almost all the happiness of a popular government; and the state will become powerful.

9. A spirit of moderation is the virtue of an Aristocracy; and holds the same place, as equality in a popular state.

10. Modesty, and simplicity of manners, constitute the strength of the nobility in an Aristocracy.

11. If any of the nobility had personal and particular prerogatives distinct from the body, it would cease to be an Aristocracy; and the form of government would approach to a monarchy.

12. The two principal springs of confusion, in an Aristocratical form of government, are the prodigious inequality between the governors and the governed; and the inequality between those that govern.

13. The first of these inequalities will exist, if the privileges and prerogatives of the rulers are honourable, by being oppressive, and taxes be levied partially.

14. Trade is the profession of people on a level, and therefore beneath the nobility in an Aristocracy.

15. The laws of an Aristocracy ought to oblige the nobility to do justice to the people.

16. The laws ought, in every respect, to curb the pride of tyrannizing.

17. There ought to be some authority, to counterbalance the power of the nobility.

18. The extreme poverty, or exorbitant riches of the nobility, are pernicious in an Aristocracy.

19. There should be no right, by seniority, among the nobility, that, the estate of the family being divided among the children, all of the same rank and family might possess an equal fortune.

20. All disputes among the nobility ought soon to be finally determined.

21. The laws ought, in particular, to tend to abolish the distinction which vanity makes among noble families.

22. If the laws are good, the nobility will rather think of the advantages which will result from obeying, than their own punctilio's.

23. Aristocracy degenerates, when, the power of the nobility becoming arbitrary, there is no more virtue in those that govern, than in those that are governed. M. Montesquieu has supported these maxims by so many instances, both antient and modern, that he has left us no room to doubt of the truth of them.

ARISTOTE'LIAN *Philosophy*—The philosopher from whom the denomination arises, was the son of Nicomachus, physician of Amyntas, king of Macedonia, born in the year of the world 3566; before Christ, 348; at Stagira, a town of Macedonia; or, as others say, of Thrace; whence he is also called the Stagirite.

At seventeen years of age he entered himself a disciple of Plato, and attended in the academy till the death of that philosopher. Repairing afterwards to the court of king Philip, at his return, he found that Xenocrates, during his absence, had put himself at the head of the Academic seat; upon which, he chose the Lyceum for the scene of his future disputations.

It being his practice to philosophize walking, he got the appellation Peripateticus; whence his followers were also called Peripatetics. Though others will have him to have been thus named, from his attending on Alexander, at his recovery from an illness, and discoursing with him, as he walked about.

Aristotle was a person of admirable genius, and of great and various learning. Averrhoes makes no scruple to call him, 'The genius of nature, the limit of human understanding;' and declares him, 'sent by providence, to teach us all that 'may be known.' He is accused of a too immoderate desire of fame, which led him to destroy the writings of all the philosophers before him, that he might stand singly, and without competitors. And hence, in the schools, Aristotle is called, The philosopher. Laertius, in his life of Aristotle, enumerates his books to the number of 4000; of which scarce above 20 have survived to our age.

This great philosopher has been deified by some, and despised by others, but a short view of his works will abundantly convince us, that both these extremes are ill founded. His first essays were on oratory and poetry; which, in all probability, he composed for the use of his royal pupil, Alexander the Great. These books are master-pieces; and his study of Homer gave him so finished a taste in poetry and rhetoric, that whoever would now speak, or write, elegantly, on those subjects, must observe his precepts; and, perhaps, these performances do most honour to his memory.

His ethics are very dry, barren, and unfruitful; offer nothing to us, but general views, and metaphysical propositions; fitter to adorn the mind, and lead the memory, than touch the heart, and correct the will: and this spirit prevails in all the moral writings of our philosopher. A sketch of his principal doctrines will sufficiently prove this assertion. 1. The happiness of man, says he, consists not in riches, pleasures, power, nobility, nor philosophical speculations; but rather in certain habits of the soul, which render him more or less perfect. 2. Virtue is full of charms; consequently, a virtuous life must be happy. 3. Though virtue be sufficient of itself, yet it cannot be denied, but that riches, honours, a noble birth, beauty of body, and things of this nature, greatly contribute to advance the happineſs of man. 4. Every virtue keeps the mean betwixt two extremes: thus courage is the mean betwixt fear and raſhneſs; liberality, betwixt avarice and extravagance, &c. from whence we may conclude, that the number of vices are twice the number of virtues; becauſe every virtue has on each ſide an oppoſite vice. 5. He diſtinguiſhes two ſorts of juſtice; the one he calls univerſal, the other particular. Univerſal juſtice tends to the preſervation of civil ſociety, by the reſpect and obedience it inſpires and enjoins for the laws. Particular juſtice conſiſts in rendering every man his due; and is of two ſorts, diſtributive and communicative. Diſtributive juſtice diſpenſes rewards and puniſhments to every citizen, according to his merit; and is founded on a geometrical proportion. Communicative juſtice has commerce for its object; conſiſts in rendering to every man his due; and muſt proceed according to arithmetical proportion. 6. Friendſhip ariſes either from the pleaſure we find in a perſon's converſation, the profit which may reſult from it, or from the merit of ſome eminent qualities, founded on virtue, we diſcover in the object: this laſt is true friendſhip; benevolence, properly ſpeaking, is not friendſhip, though it leads to it.

Ariſtotle has ſucceeded much better in his logic than in his ethics. His logic diſcovers all the principal ſprings of the art of reaſoning; he deſcends ſoon to the thoughts of man; diſtinguiſhes his ideas; ſhews their connection; purſues them through all their deviations and ſeeming contrarieties; and at laſt reduces them to a fixed point. If the extent of the mind could have been known, Ariſtotle would certainly have diſcovered it. Is it not ſurpriſing, that, by the different combinations he has made of all the forms the mind can put on in reaſoning, he has confined it in ſuch a manner, by the rules he has laid down, that it can never deviate from its object, nor reaſon abſurdly? But his method, though ſo much extolled by all philoſophers, is not free from faults. 1. He is too prolix; all his books of categories might be reduced to a few pages; the ſenſe is drowned in a ſuperfluity of words. 2. He is obſcure and intricate; he expects you to gueſs at his meaning; would have his reader, like himſelf, know what he intended. A man of the beſt capacity muſt often deſpair of having fully underſtood him in his doctrine of the analyſis and ſyllogiſm.

Let us now come to ſpeak of Ariſtotle's natural philoſophy; and here we ſhall principally follow the famous Lewis Vilis, who has proceeded very methodically on the ſubject, by taking notice of all this philoſopher's phyſical works; he begins with his eight books of natural principles; which ſeem rather ſo many different memoirs, than a book wrote on one and the ſame plan. Theſe eight books treat of bodies extended in general, which is the object of phyſics; and, in particular, of the principles of bodies, and all that is connected with theſe principles, as motion, place, time, &c. Nothing is more confuſed, than the long detail he gives us; his definitions render things, clear and evident in themſelves, obſcure and unintelligible. Ariſtotle begins with condemning all the philoſophers who went before him, and even in very harſh terms: ſome he blames for having admitted too many principles; others for having admitted only one. With regard to himſelf, he lays down three principles, which are matter, form, and privation. Matter, according to him, is the general ſubject on which nature operates: this matter is eternal; the parent of all things; which eagerly longs for motion, and deſires to be united to form. Ariſtotle's definition of his firſt matter is a kind of jargon; he defines it in theſe terms: 'That which has neither quality or quantity, or any thing by which its being can be determined'. If he only means, according to his method of conſidering things, firſt in a general view, and afterwards deſcending to particulars, that this firſt matter had no other foundation than his own conception, nor exiſtence, but in an arrangement of ideas, to reaſon on the ſubject, it may be granted him: but then this firſt matter is an imaginary being, a mere abſtract idea, which exiſts no more in general than a flower, or man, which are but parts of the univerſe. Some are of opinion, Ariſtotle meant, by his firſt matter, not only body in general, but a certain uniform paſte, which, like yielding wax, took any impreſſion; out of which all things were formed, and into which they return at their diſſolution; that all bodies were the ſame, and differed only with reſpect to their figure, quantity, motion, or reſt, which are all accidents. This opinion, which owes its origin to Ariſtotle, appeared ſo ſpecious to all philoſophers, both antient and modern, that it has been generally adopted; though nothing can be more falſe, as is abundantly proved by experiments; for, in conſequence of this doctrine, if motion produced out of this firſt matter, this original paſte or wax, an animal, a tree, or a maſs of gold; take away this motion, the animal, the tree, the gold, muſt return to their primeval paſte. Empedocles, Plato, Ariſtotle, and the ſchoolmen, aſſert this; but it is falſe. The organized body, on its diſſolution, ſeparates into different maſſes, ſkin, hair, fleſh, bone, &c. The mixed body reſolves itſelf into water, ſand, ſalt, and earth: but the moſt powerful diſſolvents, and the hotteſt fire, can never produce any change in theſe ſimple bodies. Sand remains ſand, iron remains iron, gold, purified, ſuffers no change; the caput mortuum will always remain a caput mortuum, though tried and tortured a thouſand ways. Chemical experiments have proved this paſt all doubt: we can go no further, the ſeparate elements are permanent, and incapable of change; for this reaſon, that the univerſe, which is compoſed of them, may receive different forms, by their being blended together; and yet be durable, as the principles which form its baſis. As to form, Ariſtotle's ſecond principle, he looks on it as a ſubſtance, an active, conſtituent principle of bodies, which operates on matter. It follows from this poſition, that there muſt be as many natural forms, which are born, and die by turns, as there are primitive and elementary bodies. As to privation, ſays Ariſtotle, it is not a ſubſtance; it is even, in ſome reſpects, a ſort of nothing: in ſhort, bodies which receive ſuch a form, are ſuch as could never have had that form before, but muſt even have had one abſolutely contrary to it. Thus the dead and living are directly oppoſite.

Theſe three principles premiſed, Ariſtotle proceeds to the explanation of cauſes, which he treats of diſtinctly enough; but almoſt always without mentioning the firſt cauſe, which is God. Some have taken occaſion from hence to accuſe him of atheiſm; but we are of a different opinion. Ariſtotle aſſerts, nature is an effective principle, a plenary cauſe, which renders all bodies, wherein it reſides, capable of motion or reſt in themſelves: all bodies which have this power, that cannot in one ſenſe be annihilated, and this tendency to motion, which is always equal, are properly called ſubſtances: nature, conſequently, is another principle of Ariſtotle; and nature is a term by which he could mean nothing but the Deity; wherefore he did not miſtake the firſt cauſe; but his commentators puzzled themſelves, and the ſchoolmen ran into ſo many abſurdities, by miſunderſtanding him.

After having explained the efficient cauſe of all power diſtributed throughout the univerſe, Ariſtotle proceeds to define motion; but, though the efforts of a great genius are conſpicuous, his definition is very lame and imperfect. The farther he advances, his reaſoning becomes more clear; finite and infinite, the vacuum and atoms, ſpace and time, place and the bodies contained in it, preſent themſelves to his view; he makes no confuſion; one propoſition leads to another; and, though the progreſs be extremely rapid, the connection is very plain.

The doctrine, contained in his two books of generation and corruption, neceſſarily depends on his principles which we have already explained. Before Socrates, the prevailing opinion was, that nothing abſolutely died or periſhed, but ſomething was again produced from it; that all the changes which happen in bodies were only another arrangement, a different diſtribution of the parts of matter which compoſed theſe ſame bodies: they aſſerted, that increaſe and diminution, diviſion and re-union, ſeparation and mixture, accounted for all the changes viſible in the univerſe. Ariſtotle rejected all theſe notions, though very ſimple in themſelves, and therefore probable; and eſtabliſhed the doctrine of generation and corruption, properly ſo called. He obſerved new beings produced from the womb of nature continually, which periſhed in their turns. Two things led him into this way of thinking: 1. He imagined the matter of all bodies the ſame; that they only differed in form, which he looked on as their eſſence. 2. This doctrine of privation teaches, that contraries are produced by their contraries, as white by black; whence it follows, that white muſt be annihilated before black can ſucceed. To clear up this ſyſtem, we ſhall make two remarks: 1. That generation and corruption have no connection with the other modifications of bodies, as increaſe, decreaſe, tranſparence, conſiſtence, &c. under all theſe modifications. The firſt form is not effaced, though infinitely diverſified. The ſecond remark, which naturally reſults from the firſt, is, that, as all the diverſity of nature conſiſts in generation and corruption, ſimple and primitive beings only can be ſubject to them; all other bodies are only mixtures, and various combinations of theſe firſt. Though nothing can be more chimerical than this part of Ariſtotle's ſyſtem, yet it has perplexed the ſchoolmen, who have multiplied a number of nonſenſical terms, ſuch as forma ſubſtantialis, modalitas, &c. and continually diſputed about it, without any meaning.

Ariſtotle does not content himſelf with exhibiting a general theory in phyſics, but deſcends to particulars; his meteorology is held by father Rapin to be more clear than all that has been advanced by the moderns on the ſubject. It, indeed, muſt be owned, he accounts for rain, hail, dew, &c. in an extraordinary manner, conſidering his ignorance of the experiments the moderns have made, and ſome diſcoveries, owing to time and chance. His account of the rainbow is ingenious, and really differs but little from that of Deſcartes. His definition of the wind is this, that it is a current of the air; and he ſhews, that its direction depends on an infinity of cauſes, extraneous and little known; which, ſays he, hinders me from giving a general ſyſtem of it. With regard to his hiſtory of animals, it will be ſufficient to ſay, it is highly approved of by M. de Buffon.

Thus we have given ſome account of all his works. Let us now take a ſhort view of his doctrines. The matter, according

ing to Ariſtotle, which compoſes all bodies, is the ſame, and only owes its different forms to the different combination of its parts. He admits of four elements, fire, air, water, and earth; which, according to him, are ſufficient to form all ſublunary bodies, but the beauty of the heavens made him ſuſpect them to be formed of finer materials; and, therefore, he ſuppoſed a ſort of fifth element, the quinteſſence of the other four, for the conſtruction of the heavens: and perhaps, when he had invented a new word, thought, like ſome moderns, he had made a diſcovery of ſomething new; and that what ſubſiſted in his imagination, muſt conſequently alſo ſubſiſt in the univerſe. But neither the authority of Ariſtotle or any other philoſopher, nor the pretended evidence of their arguments, can convince us of the reality of what they imagined. From theſe five principles, fire, air, water, earth, and a quinteſſence of theſe, Ariſtotle ſuppoſed the whole univerſe to be formed. Of this quinteſſence, or fifth body, being, or eſſence ſor (literally the term ſignifies no more, though taken in a metaphorical acceptance, it is generally underſtood to convey another idea) he ſuppoſes, the celeſtial bodies formed; and to this he aſcribes a circular motion. To the four elements, of which he ſuppoſes all ſublunary bodies compoſed, he aſſigns only a rectilinear motion. The fifth eſſence has neither gravity nor levity, is incorruptible and eternal; always continues an equal and uniform motion, whereas, of the four elements, two deſcend and gravitate towards the center, two aſcend and ſeek the circumference; yet they may change their places, and indeed often do ſo, becauſe of the facility they have of transforming themſelves by rarefaction, condenſation, &c.

This premiſed, Ariſtotle aſſerts the univerſe is not equally under the government of God; notwithſtanding he is the general cauſe of all, the celeſtial bodies only are worthy his care and attention, but the earth and ſublunary beings are below his notice. Diogenes Laertius tells us, it was the opinion of Ariſtotle, that the heavenly bodies were regulated by the Deity; that the earth and ſublunary beings were governed by a kind of ſympathy with the celeſtial bodies, and influenced by them. This chain of reaſoning infers the mortality of the ſoul, and excludes free agency. A prevailing notion among all the ancient philoſophers, that the ſoul was a particle of the divine Being, and ſhould return to the Being from whence it proceeded after certain revolutions, contributed not a little to confirm Ariſtotle in this notion.

The falſe Ideas this philoſopher had conceived of motion, had led him into an opinion that the world was eternal. Motion, ſays he, muſt have been eternal, conſequently the world wherein it ſubſiſts muſt have been ſo too.

We have now ſeen enough of the doctrine of Ariſtotle to be convinced he is no more to be charged with atheiſm than almoſt all the other ancient philoſophers, who were infected with the ſame errors. Ariſtotle repreſents God, as an immaterial and intelligent Being; the firſt mover of all things, who could not be moved himſelf: ſhould it be aſked, what can be thought of Ariſtotle's creation? The anſwer is eaſy; for he admits, if there had been nothing in the univerſe but matter, it could not have been formed without ſome original firſt cauſe. This plainly infers a Deity, and wipes off the imputation of atheiſm, which ſome would have fixed on him. He only differs in opinion from his maſter Plato in this; Ariſtotle thought the world a natural and powerful emanation from the Deity, like light from the ſun: whereas Plato thought the world was not an eternal and neceſſary but voluntary and deliberate choice of the Deity. The doctrine of the creation in both makes the world eternal, and is very different from that of Moſes, in which God is left ſo free with regard to creating the world, that he might have left it eternally in its original chaos.

But if Ariſtotle be acquitted of atheiſm, becauſe he admits a firſt cauſe and makes God the author and firſt mover of all things; yet his notions tend indirectly to ſubvert and deſtroy the liberty of his agency: becauſe, ſays he, motion impreſſed on matter did not proceed from his will, but the neceſſity of his nature; ſo that his god is diveſted of all the attributes we juſtly aſcribe to the divine Being. Notwithſtanding theſe abſurdities, which ſtrike at the root of the Chriſtian religion, ſome eminent men of the Romiſh perſuaſion have been ſo prejudiced in favour of his philoſophy, that his picture has been drawn in the ſame piece of painting with that of our Saviour: nay, have been wicked and weak enough to place his writings on the level of holy writ. In latter ages, even after the revival of learning in Italy, ſome have not ſcrupled to place him among the number of the bleſſed. We have two books yet extant, written expreſly on this ſubject, one intitled 'The ſalvation of Ariſtotle', which the divines of Cologne are ſaid to have publiſhed; the other, by Lambert Dumont profeſſor of philoſophy, intitled 'What may moſt probably be advanced concerning the ſalvation of Ariſtotle, drawn from the proofs of holy ſcripture, and borrowed from the teſtimonies of the ſoundeſt body of divines'. Strange infatuation!

We cannot conclude this article without giving an abſtract of the ingenious parallel father Rapin has drawn between Ariſtotle and Plato. They both, ſays he, poſſeſſed an uncommon and elevated genius. The mind of Plato was, it is true, more refined, but Ariſtotle's more penetrating and profound. Plato's imagination is lively, copious, fruitful in invention, idea, and expreſſion: he gives every ſubject he treats of a thouſand different turns, ſets it in a thouſand lights, and all are pleaſing. But, after all, this is nothing but imagination. Ariſtotle is crabbed and dry, but what he ſays, carries the force of reaſon with it. His diction, though pure, is harſh, and his natural or affected obſcurities perplex and tire his readers. Plato has a delicacy in his thought and expreſſion; Ariſtotle ſeems to avoid this, in order to be more natural: his ſtile is ſimple and even, but cloſe and nervous; that of Plato pompous and elevated, but looſe and diffuſive. In ſhort Plato's principal intention ſeems to have been elegance of diction: Ariſtotle's ſolid Reaſoning.

Of the Reſtorers of ARISTOTLE'S *Philoſophy*.—Philoſophy was never ſo much cultivated as under the Roman emperors, yet the hiſtory of thoſe times ſhews us, it by no means made ſo great a progreſs as might have been expected from the encouragement it met with from them. An inundation of Barbarians deſtroyed the Roman empire and philoſophy too. Ignorance ſucceeded, and the only ſtudy in reputation, for ſome time, was a kind of logic, which conſiſted in quirks and deſtinctions which ſignified nothing. On the revival of learning, ſome men of letters undertook to give a correct tranſlation of Ariſtotle's works into Latin; former tranſlators had given his diſciples a mean opinion of this great philoſopher, and had rather exhibited their own Gothic taſte, than Ariſtotle's genius. But the reſtoration of learning was too great a work for perſons in a private ſtation; princes intereſted themſelves in it, procured manuſcripts out of the Eaſt, and cauſed them to be tranſlated and publiſhed. Pope Paul V. acquired immortal honour by the encouragement he gave to all undertakings of this kind. He was paſſionately fond of all ſorts of literature, but eſpecially of Ariſtotle's philoſophy. Men of learning increaſed, and tranſlations of courſe. Averrois, till then, had been thought Ariſtotle's beſt commentator, but, as learning improved, taſte refined; they thought Averroïs retained ſomewhat of barbariſm, and therefore choſe Alexander to explain Ariſtotle in the Lycæum, as a man of more elegance and politeneſs. Averroïs and he, were without compariſon the moſt eminent in the Peripatetic philoſophy, but their opinions about the ſoul were not orthodox. For Alexander thought it mortal, and Averroïs, though he acknowledged the ſoul immortal, yet meant only an univerſal ſoul of which all men partook. Theſe opinions ſpread very much in the time of Thomas Aquinas, who refuted them very fully. The ſect of Averrois prevailed in Italy, inſomuch that Pope Leo X. thought proper to put a ſtop to the propagation of doctrines ſo oppoſite to Chriſtianity, and condemned the opinion of Averroïs as impious in the ſecond Lateran council. Some profeſſors, thinking the fulminations of the church inſufficient to make men of learning lay aſide theſe dangerous opinions, oppoſed the Platonic philoſophy as the beſt remedy to this growing evil; others, finding many beauties in the philoſophy of Ariſtotle, and highly reverencing the doctrines of the goſpel, were for reconciling him with Plato; others, again, ſoftened the expreſſions of Ariſtotle and gave them a religious turn.—It may not be diſagreeable to mention ſome of thoſe who diſtinguiſhed themſelves in theſe controverſies.

Among the Greeks who left their own country and came to tranſplant learning into Italy, Theodorus Gaza was one of the moſt eminent; he underſtood the opinions of every ſect of philoſophy, was a great phyſician, a profound divine, and remarkable for his ſkill in polite literature. He was of Theſſalonica; the victorious arms of Amurath that ravaged all the Eaſt, drove him to ſeek refuge in Italy. Cardinal Beſſarion received him with friendſhip, and gave him prieſt's orders. He tranſlated Ariſtotle's Hiſtory of Animals, and the Problems of Theophraſtus on Plants. His tranſlations pleaſed him ſo much, that he boaſted of them as equal to the original. But though he is eſteemed one of the beſt tranſlators, yet, as Eraſmus juſtly obſerves, his Latin phraſe has a tincture of Greek, and his opinions the tincture of the age he lived in. Coſmo of Medicis joined with cardinal Beſſarion in doing him ſervices and advancing his fortune, but Greek and Brutian ſycophants and his own want of œconomy reduced him to extreme poverty; under theſe circumſtances he ſet about the tranſlation of Ariſtotle's Animal Hiſtory, which he dedicated to Sixtus IV. from whom he only received a preſent of a hundred piſtoles, which he threw with indignation into the Tiber, and withdrew himſelf from Rome into the country of Brutii, where he would have ſtarved, had not the duke of Ferrara taken notice of him. He died of vexation ſoon after, a remarkable example of the changes of fortune.

George of Trebizond, as well as Gaza, applied himſelf to the Peripatetic philoſophy; gave himſelf this title, becauſe it was the country of his anceſtors; for he was a Cretan by birth. He went into Italy, while the council ſat about reuniting the Latin and Greek churches. He was at Venice firſt, from whence he went to Rome where he taught rhetoric and philoſophy. He was ſo zealouſly fond of Ariſtotle as to defend him in every point: and wrote the bittereſt in-

vectives

vectives againſt the followers of Plato; which created him many enemies. Nicholas V, his patron, notwithſtanding his inclination to the Ariſtotelian philoſophy, diſapproved of his conduct. Cardinal Beſſarion was the moſt powerful antagoniſt that took up the pen againſt him; he refuted him under the title of the ſlanderer of Plato. But he had a more formidable enemy than the cardinal, neceſſitous poverty; for this diſpute unhappily deprived him of all ſupport. Poſterity will more eaſily pardon his prejudices againſt the followers of Plato in his age, than the incorrectneſs of his tranſlations. His tranſlations of the Laws of Plato and Ariſtotle's Hiſtory of Animals are deficient in many reſpects; inattention, want of erudition and honeſty, manifeſt themſelves very frequently. For he took the liberty of altering the text, leaving out many things of conſequence, and changing others; as may be ſeen by the tranſlation Euſebius has given us. Thus we ſee, on the revival of learning, men of letters were divided between Plato and Ariſtotle; both ſides caſt the ſevereſt reflections on each other, which is the caſe of all parties; but neither are to be regarded more than reaſon decides in their favour.

The Ariſtotelian philoſophy, however, was continued in vogue till Des Cartes demoliſhed it; though he did not ſubſtitute any thing more rational in its ſtead; as we have obſerved in the preface to the Dictionary.

Univerſal ARITHMETIC, a name given by Sir Iſaac Newton to algebra, or the calculation of quantities in general. Nor is it without reaſon that this great man, whoſe elevated genius and profound penetration ſeem to have traced all the ſciences to their true metaphyſical principles, gave it this title.

In ſhort, in common Arithmetic are two kinds of principles; the firſt are general rules independent of the characters made uſe of to expreſs numbers: the ſecond are rules which depend on the characters; and theſe are more properly called rules of Arithmetic. The firſt principles contain only the general properties of proportions, and take place, however theſe proportions are ſtated: ſuch, for example, are theſe rules, take one number from another, and the remainder, added to that number, will give the firſt number; if you divide one number by another, the quotient multiplied by the diviſor will give the dividend; if the ſum of ſeveral numbers be multiplied by the ſum of ſeveral other numbers, the product will be equal to the ſum of the products of each part multiplied by all the others, &c.

From whence it follows, that by noting numbers by general expreſſions, though they no more denote one number than another, we may form certain rules relative to operations which may be performed on numbers ſo expreſſed. Theſe rules ſhew the reſult of one or more operations performed on numbers expreſſed in a general manner, by the moſt ſimple method; and this reſult ſo expreſſed is properly nothing more than an arithmetical operation expreſſed in characters, which will vary according to the different arithmetical values we aſſign the quantities ſubſtituted for numbers.

To ſet this idea of algebra in a clearer light, it may not be amiſs juſt to mention the four common rules in Arithmetic. To begin with addition, which conſiſts in adding any numbers propoſed into one total, without any other operation. If it were propoſed to add two diſſimilar quantities together a, b, I would write ſimply $a + b$; the reſult is only an indication that if I mean a certain number by a, and another by b, theſe numbers muſt be added together; thus, $a + b$ is nothing but the indication of an arithmetical addition, the ſum of which will be different, according to the different numerical values aſſigned to a and b. Suppoſe it were required to add $5a$ to $3a$, I might write $5a + 3a$, but it is plain, this may be expreſſed in a more ſimple manner; for $5a + 3a$, $= 8a$, and, therefore, the arithmetical operation may be expreſſed in a conciſer method than $5a + 3a$, by writing ſimply $8a$.

The general rule of addition in algebra for ſimilar quantities is performed by adding together their numerical co-efficients, and adjoining the literal quantities.

Whence it follows, that addition in algebra expreſſes the ſum or aggregate of ſeveral numbers, generally in the moſt ſimple manner, and ſaves the arithmetician as much labour as poſſible.

In ſubtraction the thing is the ſame; for, if I would ſubtract b from a, I write ſimply $a - b$; becauſe I cannot repreſent this operation in a more ſimple manner: but, were I to ſubtract $3a$ from $5a$, I would not write $5a - 3a$, becauſe that would give me the trouble of ſeveral arithmetical operations, if a had any numerical value, but ſimply $2a$, which is more convenient in calculation.

The ſame thing is true in multiplication and diviſion; if I would multiply $a + b$, by $c + d$, I might write indifferently $\overline{a + b} \times \overline{c + d}$, or $ac + bc + ad + bd$, though I ſhould prefer the firſt method, becauſe it ſeems to require fewer arithmetical operations; in the firſt, there are only wanted two additions and one multiplication; in the ſecond, three additions and four multiplications. But, were I to multiply $5a$ by $3a$, inſtead of writing $5a \times 3a$, I would write $15aa$, becauſe in the firſt caſe I ſhould have three arithmetical operations to perform, in the ſecond only two; one to find aa, the other to multiply aa by 15. In like manner, were I to multiply $a + b$ by $a - b$, I ſhould write $aa - bb$; becauſe this reſult would often prove more commodious than the other in arithmetical calculations. Beſides, a theorem reſults from it, namely, that the product of the ſum of two numbers by the difference of the ſame numbers, is equal to the difference of the ſquares of the two numbers. Thus we find the product of $a + b$ by $a + b$, that is, the ſquare of $a + b$ is $aa + 2ab + bb$, and, conſequently, contains the ſquare of both quantities, plus twice the product of one by the other; which is of uſe in extracting the ſquare root.

In diviſion, inſtead of writing $\frac{20ab}{5b}$ I would write $4a$ ſimply, and inſtead of $\frac{aa - xx}{a + x}$, $a - x$: but, were I to divide bc by bd, I would write $\frac{bc}{bd}$, becauſe I could not find a more ſimple manner of expreſſion.

Hence it is evident, that Sir Iſaac Newton was in the right to call algebra univerſal Arithmetic; becauſe it conſiſts in exhibiting all the general and common rules of every kind of Arithmetic, in a more clear, conciſe, and ſimple method.

But it may be aſked why all this perplexity? In all arithmetical queſtions the numbers are expreſſed; of what uſe is it then to give them a literal expreſſion?

It is eaſy to ſee the advantage of this expreſſion; every queſtion, that may be propoſed in Arithmetic, is not ſo ſimple as that of adding a number given to another, ſubtracting one from another, or multiplying or dividing one by another. There are queſtions much more complicated; for the ſolution of which we are obliged to form combinations of which the number or numbers muſt make a part. We muſt therefore be poſſeſſed of an art whereby we may repreſent theſe combinations, without knowing the number ſought; and, conſequently, expreſs theſe numbers by characters not numerical: becauſe it would be very improper and inconvenient to expreſs an unknown number by a numerical character, which we had no reaſon to expect would be its real value. To render this ſtill more plain by an example: let us ſuppoſe two numbers were required, whoſe ſum is 100, and their difference 60. It is eaſy to ſee that by ſetting down two unknown numbers at pleaſure in figures, as, for example, 25 and 50, the expreſſion would be falſe; becauſe theſe two numbers do not anſwer the conditions of the queſtion. The ſame inconvenience would ariſe in a multitude of other numerical expreſſions. To avoid this inconvenience, let us call the greater number x, the leſſer y, and, by this algebraic expreſſion, the conditions of the queſtion will be eaſily repreſented; thus x plus y is equal to 100, and x minus y is equal to 60; or, in algebraic characters,

$$x + y = 100$$
$$x - y = 60$$

As $x + y$ is equal to 100, and $x - y$ equal to 60, it is evident that 100 added to 60 muſt be equal to $x + y$ added to $x - y$. But to add $x + y$ to $x - y$, by the rule of addition in algebra, we muſt write $2x$, and conſequently $2x$ is equal to 160; that is, 160 is equal to twice the greater number ſought; and conſequently x, or the greater number, is equal to 80. From whence it is eaſy to find the other y, for if $x + y$ be equal to 100, and x equal to 80, then 80 plus y is equal to 100; therefore y is equal to 100 minus 80; that is, the two numbers, therefore, are 80 and 20; for their ſum is 100, and their difference 60.

In other caſes we do not inſiſt on the neceſſity of algebra; nay, if queſtions, more complicated than this were not propoſed, it would not be neceſſary; we only mean to ſhew, by this plain example, which is obvious at firſt ſight, how we arrive at a diſcovery of unknown quantities by the help of algebra.

The algebraic expreſſion of a queſtion, as Sir Iſaac Newton has well obſerved, is only a tranſlation of the ſame queſtion into algebraic characters; which has this advantage, and eſſentiality in its nature, that it confines itſelf to what is abſolutely neceſſary in the queſtion, and contracts the work by baniſhing ſuperfluous terms. See EQUATION, in the Dictionary and Supplement.

ARK, *Arca*, in the ſcripture language, denotes a kind of floating veſſel built by Noah, for the preſervation of the ſeveral ſpecies of animals from the deluge.

The Ark has afforded ſeveral points of curious enquiry among the critics and naturaliſts, relating to its form, capacity, materials, time of building, place of reſting after the flood, &c. Noah is computed to have been an hundred years in building the Ark, viz. from the year of the world 1557, to the flood, which happened in the year 1656: at leaſt, this is the common opinion of the learned. Origen and St. Auſtin aſſert as much; and are followed by Salian, Torniel, Spondeus, Pelletier, &c.

Yet Beroſus affirms, that Noah only began to build the Ark ſeventy-eight years before the flood: Solomon Jarchi, on the other hand, will have it an hundred and twenty years in building, and Tanchuma only fifty-two.

Father Fournier, in his Hydrography, embraces the opinion of the fathers; noting, that the only hands employed in it were Noah and his three ſons. To this purpoſe he alledges the inſtance of Archias of Corinth, who, with the help of three-hundred workmen, built Hiero's great ſhip in one year. Add, that Noah's eldeſt ſon was not born till about the time when the Ark was begun, and the younger, after; ſo that it was a long time before they could do their father any ſervice. However, for ſo large a building, a prodigious number of trees muſt have been required, and, conſequently, a great number of workmen employed to fell and hew them, beſides thoſe who built the Ark.

The wood whereof the ark was built, is called, in ſcripture, עצי גפר, etſe gopher, gopher wood: and in the LXX. ξύλα τετράγωνα, ſquare timbers. Onkelos and Jonathan render gopher by קדרוס, kedros, cedar: St. Jerom, in the vulgate, by ligna lævigata, planed wood; and, elſewhere, ligna bituminata, q. d. pitched wood. Kimchi tranſlates it, wood proper to float; Vatable, light wood, which ſwims in the water without corrupting: Junius, Tremellius, and Buxtorf, a kind of cedar, by the Greeks called κεδρελάτη; Avenarius and Munſter, pine; Fuller and Bochart, cypreſs; others box; others fir; Caſtalio, turpentine, &c. Pelletier prefers the opinion of thoſe who hold the Ark made of cedar: his reaſons are, the incorruptibility of that wood; the great plenty thereof in Aſia, whence Herodotus and Theophraſtus relate, that the kings of Egypt and Syria built whole fleets of it; and the common tradition, throughout the Eaſt, imports, that the Ark is preſerved intire to this day on mount Ararat.

The dimenſions of the Ark, as delivered by Moſes, are three hundred cubits in length, fifty in breadth, and thirty in height; which, compared with the great number of things it was to contain, ſeems, at firſt ſight, too ſmall. And hence an argument has been drawn againſt the authority of the relation. Celſus long ago laughed at it, calling it κιβωτὸν ἀλλόκοτον, the abſurd Ark. To ſolve this difficulty, many both of the ancient fathers and later critics have been put to miſerable ſhifts. Origen, St. Auguſtin, and others, maintain, that, by the cubits here ſpoke of, we are to underſtand the Egyptian geometrical cubit, equal, according to them, to ſix vulgar cubits, or nine feet. But the truth is, it does not appear there ever was any ſuch meaſure as a geometrical cubit either among the Egyptians or Jews. Others account for it, by aſſerting the ſtature of mankind, in the firſt ages, to have been much greater than in our days; and, conſequently, the cubit, which is taken from a part of a human body, proportionably larger. But this does not avail, ſince the ſame reaſon will infer an equal augmentation of other animals. Others ſuppoſe the ſacred cubit here ſpoken of, which was a hand's-breadth longer than the civil one: but this only affords a ſmall ſupply; beſides, that the ſacred cubit does not appear to have been ever uſed, except in ſacred edifices, as the temple and tabernacle.

This difficulty is much better ſolved by Buteo and Kircher, wherein, ſuppoſing the common cubit of a foot and a half, they prove geometrically, that the Ark was abundantly ſufficient for all the animals ſuppoſed to be lodged therein. Snellius computes the Ark to have been above half an acre in area: Cuneus, Buteo, and others, have alſo calculated the capacity of the Ark.—Dr. Arbuthnot computes it to have been 81062 tons. Father Lamy ſhews that it was an hundred and ten feet longer than the church of St. Mary at Paris, and ſixty-four feet narrower; to which his Engliſh tranſlator adds, that it muſt have been longer than St. Paul's church at London, from weſt to eaſt; broader than that church is high in the inſide, and about fifty-four feet in height, our meaſure.

The things contained in it were, beſides eight perſons of Noah's family, one pair of every ſpecies of unclean animals, and ſeven pair of every ſpecies of clean animals, with proviſions for them all, during the whole year. The former at firſt view ſeems almoſt infinite, but if we come to a calculation, the number of ſpecies of animals will be found much ſmaller than was imagined, not amounting to an hundred ſpecies of quadrupeds, nor two hundred of birds; out of which, in this caſe, are to be excepted ſuch animals as can live in the water. Zoologiſts uſually reckon but an hundred and ſeventy ſpecies in all; but biſhop Wilkins ſhews, that only ſeventy-two of the quadrupede kind needed a place in the Ark.

By the deſcription Moſes gives of the Ark, it appears to have been divided into three ſtories, each ten cubits, or fifteen feet high: and it is agreed on, as moſt probable, that the loweſt ſtory was deſtined for the beaſts, the middle for the food, and the upper for the birds, with Noah and his family; each ſtory being ſubdivided into different apartments, ſtalls, &c. Though Joſephus, Philo, and other commentators add a kind of fourth ſtory, under all the reſt, being, as it were, the hold of the veſſel, to contain the ballaſt, and receive the filth and fæces of ſo many animals.

Drexelius makes three hundred apartments; father Fournier, three hundred and thirty-three; the anonymous author of the queſtions on Geneſis, four hundred; Buteo Temporarius, Arias Montanus, Hoſtus, Wilkins, Lamy, and others, ſuppoſe as many partitions as there were different ſorts of animals. Pelletier only makes ſeventy-two, viz. thirty-ſix, of the birds, and as many for the beaſts: his reaſon is, that if we ſuppoſe a greater number, as three hundred thirty-three or four hundred, each of the eight perſons in the Ark muſt have had thirty-ſeven, forty-one, or fifty ſtalls to attend and cleanſing daily, which he thinks impoſſible. But there is not much in this; to diminiſh the number of ſtalls, without a diminution of the animals, is vain; it being, perhaps more difficult to take care of three hundred animals in ſeventy-two ſtalls, than in three hundred.

Buteo computes that all the animals contained in the Ark could not be equal to five hundred horſes; he even reduces the whole to the dimenſions of fifty-ſix pair of oxen. Father Lamy enlarges to ſixty-four pair, or an hundred and twenty-eight oxen; ſo that, ſuppoſing one ox equal to two horſes, if the Ark had room for two hundred and fifty-ſix horſes, there muſt have been room for all the animals. But the ſame author demonſtrates, that one floor would ſuffice for five hundred horſes, allowing nine ſquare feet to an horſe.

As to the food in the ſecond ſtory, it is obſerved by Buteo from Columella, that thirty or forty pounds of hay ordinarily ſuffice an ox for a day; and that a ſolid cubit of hay, as uſually preſſed down in our hay-ricks, weighs about forty pounds; ſo that a ſquare cubit of hay is more than enough for one ox for one day. Now it appears that the ſecond ſtory contained 150000 ſolid cubits, which, divided between two hundred and ſix oxen, will afford each more hay by two thirds, than he can eat in a year.

Biſhop Wilkins computes all the carnivorous animals equivalent, as to the bulk of their bodies and their food, to twenty-ſeven wolves, and all the reſt to two hundred and eighty beeves. For the former he allows 1825 ſheep, and for the latter 109500 cubits of hay: all which will be eaſily contained in the two firſt ſtories, and a deal of room to ſpare.

As to the third ſtory, no-body doubts its being ſufficient for the fowls, with Noah, his ſons and daughters.

Upon the whole, the learned biſhop remarks, that, of the two, it appears much more difficult to aſſign a number and bulk of neceſſary things to anſwer the capacity of the Ark, than to find ſufficient room for the ſeveral ſpecies of animals already known. This he attributes to the imperfection of our liſts of animals, eſpecially thoſe of the unknown parts of the earth; adding, that the moſt expert mathematician at this day could not aſſign the proportions of a veſſel better accommodated to the purpoſe, than is here done; and hence, finally, concludes, that 'the capacity of the Ark, which had been made an objection againſt ſcripture, ought to be eſteemed a confirmation of its divine authority; ſince, in thoſe ruder ages, men, being leſs verſed in arts and philoſophy, were not ſo obnoxious to vulgar prejudices as now; ſo that, had it been an human invention, it would have been contrived according to thoſe wild apprehenſions which ariſe from a confuſed and general view of things; as much too big, as it has been repreſented too little.'

ARMA'DA, or ARMATA, a naval army, or a fleet equipped for war.

ARMADI'LLA, in the Spaniſh America, denotes a ſquadron of men of war, to the number of ſix or eight, from twenty-four to fifty pieces of cannon, which the king maintains, to prevent foreigners from trading with the Spaniards and the Indians, both in time of war and peace.

The veſſels of this Armadilla are thoſe that have made ſo much noiſe, under the name of Guarda-coſta's.

ARMENI'ACA, *Apricock*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of ſeveral petals, arranged in a circular form. The piſtil ariſes from the cup, and finally becomes a fleſhy fruit, of a roundiſh figure, but uſually a little compreſſed ſideways, and having a furrow down its middle. This fruit contains a flatted ſtone, which includes a kernel of the ſame figure.

We have in Engliſh gardens about ſeven ſorts of this fruit cultivated; which are,

1. The maſculine apricock. 2. The orange apricock. 3. The Algier apricock. 4. The Roman apricock. 5. The Turkey apricock. 6. The Breda apricock. 7. The Bruſſels apricock.

The maſculine is the firſt ripe of all the apricocks; it is a ſmall, roundiſh fruit, of a red colour towards the ſun; as it ripens, the colour fades to a greeniſh yellow on the other ſide. It is only preſerved for being the firſt ripe, having little flavour: the tree is very apt to be covered with flowers; but, as they come out early in the ſpring, are frequently deſtroyed by the cold, unleſs the trees are covered to protect them.

The orange is the next ripe apricock; this fruit is much larger than the former; and, as it ripens, changes to a deep yellow colour. The fleſh of this is dry, and not high-flavoured; it is better for tarts than for the table.

The Algier is the next in ſeaſon; this is of an oval ſhape, a little compreſſed on the ſides; it turns to a pale-yellow, or ſtraw-colour, when ripe; the fleſh is dry, and not high-flavoured: this, and what is by ſome perſons called the common apricock, are often confounded.

The

The Roman is the next ripe apricock; this is a larger fruit than the former, and not compreſſed on the ſides; the colour is deeper, and not ſo dry as the former.

The Turkey apricock is yet larger than either of the former, and of a globular figure; they turn to a deeper yellow than the former; the fleſh is firmer, and of an higher flavour than either of the former.

The Breda apricock (as it is called from its being brought from thence into England) was originally brought from Africa: this is a large, roundiſh fruit, changing into a deep-yellow, when ripe; the fleſh is ſoft, full of juice, and of a deep orange-colour with inſide; the ſtone is rounder and larger than of the other ſorts: this is the beſt apricock we have; and, when ripened on a ſtandard, is preferable to all other kinds.

The Bruſſels is the lateſt ripe of all the apricocks; for, when it is planted againſt a wall, it is generally the beginning of Auguſt before it is ripe, unleſs when it is planted to a full ſouth aſpect; which is what ſhould not be practiſed, becauſe the fruit is never well-taſted which grows in a warm expoſure. This fruit is of a middling ſize, rather inclining to an oval figure; red on the ſide next the ſun, with many dark ſpots, and of a greeniſh-yellow on the other ſide; the fleſh is firm, and of an high flavour; the fruit often cracks before it is ripe. This is commonly preferred to the former ſort by moſt people; but, when the other is planted as a ſtandard, the fruit is fuller of juice, and of a richer flavour than this.

Moſt people train theſe trees up to ſtems of ſix or ſeven feet high, or bud them upon ſtocks of that height; but this is a practice I would not recommend, becauſe, the higher the heads of theſe trees are, the more they are expoſed to the cutting winds in the ſpring, which too frequently deſtroy the bloſſoms; and the fruit is alſo more liable to be blown down in ſummer, eſpecially if there ſhould happen to be much wind at the time they are ripe; which, by falling from a great height, will be bruiſed and ſpoiled; therefore I prefer half-ſtandards, of about two and a half, or three feet in the ſtem, to thoſe which are much taller; or to plant them as dwarfs againſt an eſpalier, where, if they are ſkilfully managed, they will produce a large quantity of good fruit; and the trees in eſpalier may be more conveniently covered in the ſpring, when the ſeaſon proves bad; whereby there will be a certainty of fruit every year.

Theſe fruits are all propagated by budding them on plum-ſtocks, and will readily take upon almoſt any ſort of plum, provided the ſtock be free and thriving (except the Bruſſels kind, which is uſually budded on a ſort of ſtock, commonly called the St. Julian, which better ſuits the tree, as being generally planted for ſtandards, than any other ſort of plum will.) The manner of raiſing the ſtocks, and budding theſe trees, are treated of under their particular articles, to which I refer the reader, and ſhall proceed to their planting and management.

Theſe trees are all (except the two laſt ſorts) planted againſt walls, and ſhould have an eaſt or weſt aſpect; for, if they are planted full ſouth, the great heat cauſes them to be mealy before they are well eatable. The borders under theſe walls ſhould be ſix feet wide at leaſt, and, if it were more, the better; but I would never adviſe the making of them ſo deep, as is the general cuſtom; for, if the earth be two feet deep, or two and an half at moſt, it is enough.

If your ground is a wet cold loam or clay, you ſhould raiſe your borders as much above the level of the ſurface as it will admit, laying ſome ſtones or rubbiſh in the bottom, to prevent the roots from running downwards; but, if you plant upon a chalk or gravel, you muſt remove it to a conſiderable width, to make room for a good ſoil to be put in; but you need not go above two feet and an half deep at moſt.

The ſoil I would in general adviſe to be uſed for theſe and all other ſorts of fruit-trees, is freſh untried earth, from a paſture-ground, taken about ten inches deep, with the turf, and laid to rot and mellow at leaſt twelve months before it is uſed; and this muſt be kept often turned, to ſweeten and imbibe the nitrous particles of the air.

When the former ſoil of the border is taken away, this freſh earth ſhould be carried in the place; and, if the borders are filled with it two months before the trees are planted, the ground will be better ſettled, and not ſo liable to ſink after the trees are planted: in filling of the borders, the ground ſhould be raiſed four or five inches above the level they are deſigned, to allow for the ſettling.

Your borders being thus prepared, make choice of ſuch trees as are but of one year's growth from budding; and, if your ſoil is dry, or of a middling temper, you ſhould prefer October for the beſt ſeaſon for planting, eſpecially having, at that time, a greater choice of trees from the nurſeries, before they have been picked and drawn over by other people. The manner of preparing theſe trees for planting being the ſame in common as other fruit-trees, we refer the reader to the article of PEACHES, where he will find it largely treated of. But do not cut off any part of the head at that time, unleſs there are any ſtrong fore-right ſhoots which will not come to the wall, which may be taken quite away.

Your trees being thus prepared, you muſt mark out the diſtances they are to ſtand, which, in a good ſtrong ſoil, or againſt a low wall, ſhould be twenty feet, or more; but, in a moderate one, eighteen feet is a good reaſonable diſtance; then make an hole where each tree is to ſtand, and place its ſtem about four inches from the wall, inclining the head thereto: and, after having fixed the tree in the ground, nail the branches to the wall, to prevent their ſhaking, and cover the ſurface of the ground round the root with rotten dung, to keep out the froſt: in this ſtate let it remain till February, when, if the weather is good, you muſt un-nail the branches of your trees, ſo as not to diſturb the roots, and, being provided with a ſharp knife, put your foot cloſe to the ſtem of the tree; and, having placed your left-hand to the bottom of the tree, to prevent its being diſturbed, with your right-hand cut off the head of the tree, to about four or five eyes above the bud, ſo that the ſloping ſide may be towards the wall.

In the ſpring, if the weather proves dry, you muſt, now-and-then, give your trees a gentle refreſhing with water; in the doing of which, if you obſerve to water them with a roſe to the watering-pot, all over their heads, it will greatly help them; and alſo lay ſome turf, in the manner directed for apples, or ſome other mulch, round the roots, to prevent their drying during the ſummer-ſeaſon: as new branches are produced, obſerve to nail them to the wall in an horizontal poſition; and ſuch ſhoots as are produced fore-right, muſt be intirely diſplaced. This muſt be repeated, as often as is neceſſary, to prevent their hanging from the wall; but by no means ſtop any of their ſhoots in ſummer.

At Michaelmas, when the trees have done growing, you muſt un-nail their branches, and ſhorten them in proportion to their ſtrength; a vigorous branch may be left eight or nine inches long, but a weak one ſhould not be left above five or ſix. I ſuppoſe many people will wonder at this direction, eſpecially having allowed ſuch a diſtance between the trees, as believing, by this management, the wall will never be filled; but my reaſon for it is, that I would have no part of the wall left unfurniſhed with bearing-wood; which muſt conſequently be the caſe, if the branches are left to a great length at firſt; for it ſeldom happens, that more buds than two or three ſhoot for branches; and theſe are, for the moſt part, ſuch as are at the extreme part of the laſt year's wood; ſo that all the lower part of the ſhoots become naked, nor will they ever after produce ſhoots; and this is the reaſon we ſee ſo many trees which have their bearing-wood ſituated only in the extreme part of the tree.

When you have ſhortened the ſhoots, be ſure to nail them as horizontally as poſſible; for upon this it is that the future good of the tree chiefly depends.

The ſecond ſummer obſerve, as in the firſt, to diſplace all fore-right ſhoots, as they are produced, nailing-in the other cloſe to the wall horizontally, ſo that the middle of the tree may be kept open; and never ſhorten any of the ſhoots in ſummer, unleſs to furniſh branches to fill vacant places on the wall; and never do this later than April, for reaſons hereafter given in the article of PEACHES. At Michaelmas ſhorten theſe ſhoots, as was directed for the firſt year; the ſtrong ones may be left nine or ten inches, and the weak, ſix or ſeven at moſt.

The following year's management will be nearly the ſame with this; but only obſerve, that apricocks produce their bloſſom-buds, not only upon the laſt year's wood, but alſo upon the curſons or ſpurs, which are produced from the two years wood: great care ſhould therefore be had in the ſummer-management, not to hurt or diſplace theſe: obſerve alſo, to ſhorten your branches at the winter-pruning, ſo as to furniſh freſh wood in every part of the tree; and be ſure to cut out intirely all the luxuriant branches, or diſplace them, as ſoon as they are produced; which, if left to grow, would exhauſt the nouriſhment from the bearing branches, which, in my opinion, cannot be too ſtrong, provided they are kindly; for the more vigorous your tree is, the more likely it is to reſiſt the injuries of the weather: and I have often ſeen trees brought to ſo weak a condition, as to be able only faintly to blow their bloſſoms, and then moſt or all of the bearing branches have died; which has given occaſion to the owner to imagine it was the effect of a blight, when, in reality, it was only for want of right management. And, I am fully perſuaded, half the blights we here complained of, proceed from nothing elſe but this.

Theſe few rules, well executed, together with a little obſervation and care, will be ſufficient; and, to pretend to preſcribe particular directions for all the different accidents, or manners of treating fruits, would be impoſſible; but I believe the reader will find what has been ſaid, if duly attended to, will anſwer his deſign; for, without diligent obſervation, there can be no ſuch thing as a ſkilful manager, let him have ever ſo many or good inſtructions laid down to him.

The Bruſſels and Breda apricocks, being, for the moſt part, planted for ſtandards, will require very little pruning or management; only obſerve to take out all dead wood, or ſuch branches as croſs each other; this muſt be done early in autumn, or in the ſpring, after the cold weather is paſt, that the part may not canker where the inciſion is made. *Miller's Gard. Dict.*

ARME'NUS *Lapis*, Armenian stone, in natural history, a mineral substance, which is but improperly called a stone, being no other than ochreous earth, and properly called blue ochre. It is a very valuable substance in painting, being a bright and florid blue. It was in so high esteem as a paint, among the ancients, that counterfeits were continually attempted to serve in its place: and Theophrastus has recorded it as a thing judged worthy a place in the Egyptian annals, which of their kings had the honour of inventing the factitious kind; and he tells us the genuine native substance was a thing of that value, that presents were made of it to great persons; and that the Phœnicians paid their tribute in it. *Hill's Theophrastus.*

It is a very beautiful earth, of an even and regular texture, and of a fine blue; sometimes deeper, sometims paler, and sometimes mixt with green. It is soft, tender, and light; of an even, but somewhat dusty, surface; it adheres firmly to the tongue, and is dry, but not harsh to the touch. It easily breaks between the fingers, and does not stain the hands. It is of a brackish disagreeable taste, and does not ferment with acids. It is a very scarce fossil, but is found very pure, though in but small quantities, in the mines at Gosselaer in Saxony. It is frequently found spotted with green, and sometimes with black; and very often is mixed among the green ochre, called berggruen by the Germans, which has thence, by some, been erroneously called by its name. *Hill's Hist. of Fossils.*

ARMOI'SIN, a silk-stuff, or kind of taffety, of an indifferent goodness. It is made at Lyons, and in several places in Italy. There are half-Armoisins (demi-Armoisins) made at Avignon, which are of an inferior quality, and less price than the others. They manufacture also Armoisins with three threads. Armoisins of all colours are imported from the East-Indies, and particularly from Casembasar, by the way of Bengal. See the next article. Some pretend that the word Armoisin comes from the Italian armesino; or that those silks were thus called, because there were coats of arms delineated upon the cloth in which they were wrapped up.

ARMOISIN *of the Indians.* It is a taffety manufactured in the East-Indies, but slighter than those that are made in Europe, and of an inferior quality. Their colours, and particularly their crimson and red, are commonly false, and they have but little gloss, and no brightness at all.

There are two sorts of them, the arains, which are taffeties, either striped or chequered; and the damaras, or flowered taffeties. Their length is from 7 French ells to 24, and their breadth from $\frac{7}{16}$ to $\frac{7}{8}$ of an ell.

The Indian Armoisins have sold at Amsterdam from 18 to 20 guilders per piece. When you do not buy them of the company, that is to say, at second-hand, you may stipulate to pay for them either in current or bank-money, or to deduct the difference.

The Armoisins of Lucca have sold at Amsterdam from 7 to 9 sols de gros per ell. They who sell them again, buy them by deducting the interest of the money for 18 months, they not being obliged to pay for them, but after those months are elapsed: they also deduct 1 per cent. for prompt payment. But, when they sell them to retailers, they deduct but 2 per cent. upon the whole for prompt payment; that is, they allow so much discount for the payment of ready money.

It must be observed that all the silks of Italy are sold after the same manner.

A'RMORIC, or ARREMORIC, something that belongs to the province of Bretagne or Britanny in France.

Armoric, absolutely used, denotes the language in use among the inhabitants of Britanny.

The French usually call this language bas Breton.

The Armoric is a dialect of the Welch, and sister of the Cornish language.

The inhabitants of Britanny, of Cornwal, and of Wales, still understand each other's speech; though considerable diversities have crept in between these languages, since their separation from each other.

A'RMOURERS *Company, in London.* The arms and crest of the brothers and sisters of the fraternity, or guild, of St. George, of the mystery of the Armourers of the city of London (as they were stiled in their charter) were antiently borne by the said corporation, but afterwards declared and confirmed to them by Thomas Hawley, Clarencieux, by patent under the seal of his arms and office, in the third and fourth years of Philip and Mary, 1556.

Their arms are argent on a cheveron, gules; a gantlet, between four swords in saltier, on a chief, sable; a buckler, argent, charged with a cross, gules, between two helmets of the first.

Their crest is a man demi-armed at all points, surmounting a torce and a helmet. Their motto, Make all sure. Their hall is in Coleman-street.

ARMS, or ARMORIES, are used in heraldry, for marks of dignity and honour, regularly composed of figures and colours, given or authorized by sovereigns, and borne in banners, shields, coats, &c. for the distinction of persons, families, and states, and passing by descent to posterity.

They are called Arms, in regard they are borne principally on the buckler, cuirasse, banners, and other apparatus of war. They are also called coats of Arms, coat-armour, &c. because antiently embroidered on sur-coats, &c. Some will have the name to have been first occasioned by the antient knights, who, in their justs and tournaments, bore certain marks (which were frequently their mistress's favours) in their armour, i. e. their helms or shield, to distinguish them from each other.

Three flowers-de-lys, in a field azure, are the Arms of France. The Arms of England are three lions. In the Arms of Great-Britain are quartered the Arms of France, England, Scotland, and Ireland.

There has been a great dispute among the learned about the origin of Arms. Tavyn will have them to have been from the beginning of the world: Segoin, from the time of Noah; others, from that of Osiris, which is supported by some passages in Diodorus Siculus; others from the times of the Hebrews, in regard Arms were given to Moses, Joshua, the twelve tribes, David, &c.

Others will have them to have taken their rise in the heroical age, and under the empire of the Assyrians, Medes, and Persians; building upon Philostratus, Xenophon, and Quintus Curtius.

Some pretend that the use of Arms, and the rules of blazon, were regulated by Alexander. Others will have them to have had their original under the empire of Augustus; others, during the inundations of the Goths; and others, under the empire of Charlemaign.

Chorier observes, that, among the antient Gauls, each man bore a mark on his buckler, by the sight whereof he might be known to his fellows; and hence he refers the original of the Arms of noble families. Cambden has observed something like this of the ancient Picts and Britons, who, going naked to the wars, painted their bodies with blazons, and figures of divers colours, which he supposes to have been different in different families, as they fought divided by kindreds. Yet, Spelman says, that the Saxons, Danes, and Normans, first brought Arms from the north into England, and thence into France.

Upon the whole, it is certain, that, from time immemorial, there have been symbolical marks in use among men, to distinguish them in armies, and to serve as ornaments of shields and ensigns; but these were used as arbitrarily as devices, emblems, hieroglyphics, &c. and were not regular armories, like ours, which are hereditary marks of the nobility of a house, regulated according to the rules of heraldry, and authorized by princes.

Before Marius, even the eagle was not the constant ensign of the Roman army; but they bore in their standard a wolf, leopard, or eagle, indifferently, according to the fancy of the generals.

The same diversity has been observed with regard to the French and English; on which account, authors are divided, when they speak of the antient Arms of those countries. In effect, it appears from all the best authors, that the armories of houses, as well as the double names of families, were not known before the year 1000. And several have even endeavoured to prove, that the use of Arms did not begin till the time of the first croisades. See HERALDRY in the Dict.

ARO'BE, which some spell and pronounce arrobe, in Spanish Arroba, and, in the language of Peru, arroue, a weight used in Spain, in Portugal, at Goa, and throughout all Spanish America. The Portuguese use it also in Brazil, where, as well as at Goa, it is sometimes called arate. All these Arobes are scarce any otherways alike each other but in name, being very different in weight, and in their proportion to the weights of other countries.

The Arobe of Madrid, and almost over all Spain, except Seville and Cadiz, weighs 25 Spanish pounds, which do not quite make 23 pounds and one-quarter Paris weight: so that the common quintal, which is of 4 Arobes, makes but 93 pounds Paris weight.

The Arobe of Seville and Cadiz is also of 25 pounds, but these make 26 pounds and a half at Paris, Amsterdam, Strasburgh, and Besancon, where the pound is equal; 4 Arobes make the common quintal, that is to say, 100 pounds; but there must be 6 Arobes to make the quintal of Macho, which amounts to 150 pounds Seville and Cadiz weights, which may be reduced to the Paris weights upon the foot of the reduction of the Arobe of those two cities, made above.

The aroue, or Arobe, of Peru, weighs 25 pounds French weight. It is chiefly used to weigh the herb paraguay, of which the Spaniards and the Indians, who use it like tea, make so great a consumption, that there are wanted for Peru alone above 75,000 Arobes yearly.

The arate, or Portuguese Arobe, weighs much more than the Spanish Arobe; it being 32 pounds of Lisbon, which amount to near 29 pounds Paris weight. *Sav. Dict. de Com.*

A'ROPH, a term used by Paracelsus, to denote a medicine endued with a power of breaking or dissolving the stone in the human body.

Aroph Paracelsi is also a name given to a kind of chemical flowers, elegantly prepared by sublimation, from equal quantities of lapis hæmatitis and sal armoniac; said to be of great efficacy in quartan agues, the plica Polonica, and hypochondriac diseases.

A'ROUGHCAIN, an animal found in Virginia, which entirely resembles the beaver, except that it feeds and leaps upon trees like the squirrel.

The English value its furr pretty much, which makes a branch of their trade with the Indians who live near their colony.

A'RPENT, a certain measure of land, which is greater or lesser, according to different countries and provinces. But, as to the surveying, or measuring, of forests and coppices sold in France, the Arpent must be the same throughout the whole kingdom, according to the king's ordonnance of August the 13th, 1669, article 14 of the title, which relates to the policy and preservation of forests, of which here follows an extract: no measure shall be admitted, nor used, in the king's woods and forests, nor in those held in coparcenery, in eyre, in appennage, mortgage, usucaption, or held by ecclesiastical community, or private persons, without exception, but that of 12 lines per inch, 12 inches per foot, 22 feet per perch, and 100 perches per Arpent, upon pain of a fine of 1000 livres, notwithstanding all customs and possessions to the contrary.

It must be observed that the ordonnance, mentioning 100 perches per Arpent, must be understood of 100 square perches.

The Arpent is commonly divided two ways; the one into an half, a quarter, and half a quarter; and the other into a third, half a third, &c. of an Arpent.

A'RQUEBUSE, or HARQUEBUSE, a fire-arm, of the same length with a fusee, or musquet, which is commonly cocked with a spring-lock. This kind of arms was formerly very much used both in war and for hunting; but, at present, it is hardly any otherwise used than for the defence of besieged places; but it has given name to a considerable company of tradesmen at Paris, called arquebusiers, that is, gun-smiths.

A'RSCHIN, a long measure, used in China, to measure stuffs. It is of the same length with the Dutch ell, which is of 2 feet 11 lines, which amounts to four-sevenths of a French ell. So that 7 Arschins of China make 4 ells of France.

The ell of Amsterdam makes three-fourths of a yard of London, so that 4 ells of Amsterdam, or 4 Arschins of China, make 3 yards of London. So that, to reduce the Arschins to the yard of London, you must say, if your Archins make three yards, so many Arschins (thirty for instance) how many yards will they make? Answer, $22\frac{1}{2}$. And, in order to reduce the yards into Arschins, say, if 3 yards make 4 Arschins, so many yards (as 35 for instance) how many Arschins will they make? Answer, $46\frac{2}{3}$.

A'RSMART, in the botanic pharmacy, a medicinal plant, of a hot, pungent, penetrative taste, whence it is also called hydropiper, or water-pepper. Botanists call this plant persicaria, and, sometimes, persicaria non maculosa, by way of distinction from another species of that plant, called persicaria mitis, or maculosa.

Arsmart, by its heat and pungency, becomes almost intolerable to the tongue; and hence it obtains in scorbutic, hypochondriac, and other disorders, arising from a sluggish circulation of the fluids.

Several value its distilled water for its efficacy in the stone in the kidnies or bladder. Some, also, use the plant in external applications, particularly to dissipate bruised blood; others for the tooth-ach, &c.

ARRACHEE', in heraldry, is understood of representations of plants forcibly torn up by the roots, with their roots hanging at them. *Nisb. Herald.*

ARRE'ST, ARRESTS, or ARRETS, among farriers, denote a sort of mangy tumors on the sinews of the hind legs of a horse, between the ham and the pastern; called also rat-tails. *Guill. Gent. Dict.*

The name of it is taken from the resemblance they bear to the arretes or back-bones of fishes.

Arrets bear a near resemblance to scratches.

ART. See MECHANICS.

ART *and part*, in the law of Scotland, is used for being an accomplice of a crime, either by aiding or advising.

The facts, inferring Art and part, need not be particularly laid in the libel or indictment, for these general words, as terms of stated signification, are sufficient. Yet these facts may be set forth, and it is proper so to do, if the prosecutor chuses to confide in the court rather than in the jury. *Mackenz. Crim. Law.*

ARTA'BA, an antient measure of capacity used by the Persians, Medes, and Egyptians.

The Persian Artaba is represented by Herodotus as bigger than the Attic medimnus by three Attic chœnixes; from which it appears, that it was equal to $6\frac{1}{4}$ Roman modii; consequently, that it contained $166\frac{2}{3}$ pounds of wine or water, or $126\frac{2}{3}$ pounds of wheat. *Beverin. de Pond et Mens. P. 2. p.* 125.

The Egyptian Artaba contained five Roman modii, and fell short of the Attic medimnus by one modius; consequently, held $133\frac{1}{3}$ pounds of water or wine, 100 pounds of wheat, or 60 of flour.

ARTEMI'SIA, in the botanical pharmacy, a medicinal herb of great efficacy as an uterine, and promoter of the menses.

Artemisia is the same with what is popularly called mugwort; among botanists it is also under the denomination of Artemisia vulgaris major, Artemisia rubra, and Artemisia officinarum. It is much used in female complaints, both internally and externally: it is held an opener and discutient, a cleanser of the uterus, promoter of the menses, and of delivery. But it is more esteemed among midwives and nurses than among physicians. Its chief use in the shops is in a compound syrup, which takes its name from it. *Quins. Dispens.*

A'RTICHOKE, in gardening.—There are several species of this plant; but only one is at present generally cultivated, which is the red kind.

The manner of propagating this plant is from slips or suckers taken from the old roots, in February or March, which, if planted in a good soil, will produce large fair fruit the autumn following: but as this is a plant which few gardeners, that have not been instructed in the kitchen-gardens near London, understand to manage well, I shall be the more particular in my directions about it.

At the latter end of February, or in March, according to the goodness of the season, or forwardness of the old Artichoke-stocks, will be the proper time of dressing them, which must be thus performed: with your spade remove all the earth from about your stock, down below the part from whence the young shoots are produced, clearing the earth from between the shoots, so as to be able to judge of the goodness of each, with their proper position upon the stock; then make choice of two of the clearest, straightest, and most promising plants that are produced from the under-part of the stock, which you are to let remain for a crop; then with your thumb force off all the other plants and buds, close to the head of the stock, from whence they are produced, and with your spade draw the earth about the two plants which are left, and with your hands close it fast to each of them, separating them as far asunder as they can conveniently be placed without breaking them, observing to crop off the tops of the leaves, which hang down, with your hands: your ground being levelled between the stocks, you may sow thereon a small crop of spinage, which will be taken off before the Artichokes will cover the ground; and be sure to keep them clear from weeds; and towards the latter end of April, or the beginning of May, when your plants begin to shew their fruit, you must carefully look over your stocks, and draw up all young plants from them, which may have been produced since their dressing, and cut off all suckers which are produced from the stems of the Artichokes, leaving only the principal head, by which means your fruit will be larger: when your Artichokes are fit to gather, you must break, or cut them down close to the surface of the ground, that your stocks may make strong fresh shoots before the end of October, which is the season for earthing, or, as the gardeners term it, landing them up: which is thus done:

Cut off all the young shoots quite close to the surface of the ground; then dig between every stock, raising all the earth between each row of stocks into a ridge, as is done in the common method of trenching ground, so as that the row of Artichokes may be exactly in the middle of each ridge; this will be sufficient to guard them against frost: and I would here recommend it to the public, as infinitely preferrable to long dung, which is by the unskilful often used, and is the occasion of their fruit being small, and almost without any bottoms to them. Observe, that, although I have mentioned October as the season for earthing them, yet, if the weather proves mild, it may be deferred till any time in November.

When you have thus earthed them up, you have nothing more to do till February or March, by which time they will have grown through the ridge of the earth; and, when the weather is proper, must be dressed as was before directed. *Miller's Gard. Dict.*

The Artichoke is a pleasant, wholesome, and very nourishing food; the roots are reckoned to be aperitive, cleansing, and diuretic; good for the jaundice, and to provoke urine.

The French and Germans eat not only the heads, but also the young stalks boiled, and seasoned with butter and vinegar.

The Italians seldom boil the heads, but eat them raw, when young, with salt, oil, and pepper.

Artichokes have the reputation of promoting venereal inclinations to a very great degree; the stalks, preserved in honey, are said to be an excellent pectoral; but they should first be blanched, like celery.

The common leaves, boiled in white-wine whey, are much commended in the jaundice, as is also the juice of these leaves. *James's Dict. Med.*

Jerusalem ARTICHOKE, is the root of a species of sun-flower of the perennial kind, which is propagated in many gardens for the use of the kitchen; it is a very agreeably tasted root, but watery and windy, and therefore, at present, generally disregarded.

It is propagated by planting out the smaller roots, or even pieces of the larger, which have buds to them in the spring or autumn; they must be allowed a very considerable distance, for they spread immoderately, and multiply very quick. The autumn following when their stems decay, the roots may be taken up for use. They are but an unsightly plant, though very tall, and are commonly placed in obſcure corners of a garden. *Miller's Gard. Dict.*

ARTIFICERS, thoſe who work with the hands, and ſell things faſhioned by them into other forms.

Artificers amount to the ſame with what we otherwiſe call handicrafts and mechanics; ſuch as ſmiths, carpenters, taylors, ſhoemakers, weavers, and the like. See MECHANICS.

By the Engliſh laws, Artificers in wood, iron, ſteel, braſs, or other metal, going out of the kingdom into any foreign country without licence, are to be impriſoned three months, and fined in a ſum not exceeding one hundred pounds. And ſuch as going abroad and not returning on warning given by our ambaſſadors, &c. ſhall be diſabled from holding lands by deſcent or device, from receiving any legacy, &c. and be deemed aliens. *Stat.* 5. *Geo.* I. c. 27.

ARTILLERY (*Dict.*)— The larger pieces of Artillery depend upon the buſineſs of foundery, the other upon ſmithery. The former is commonly called ordnance, the other ſmall arms, &c.

To carry on manufactures or ordnance with ſucceſs, there are various circumſtances which are requiſite to be well weighed and conſidered, or the undertakers may be ſoon undone.

1. The ſituation of the place for caſting of ordnance of iron ſhould be very near ore and fuel, and water, not only for ſafe carriage, but for the conveniency of working of bellows for their caſting part, and forging hammers for the working up the heads of their cannon, and other ſuperfluous caſt iron, which is ſeparated therefrom.

2. The price of labour, as well as that of fuel, ore, and carriage, ſhould alſo be calculated, in order to be able to judge of the profits of the manufactory, according to the views and expectations of vent for the ſame.

3. Theſe things conſidered, the next is that of hiring, or erecting furnaces, forges, and water-mills, and all other conveniences neceſſary for the purpoſe.

If hiring, or building, be the intention, due regard ſhould be had to the ſtructure of furnaces, not only that they may be properly built for the occaſion, but adapted to the quantity of ore deſigned to be melted at a time; and that the bellows be ſo hung as to give the neceſſary continued blaſt. Theſe things depend on the care and ſkill of able and experienced workmen, or rather upon the maſter-founder himſelf, who has the conduct of the whole.

4. But, let his judgment and experience be ever ſo great, yet if the ſeveral workmen, the operators in the various claſſes, are not equal to their reſpective parts, the undertakers may ſoon be ruined; for there is ſuch a delicacy in the caſting of large pieces of ordnance, that I have known ſeventeen pieces out of thirty not ſtand proof upon trial, though caſt at one of the beſt founderies in the kingdom; which proved a great loſs to the proprietors.

5. There is much in this art that depends upon a careful and ingenious mould-maker; and more on the method of preparing the ore, and ſmelting it with ſuch fluxes as will render the metal conſtantly ſo tough as is neceſſary to ſtand all proof. When this is ſkilfully done, thoſe accidents before mentioned can very rarely happen; as no little defect in the moulds could change the general texture, compactneſs, and toughneſs of the metal; little exuberances in the moulds could never have that effect as to prevent ſuch metal ſtanding proof, if that itſelf was as good as it ought to be.

Theſe accidents to which our iron founderies are liable in caſting of ordnance, ſeem to indicate that this art is not yet brought to its laſt perfection.

Under the articles IRON and FOUNDERY, we ſhall ſhew the method of ſmelting the various ſpecies of ores for ordnance, and other matters, which are made of caſt iron; and endeavour to point out the cauſes of thoſe miſcarriages; which may in ſome meaſure, poſſibly, contribute to prevent their frequency.

And, in regard to the making of braſs ordnance, that will be repreſented under the articles BRASS and FOUNDERY.

ARUM, *wake-robin*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, of a very ſtrange figure, repreſenting, in ſome degree, a hare's ear; from the bottom of the flower ariſes a piſtil, which, at its baſe, is ſurrounded by a great number of embryo's, each of which finally ripens into a roundiſh or oval berry, containing one or two ſeeds. To theſe marks it may be added, that the leaves are not divided.

The ſpecies of Arum, enumerated by Mr. Tournefort, are thirty-four.

The root of Arum is extremely pungent and volatile, which quality makes it recommended in all viſcidities, phlegmatic and ſcorbutic caſes; becauſe it penetrates and rarifies tough concretions and infarctions of the glands and capillary veſſels. It has alſo been preſcribed in humerous aſthma's and obſtructions of the bronchia. Van Helmont commends it greatly with vinegar, in bruiſes and falls, as ſerving to prevent the blood from ſtagnating, and falling into grumes, upon the injured parts. Some have affirmed, a drachm of this root, freſh powdered, and taken in any proper vehicle, to be an infallible remedy againſt poiſon, and the plague. Matthiolus commends, with great reaſon, a cataplaſm of it, freſh bruiſed, and cow-dung, to be applied hot, in arthritic pains. As this root, kept dry, ſoon loſes its efficacy, the compound powder of the ſhops, which takes its name from it, muſt be of little or no ſignification. *Quinſ. Pharm.*

ASH, *fraxinus*, in botany, a genus of trees, whoſe characters are: it hath pinnated leaves, which moſtly end in an odd lobe: the male flowers (which grow at a remote diſtance from the fruit) have no petals, but conſiſt in many ſtamina: the ovary becomes a ſeed-veſſel, containing one ſeed at the bottom, which is ſhaped like a bird's tongue.

There are ſix ſpecies of this tree; all which may be propagated by budding them into common Aſh; upon which they will all take very well, and become hardier than upon their own ſtock: but theſe budded trees never grow ſo large as thoſe which are raiſed from ſeeds; nor will the ſtock and bud keep pace in their growth; ſo that there will be a remarkable difference in the ſize of the ſtem, and above the place where they are budded: but few of theſe foreign kinds have yet arrived at an age to produce ſeeds in England, the nurſery-gardeners having been obliged to propagate theſe ſorts by budding and grafting.

The common Aſh is propagated by ſowing the keys in October or November, on a bed of freſh earth, which ſhould be well dug, and cleanſed from roots and noxious weeds. A ſmall bed will be ſufficient to raiſe a great quantity of theſe trees. The ſeeds ſhould be ſown pretty thick, and covered about half an inch thick with earth.

Theſe ſeeds, many times, continue until the ſecond ſpring before they come up; you ſhould, therefore, let the bed remain undiſturbed, and keep it clean from weeds. When your plants come up, you muſt alſo keep them very clear from weeds, and, if the ſeaſon ſhould prove very dry, if you give them, now-and-then, a little water, it will greatly promote their growth: in this bed they ſhould remain no longer than the autumn following, provided they have grown well; at which time you ſhould prepare a nurſery, which ſhould be well dug and cleared, as before; then with your ſpade looſen the roots of the plants before you draw them up; otherwiſe you will endanger the breaking of them. When you have drawn them out of the ground, ſhorten the downright taproot; but do not cut off any of the lateral fibres; then, having prepared your ground, plant them in rows, three feet diſtance row from row, and a foot aſunder in the rows, cloſing the earth to their roots with your feet.

In this nurſery they may remain two or three years, obſerving to keep them clear from weeds, as alſo to trim up the ſide-branches every winter, and dig the ground between the rows; after which time you may remove them where they are to remain for good. This tree will grow upon almoſt any ſoil; but, the better the ſoil is, the more the tree will increaſe in bulk. Notwithſtanding which, it ſhould not, by any means, be planted too near the other trees or plants; for it will exhauſt all the goodneſs of the ſoil from them; and the ſhade of this tree is malignant to moſt other plants. The diſtance they ſhould be planted is eight feet ſquare; and, after they have been planted one year, you may cut down every other tree, chuſing ſuch of them as are crooked, within ſix or eight inches of the ground; this will cauſe them to make many ſtrong, vigorous ſhoots; which, in ſeven or eight years time, will be fit for arbour-poles, or to make hoops; and the other ſtraight trees may be ſuffered to grow, for other timber; the number of which trees may be leſſened, as they increaſe in bulk, leaving ſtill the moſt promiſing ones to grow for larger timber.

If a wood of theſe trees is rightly managed, it will turn greatly to the advantage of its owner; for, by the underwood, which will be fit to cut every ſeven or eight years, for the uſes abovementioned, there will be a continual income, more than ſufficient to pay the rent of the ground, and all other charges; and ſtill there will be a ſtock preſerved for timber; which, in a few years, will be worth forty or fifty ſhillings per tree.

This timber is of excellent uſe to the wheelwrights and cartwrights, for plows, axle-trees, wheel-rings, harrows, bulls, oars, blocks for pullies, and many other purpoſes.

The beſt ſeaſon for felling of theſe trees is from November to February; for if it be done either too early in autumn, or too late in the ſpring, the timber will be ſubject to be infeſted with worms, and other inſects: but, for lopping of pollards, the ſpring is preferable for all ſoft woods.

ASP, in natural hiſtory, a ſmall poiſonous kind of ſerpent, whoſe bite gives a ſpeedy, but eaſy death. It is ſaid to be thus denominated from the Greek ἀσπὶς ſhield, in regard to its manner of lying involved in a circle; in the center of which is the head, which it exerts, or raiſes, like the umbo, or umbilicus, of a buckler.

This ſpecies of ſerpent is very frequently mentioned by authors; but ſo careleſly deſcribed, that it is not eaſy to determine which, if any of the ſpecies known at preſent, may properly be called by this name. It is ſaid to be common in Africa, and about the banks of the Nile: and Bellonius mentions

tions a ſmall ſpecies of ſerpent he had met with in Italy, and which had a ſort of callous excreſcence on the forehead; which he takes to have been the Aſpis of the antients. *Ray's Syn. Anim.*

ASPA'RAGUS, in botany, the name of a genus of plants; the characters of which are theſe: the flower is of the roſaceous kind, being uſually compoſed of ſix leaves, arranged in a circular form; from the center of the flower ariſes a piſtil, which finally becomes a ſoft fruit, or a roundiſh berry, containing a number of hard ſeeds. To this it may be added, that the leaves are always fine and ſlender.

The garden Aſparagus is propagated by ſowing of the ſeeds; in the procuring of which, you ſhould be particularly careful, ſince the goodneſs of your future crop, in a great meaſure, depends thereon: you ſhould, therefore, get it from ſome perſon of integrity; or, if you have any opportunity, ſave it yourſelf; or in ſome other neighbouring garden. You muſt look over the Aſparagus-beds in the beginning of the ſeaſon, and mark ſome of the largeſt and faireſt buds with a piece of ſtick; which buds, when they have branched out, may be faſtened to ſtakes thruſt into the ground, to preſerve them from breaking. Theſe buds will, many of them, produce great numbers of red berries; which ſhould be ſuffered to remain upon the branches until the latter end of September, when the haulm will begin to decay; then cut off the branches, and ſtrip the berries into a tub, where they may lie in an heap to ſweat for three weeks; by which means the outer huſks will be rotten: then fill the tub with water, and with your hands break all the huſks, by ſqueezing them between your hands. Theſe huſks will all ſwim upon the water, but the ſeed will ſink to the bottom; ſo that, by pouring off the water gently, the huſks will be carried along with it; and by puting freſh water two or three times, and ſtirring your ſeed about, you will make it entirely clean; then ſpread your ſeed upon a matt, and expoſe it to the ſun and air in dry weather, until it is perfectly dry; when you may put it into a bag, and hang it up in a dry place till the beginning of February; at which time, you muſt prepare a bed of good, rich earth, whereon you muſt ſow your ſeed (but not too thick, which will cauſe your plants to be ſmall) and, having trod your ſeed into the ground, rake it over ſmooth.

In the following ſummer keep it diligently cleared from weeds, which will greatly add to the ſtrength of your plants; and, toward the latter end of October, when the haulm is quite withered, you may ſpread a little rotten dung over the ſurface of the ground, about an inch thick; which will preſerve the young buds from being hurt by the froſts, &c.

The ſpring following your plants will be fit to plant out for good (for I would never chuſe plants of more than one year's growth, having very often experienced them to take much better than older, and to produce finer roots) you muſt therefore prepare your ground by trenching it well, burying therein a good quantity of rotten dung at the bottom of each trench, that it may lie at leaſt ſix inches below the ſurface of the ground: then level your whole plot very exactly, taking out all large ſtones; but this ſhould be done not long before you intend to plant your Aſparagus; in which you muſt be governed according to the nature of your ſoil, or the ſeaſon; for if your ſoil is dry, and the ſeaſon forward, you may plant early in March; but, in a very wet ſoil, it is better to wait till the end of that month, or the beginning of April; which is about the ſeaſon that the plants are beginning to ſhoot. I know many people have adviſed the planting of Aſparagus at Michaelmas; but this I have experienced to be very wrong, for in two different years I was obliged to tranſplant large quantities at that ſeaſon; but I had better thrown away the plants; for, upon examination, in the ſpring, I found moſt of the roots were grown mouldy, and decaying; and, I am ſure, not one in five of them ſucceeded; and thoſe which did, were ſo weak, as not to be worth their ſtanding.

The ſeaſon being now come, you muſt, with a narrow-pronged dung-fork, carefully fork up your roots, ſhaking them out of the earth, and ſeparating them from each other; obſerving to lay their heads even, for the more convenient planting them; which muſt be performed in this manner: your plot of ground being levelled, you muſt begin at one ſide thereof, ranging a line very tight croſs the piece; by which you muſt throw out a trench exactly ſtraight, and about ſix inches deep; into which you muſt lay your roots, ſpreading them with your fingers, and placing them upright againſt the back of the trench, that the buds may ſtand forward, and be about two inches below the ſurface of the ground, and at twelve inches diſtance from each other; then, with a rake, draw the earth into the trench again, laying it very level, which will preſerve the roots in their right poſition: then remove your line a foot farther back, and make another trench in like manner, laying therein your plants, as before directed, and continuing the ſame diſtance row from row; only obſerving, between every four rows, to leave the diſtance of two feet four inches, for an alley to go between the beds, to cut the Aſparagus, &c.

Your plot of ground being finiſhed and levelled, you may ſow thereon a ſmall crop of onions, which will not hurt your Aſparagus; and tread in your ſeeds, raking your ground level.

There are ſome perſons who plant the ſeed of Aſparagus in the place where the roots are to remain; which is a very good method, if it be performed with care. The way is this: after the ground has been well trenched and dunged, they lay it level, and draw a line acroſs the ground (in the ſame manner as is practiſed for planting of the young plants) then, with a dibble, make holes at a foot diſtance; into each of which you muſt drop two ſeeds, for fear one ſhould miſcarry: theſe holes ſhould not be more than half an inch deep; then cover the ſeeds, by ſtriking the earth in upon it; and go on, removing the line a foot back for another row; and, after four rows are finiſhed, leave a ſpace for an alley between the beds, if it is deſigned to ſtand for the natural ſeaſon of cutting; but, if it is to be taken up for hot-beds, there may be ſix rows planted in each bed; and the diſtance in the rows need not be more than nine inches. This ſhould be performed by the middle of February, becauſe the ſeeds lie long in the ground: but, if onions are intended to be ſown upon the ground, that may be performed a fortnight or three weeks after, provided the ground is not ſtirred ſo deep as to diſturb the Aſparagus-ſeeds, in raking the onion-ſeed into the ground.

As the roots of Aſparagus always ſend forth many long fibres, which run deep into the ground; ſo, when the ſeeds are ſown where they are to remain, theſe roots will not be broken or injured, as thoſe muſt which are tranſplanted; therefore they will ſhoot deeper into the ground, and make much greater progreſs; and the fibres will puſh out on every ſide; which will cauſe the crown of the root to be in the center; whereas, in tranſplanting, the roots are made flat againſt the ſide of the trench.

When your Aſparagus is come up (which will be in three weeks or a month after planting) you muſt, with a ſmall hoe, cut up the weeds, and thin your crop of onions, where they may have come up in bunches; but this muſt be done carefully, and in dry weather, that the weeds may die as faſt as they are cut up. This work muſt be repeated about three times; which, if well done, and the ſeaſon not too wet, will keep the ground clear from weeds, until the onions are fit to be pulled up; which is commonly Auguſt; and is known, when their greens fall down. When you have drawn off your onions, you muſt clean your ground well from weeds; which will keep it clean till you earth your beds, which muſt be done in October, when the haulm begins to decay; for if you cut off the haulm, while green, the roots will ſhoot freſh again, which will greatly weaken them. This young haulm ſhould be cut off with a knife, leaving the ſtems two or three inches above-ground; which will be a guide to you to diſtinguiſh the beds from the alleys; then, with an hoe, clear off the weeds into the alleys, and dig up the alleys, burying the weeds in the bottom; and throw the earth upon the beds, ſo that the beds may be about five inches above the level of the alleys: then you may plant a row of colworts in the middle of the alleys; but do not ſow or plant any thing upon the beds, which would greatly weaken the roots: nor would I ever adviſe the planting of beans in the alleys (as is the practice of many) for it greatly damages the two outſide rows of the Aſparagus. In this manner it muſt remain till ſpring, when you muſt hoe over the beds, to deſtroy all young weeds; then rake them ſmooth, and obſerve, all the ſucceeding ſummer, to keep them clear from weeds; and in October dig up the alleys again, as was before directed, earthing the beds, &c. The ſecond ſpring after planting, you may begin to cut ſome of your Aſparagus, though it will be much better to ſtay until the third; therefore now you muſt fork up your beds with a flat-pronged fork, made on purpoſe, which is commonly called an Aſparagus-fork: this muſt be done before the buds ſhoot in the ſpring, and with care, leſt you fork too deep, and bruiſe the head of the root; then rake the beds over ſmooth, juſt before the buds appear above-ground; which will deſtroy all young weeds, and keep your beds clean much longer, than if left unraked, or done ſo ſoon as forked: and, when your buds appear about four or five inches above-ground, you may then cut them; but it ſhould be done ſparingly, only taking the large buds, and ſuffering the ſmall to run up to ſtrengthen the roots; for, the more you cut, the more the roots will produce, but they will be ſmaller, and ſooner decay. When you cut a bud, you muſt open the ground with your knife (which ſhould be very narrow and long in the blade, and filled with teeth like a ſaw) to ſee whether any more young buds are coming up cloſe by it, which might be either broken or bruiſed in cutting the other; then, with your knife, ſaw it off about three inches under-ground. This may appear a troubleſome affair, to people unacquainted with the practical part; but thoſe who are employed in cutting Aſparagus, will perform a great deal of this work in a ſhort time; but care in doing it is abſolutely neceſſary to be obſerved by all who cut Aſparagus.

The manner of dreſſing your Aſparagus-beds is every year the ſame as directed for the ſecond; viz. keeping them from weeds, digging the alleys in October, and forking the beds towards the latter end of March, &c. only obſerve, every other year, to lay a little rotten dung (from a melon or cucumber-cumber-bed) all over your beds, burying some in the alleys also, at the time for digging them up. This will preserve your ground in heart, to maintain your roots in vigour; and, by this management, a plot of good Asparagus may be continued for ten or twelve years in cutting, and will produce good buds. *Miller's Gard. Dict.*

Asparagus is a medicinal plant, which furnishes one of those called the five opening-roots.

It is a known diuretic; its top, or head, taken in the way of food, readily discovers itself in the smell of the urine: but its root is still more strongly endued with that quality, as containing more of the salt from which it is derived. Hence it becomes, among us, an ingredient in all compositions, intended to cleanse the viscera, and guard against jaundices, dropsies, &c. It is also of some use as a pectoral; and makes a chief ingredient in the syrup of marshmallows, against the stone: though foreign physicians speak more sparingly of the use and virtues of this medicine.

ASPHODE'LUS, *asphodel*, in botany, the name of a genus of plants; the characters of which are these: the flowers are of the liliaceous kind, but consist of only one petal, divided into six segments. The pistil arises from the center of the flower, and finally becomes a fruit of a somewhat roundish, yet three-cornered form, and of a fleshy texture. This, when ripe, opens at the point, and shews that it is composed of three cells, each of which contains a number of triangular seeds.

The species of asphodel, enumerated by M. Tournefort, are ten.

All the sorts of asphodel are very pretty ornaments for a flower-garden, and, requiring very little trouble to cultivate them, are rendered more acceptable. They may be all propagated by seeds, which should be sown, soon after they are ripe, on a warm border of fresh light earth: in the spring the plants will appear, when you should carefully clear them from weeds; and, in dry weather, they must be frequently watered: if this be duly observed, the plants will have acquired strength enough to be transplanted by the Michaelmas following; at which time you must prepare a bed of fresh earth in the flower-nursery, into which you should plant the roots, at about six inches distance every way; observing to plant them so low, as that the top of the roots may be three or four inches under the surface of the bed: in this bed they may remain one year; during which time, they should be frequently refreshed with water in dry weather, and must be kept very clear from weeds. In this time, the roots, having acquired strength enough to produce flowers the following year, they should at Michaelmas, when their leaves are decayed, be carefully taken up, and transplanted into the flower-garden; observing to place them in the middle of the borders, among other hardy kinds of flowers, where, being properly intermixed, they will make an agreeable variety, and continue a long time in flower.

These plants may also be propagated by parting their roots; but this must not be too often repeated, lest it weaken the roots, and prevent their flowering so strong as they otherwise would do. Once in three years will be often enough to transplant the roots; at which times you may separate those which are grown large, so as to make two or three roots of each: but do not part them too small; for that will so weaken them, as to prevent their flowering the following summer. The best time to transplant these roots is at Michaelmas, just when their leaves begin to decay. *Miller's Gard. Dict.*

The roots of asphodel are of an acrimonious taste, and heating quality; being drank, they promote urine, and the menses; and the weight of a drachm, taken in wine, is used with success in pains in the side, coughs, convulsions, and ruptures. It is good against bites of serpents, and makes a good cataplasm for foul spreading ulcers, inflammations, &c. The ashes of the burnt root, rubbed on an alopecia, cause new hair to spring. *Lemery, des Drog.*

A'SSA, or ASA, among naturalists. The writers of the latter ages have formed the word asa from the lasar of the antients, and attributed it to a gum very different from that antiently known by the name they have thus corrupted.

The asa of the antients was an odoriferous and fragrant gum; and the asa of after ages had so little right to this epithet, that they distinguished it by one, expressing its being of an offensive or stinking smell.

The Arabian writers, according to this distinction, describe two sorts of asa, one stinking, the other aromatic; and the modern Greeks preserved the name asa, or lasar, to the stinking gum, the Latins called by this name; but added a distinctive epithet, to express its ill smell; and called it scordolasarum. Thus Myrepsus always calls the same gum scordolasarum, that the Latin writers call assafœtida.

ASSAFOE'TIDA (*Dict.*)—The plant which produces it is one of the pentandria digynia of Linnæus, and one of the herbæ umbelliferæ semine foliaceo, seu ala foliacea cincto of Ray. We had a multitude of various and false accounts of it for a long time; Garcias telling us it had leaves like the hazel; and Bontius making two plants of it, one like a willow, and the other with a root like a turnep; others have given it leaves like the fig-tree, others like those of rice; and, finally, others have made it a shrub of the phyllerea kind. Kæmpfer is the author to whom we owe the true account of it. This is given in his Amœnitates exoticæ, where he describes it fully and accurately, under the name of umbellifera levistico affinis foliis instar pœoniæ ramosis, caule pleno maximo, semine foliaceo nudo solitario brancæ ursinæ sive pastinachæ simili radice Assamsœtidam fundente. The Persians call both the plant and the juice hingesch; and the Indians, hiing; but the more accurate in both countries call the plant hingesch, and the juice or gum hiing.

The root of this plant is perennial, and very large. It is covered with a thick black rind, which easily comes off from the rest, when fresh. Within it is perfectly white, and full of a white, milky, and stinking juice, which, when collected and dried, is what the Persians call hiing, and the Europians, Assafœtida. The top of this root is furnished with a large tuft of hairy or filamentous matter, like that on the crown of the meum or spignel. The leaves are very large, and like those of the piony.

The stalk is as thick as a man's arm, and grows to eight or nine feet high. It gradually becomes taper toward the top, whence it is divided into a small number of branches. The leaves stand alternately on these stalks, and that at no great distances from one another. The flowers are small, and disposed in umbels. The seeds are flattish and striated, and of an oval figure; they have somewhat of the Assafœtida smell, but much less than might be expected. It grows in Persia, but there only in two places, at least in those only in any great plenty. These are the mountains about Heraat, and the province of Laar. In these places it abounds with juice, and yields the gum in great plenty; when found elsewhere, it yields very little. The leaves in these places are of a horrible, offensive smell, and no animal will touch them: but the people of the town of Disguum affirm, that, in the country beyond them, the plant loses much of its bad savour, and that the goats feed very greedily on the leaves, and grow fat upon the diet. Some have pretended to distinguish two species of this plant, the one yielding a smaller quantity of juice, and that of a less fetid smell; the other yielding more of it, and that more stinking: but Kæmpfer, who was upon the spot, declares the plants to be the same, and all the difference to be in the soil that produces them. If what the Persians of Disguum say be true, however, it very well accounts for the difference of the Cyrenaic and Persian kinds of silphium; for the plant, in the first of these places, might be as mild as beyond Disguum, or even more so.

It is very singular in this plant, that it seldom flowers, sometimes not till its twentieth, thirtieth, or even fortieth year; during all this time the root is increasing in size, and, consequently, it sometimes grows to an enormous bulk: roots of it have been seen of the thickness of a man's thigh, and of a yard and a half in length; those of the thickness of one's arm are frequent. When it sends forth a stalk, and has ripened its seed, it perishes. The ancients made a distinction in their silphium, as it was produced from the stalk, or from the root of the plant; but, at this time, all that we have is obtained from the root. They never make incisions in roots of less than four or five years standing; and they always find, that, the older and larger the root, the more plentifully the juice flows.

The gum or juice, as it flows from the root, is white, and perfectly resembles cream, and has no viscidity: on the contact of the air it dries or hardens, and becomes viscous and coloured. The most strongly scented Assafœtida is always esteemed the best; and Kæmpfer observes, that it is so much stronger, when fresh, than when kept and imported into Europe, that a drachm of it has more scent, than an hundred weight of what our druggists keep.

The leaves of the plant appear in autumn, and appear green the whole winter; in spring they wither. About the end of April, when their leaves are in their decaying state, the Persians ascend the mountains in search of the plants. They clear away the earth about the root for six or seven inches deep; they then twist off the leaves, and the fibrous substance at the top of the root. They next cover up the root again to its top, which is now perfectly bare; and this they cover with a bundle of weeds, to keep off the heat of the sun, which would otherwise destroy it. They lay a stone over all this, to keep it firm, that the wind may not blow it off; and in this condition they leave the roots for a month or six weeks. At the end of this time they take off the covering, bear away the earth a little from the crown of the root, and, with a sharp knife, cut it transversly off, taking off about an inch, or a little more, of the top. They then cover this wounded root with the weeds again, making them stand hollow from the wounded part, and thus leave them for two days; at the end of which time they return, and find the top of the root, where they had cut it off, covered with exsudated juice, or Assafœtida: this they collect, and put up in proper vessels; and, clearing away the earth a little lower, they cut off another slice off the top of the root, but this not thicker than a crown-piece, and cover it up again, for another gathering. As they take a large compass of ground for their search, they are kept in constant employment; the roots of their first

day's

day's cutting being ready for their taking the gum from, by that time they have cut the more distant ones, which they are regularly to return to afterwards. After they have gone through this second operation with all the roots, and collected the second quantity of gum from them, they cover them up for eight or ten days; and, after having spread their gum in the sun to harden it, they carry it home. Four or five men generally go out in a company, on these expeditions; and it is a common thing for them to bring home fifty pounds weight of it from this first gathering; this, however, is esteemed but an inferior kind of Assafœtida; after the roots have remained covered these eight or ten days, they visit them again, take off the covering of weeds, and collect the gum. They then cut off another slice of the root, and after that another, and then a third; this is done at the distance of two days between each operation, and the earth is every time cleared away to a proper depth, and the whole process managed as before.

After the third collection in this second expedition, they cover up the roots again, and return home with their stores, leaving them covered for three days. After this they return to their work, and cut them again three several times at the same distances of time; and, after the third collection of this last expedition, they leave them to perish; for they never recover this terrible operation. *Kamp. Amœn. Exot.*

Assafœtida, distilled in a retort, yields a large quantity of whitish or milky looking phlegm, smelling strongly, like garlic; there come over near three ounces of this from the pound; after this there rises near an ounce of a reddish phlegm, partly of an acid, partly of an urinous kind; this is followed by somewhat more than an ounce of a thin limpid yellowish oil, of an extremely fœtid smell, and, finally, there come over near six ounces of a reddish, stinking, and empyreumatic oil of the consistence of butter. The remainder in the retort, calcined in an open fire and lixiviated, yields about six grains of a fixed salt, but this not of the alkaline, but sal salsus kind.

In Persia and the Indies there is no drug at this time so much in use both in medicine and in sauces. They rub the vessels they are to dress their food in with it, and they give it in large doses against the rheumatism, the gout, and pains of all kinds. With us, Assafœtida is scarce at all used about our foods, and its unpleasant smell has in a great measure banished it from extemporaneous practice in physic, though it is undoubtedly a very great medicine.

The Assa fœtida plant is recommended by Mr. Lawrence to be cultivated in our fields, for the food of cattle, instead of clover, saintfoin, or such herbs as we sow among corn, and make into hay, in the succeeding summers, and use as food for cattle at other seasons.

This gentleman is of opinion, that the sheep, fed on this plant, would afford mutton of a much finer flavour than any that we are at present acquainted with. But it seems strange, that this should be the effect of these creatures feeding on a plant of so strong a scent, that, as the same author observes, one drachm of the fresh root smells more than a hundred weight of the drug, as kept by the druggists, and that the whole air is strongly and disagreeably scented with it, wherever it grows. Upon the whole, it seems probable, that though this plant, or the cytisus, or several others, might be cultivated in England for the food of cattle, yet not any one would be so easily raised, or make so great an advantage to the farmer, as the saintfoin. *Tull's Husbandry.*

A'SSES *Milk*, the milk of an animal too well known to need description.

When we examine more minutely into the medicinal virtue and disposition of Asses milk, it will appear to be fraught with an abundance of peculiar excellencies, which render it so exceedingly wholesome. In the first place, it is thinner than all other milks, and abounds with watery and serous ingredients.

Since it is known that many diseases are caused by a grossness and tenacity of the juices, which, as they pass slowly through the finer vessels, of which the principal emunctories and strainers of the glands consist, are apt to stop in those narrow passages, to fill them up, and occasion obstructions, it is very obvious and natural to conclude, that the use of Asses milk, which abounds with serous and fluid particles, must be extremely proper to open the obstructed vessels, to attenuate the gross and viscid juices, and set them in an easy and free motion. Again, when we know that multitudes of distempers proceed from an acrid, salt, and corrosive state of the fluids, we cannot but be assured that the thin serum of Asses milk will not fail of diluting, softening, and subduing them: although it must be allowed, at the same time, that the sweet oily substance contributes much towards this effect, which embraces and involves the pointed particles of salt, and by this means the crude ill-digested juices, being properly corrected, are, by the plentiful assistance of serum, conveyed in their due course through the vessels appointed for secretion.

It is another extraordinary excellence of Asses milk, that it contains but a small proportion of the grosser curdling substance. Out of eight ounces of Asses milk, which I set over hot coals in a broad vessel, after all the serum was evaporated, I could scarce gather so much as six drachms of a whitish sweet matter. I then took twelve ounces of the same milk, and set it by to curdle in a close vessel, filled about half way. In three days time a very white and thin curd settled at the bottom, which, when separated from the whey by straining through filtrating paper, and afterwards dried, scarce amounted to two drachms; all the rest of its solid parts, having in general passed with the whey through the strainer, adhered to the sides of the vessels, or lost themselves in the operation. On the contrary, the same weight of cows milk, treated in the same manner, thickened into a grosser and heavier curd, which, when cleared from the whey, spread out in a broad plate, and, dried in the sun, weighed ten drachms. From these experiments it is evident, that the quantity of the gross curdling substance is very small in Asses milk, when compared with other sorts. For this reason it easily diffuses itself into the minutest extremities of the blood-vessels, thoroughly dilutes the vital juices, liquifies the sluggish humours, and, when it has thus dissolved them, conveys them off. A third circumstance that more strongly evinces the salubrious quality of Asses milk, is, that the share of cheese-like substance which it contains is extremely soft and tender, and never makes a gross or firm curd. To make this evident, I warmed some Asses milk, and sprinkled it with vinegar, expecting to see it contract a thick consistence; but nothing appeared of that sort, except a few light thin flakes, floating here and there on the serum: when, on the contrary, cows milk, the instant it was mixed with an acid, condensed into lumps of a considerable hardness, and fell to the bottom. Now, in all cures which are sought by milk, nothing can be so hurtful and dangerous as to have it curdle in the stomach, to prevent which accident ought to be the physician's principal care and concern. For the mischiefs occasioned by a coagulation of milk in the stomach are very pernicious, and have been observed and cautioned against by the best authors. It is past dispute therefore, that the milk is the most wholesome and properest for medicinal uses, which has least tendency to curdle, which is the case with Asses milk in the most remarkable degree.

A fourth, and the most valuable excellence in Asses milk, is its exquisite sweetness, in which it exceeds all other species of milk, except the human: for you may extract from it by much the greatest quantity of delicate tasted sugar, or rather a thick substance resembling manna. To try the experiment, I boiled twelve ounces of Asses milk, in the month of July, over a gentle fire, and immediately it produced a thick concretion very sweet, weighing one ounce. Upon this, I poured it into a glass with a pint of rain water, which, when frequently shaken, almost dissolved the mass, leaving only a small sediment. The liquor was then poured through filtrating paper, and set to evaporate, and yielded half an ounce of an honey-like substance, extremely sweet, and white. As Asses milk therefore contains so plentiful a proportion of sweet salts, we cannot doubt, but it has for that reason a very singular medicinal quality which cannot be expected in other kinds of milk. For this honey-like salt greatly softens, checks, and moderates the acrimony of humours, whether acid or bilious, and, by gently irritating the fibres of the bowels, urges them to their office and operations. Hippocrates very justly observes, that Asses milk disposes to purging more than any other; and in another place advises, as a remedy for the flour albus, first to occasion a gentle purging by drinking Asses milk, and then to change it for cows milk.

From these enlarged observations which we have made on the excellencies of Asses milk, it must be evident to all that judge sensibly, that it has an admirable efficacy towards curing many distempers. The first and most remarkable instance we shall give, is by proving that no surer or more successful remedy can be invented or recommended against consumptions.

Yet, although milk of all kinds be a wholesome medicine in consumptive and decaying constitutions, yet Asses milk excels the others in a greater degree, because it fully answers every requisite that can conduce to the cure of consumptions.

Yet we must take notice, that though this be such a sovereign remedy for consumptions, and when given in a judicious manner, scarce ever fails of success, yet it will not cure every sort of consumption; but must be applied in the beginning of the distemper, and is most likely to take effect, before the ulcers be grown callous, or the corroded cavity be too deep and large, or the fever become continued and without intermission.

I likewise judge Asses milk to be very efficacious against an empyema, which is often caused by a pleurisy improperly treated, especially in bodies of a spongy habit, and shews itself by a constant and copious spitting of matter.

As Asses milk proves so very useful in relieving the pains that seize the outward parts of the body, so it is likewise no less serviceable against those that affect the inward nervous parts, the stomach and intestines, as is the case in convulsive cholics,

 When

When cramps and convulfions feize the nervous parts, which is the common fymptom in hypochondraic and hyfteric fits, I have always obferved milk, efpecially that of Affes, do great good; provided there be no coftivenefs, nor obftruction in the bowels, and the firft paffages be not clogged with fharp and vifcid phlegm.

Since, therefore, it is fo evident that Affes milk is beneficial to the nerves, and heals their feveral forementioned diforders by means of its foftening and lubricating quality, we cannot doubt but it may properly be adminiftered in other complaints, where the nervous parts are likewife afflicted and difordered with violent motions, as in epilepfies and convulfive fits.

When fcorbutic people and old men, who are naturally fubject to a falt and foul corruption of the humours, and likewife fuch as are infected with a venereal taint, are afflicted with dangerous ulcers, that feem to refemble cancers; even in thefe terrible fymptoms a very fpeedy and fure relief may be had from Affes milk, and the whey of it.

And, while we are enumerating the many noble virtues of Affes milk, we muft not omit its peculiar excellence, not only as a remedy to the diftempers of old men, but as a fort of food of great efficacy in reftoring their decayed ftrength.

Having now explained the properties of Affes milk, and its excellence in feveral diforders, I fhall proceed to the proper method of giving it, and then fhew what is neceffary to be obferved, in order to expect fuccefs from it. But it will firft be proper to fay fomewhat of the animal itfelf. A milch Afs ought to be quite free from any diforder, not very old, but of a middling age, neither too fat nor too lean, and may be efteemed the better, if fhe bring her foal in the month of May. She ought not to be fed in a houfe, but kept in meadows which produce plenty of medicinal herbs; fhe fhould drink river water, which, as it is lighter and more diluting than fpring water, paffes off quicker by the proper difcharges, and, mixing more thoroughly with the humours, cleanfes them more effectually. Helmont has an ingenious remark on this fubject: he advifes that the Afs fhould be combed or curried every morning as horfes are, for that it may eafily be known from the milk, whether fhe has been dreffed that morning or not. Without doubt there may be fome reafon for this, becaufe the ufe of the curry-comb increafes perfpiration, and cleanfes the humours, by paffing off a great many faline particles that way.

It ought to be confidered too, what the Afs is fed with, becaufe the nature and properties of the milk of animals are altered by their diet, fo as to be more or lefs wholefome, or even adapted to fome particular diforders. For as it is a common practice to make a purging or alterative medicine, given to the nurfe, communicate its properties to her milk, and take effect on the child, fo, no doubt the fame will hold good with regard to the animals whofe milk we ufe. Galen proves this by the inftance of goats, who are fed with fcammony or fpurge, whofe milk is purging. Diofcorides and Hippocrates are of the fame opinion, and in the Acta Haffniensia it is afferted, that wormwood eaten in large quantities makes the milk bitter. From hence it is that Cœlius Aurelianus commends milk in the cœliac paffion or flux, which is taken from goats that feed on willows, vine leaves, oaks, or fallows, plantain, and plants of the fame nature; giving this reafon for it, "becaufe the aftringent quality of the herbs communicates itfelf to the milk." But there is a remarkable difference between the milk which is produced in fpring from green pafture, and that in winter from dry food. Varro, who was very well acquainted with what belongs to country affairs, was of this opinion, and fays, "that milk from barley and ftubble, and all kinds of hard and dry food, is nourifhing; but that is more cleanfing which comes from green pafture." And Diofcorides thinks that the milk in fpring is thinner, and, becaufe it comes from green pafture, more laxative and foftening.

From whence it plainly appears, that milk of all forts, but more efpecially Affes, is not only moft ferviceable in the fpring, but that its virtues may, by a regulation of food, be fo prepared, as to be particularly effective againft any one diftemper. Wherefore, I would advife that a milch Afs be fed with fuch herbs as in themfelves are known proper for the difeafe you would relieve. In a confumption, and difeafes of the lungs and breaft, let her be fupplied with veronica, ground ivy, the blind or dead-nettle, colts-foot, and fcurvy-grafs; or, if you want to reftore the vigour of the folids, with fanicula, tanfey, nummularia, confolida major, flowers of St. John's wort, alchimilla, polygonum, and the like; or let the creature be drove to places where thefe plants abound. In pains and fpafms, both inward and external, it may be ufeful to mix in her food yarrow, chamomile flowers, acacia, mead-wort, tilia, melilot, fpurge, mallows, marfh-mallows, and others of this nature. In flow and hectic fevers (befides thofe we named as good for the lungs) we may add plantane, prunella, and fcurvy-grafs mixed with germander. If the hypochondria are obftructed, and caufe a fcorbutic foulnefs in the juices, chufe out fome herbs of the opening or laxative kind; fuch are fumitory, the leffer centaury, abfinthium, fcurvy-grafs, trefoil, water-crefs, nafturtium, and the leffer houfe-leek. In the fame manner may milk be rendered medicinal, and fit for almoft any complaints, by adminiftering fuch herbs and flowers as the phyfician fhall efteem moft proper and effectual.

As to the method of ufing it, thefe following rules may be obferved.

1. In cafes of neceffity, Affes milk may be drank at all times; but it is by far the moft ferviceable in the fpring and fummer, when all the herbs are full of juices, and greatly enrich the milk. 2. The milk fhould be milked into a pail fet over hot water, and immediately put into a veffel that has a narrow mouth, and fhuts clofe, and fo drank directly when it is warm; for milk, like all other liquors, has a fubtile fpirit, of a ftrengthening and invigorating quality, which by no means ought to be allowed to fly off with its warmth. Hence, Galen orders that milk be drank inftantly, and the animal brought to the patient's bed-fide; for that its nature, like that of the femen, is at once altered by the open air. 3. The morning is the beft time of day to drink it, as it will operate the eafier in an empty ftomach, and therefore no other food ought to be taken in four or five hours after it. Yet, if circumftances require a frequent repetition of it, it may be drank in the afternoon; but it fhould be about four hours after dinner has been digefted, and in but half the quantity that is drank in the morning. 4. It is impoffible to prefcribe in general any fixed quantity that fhould be ufed, becaufe of the difference of ages, conftitutions, and diftempers; but thus far may be faid, that you ought never to exceed the quantity of three common pints. 5. The time of continuing it muft be directed by the degree and ftrength of the diftemper: if that be very obftinate, it were well to continue drinking it for three months, or longer; efpecially if a favourable profpect appears of fuccefs, and the violence of the fymptoms abate very difcernably.

Yet a prudent and experienced phyfician will fo order, regulate, and methodize the ufe of this medicine, as almoft to infure fuccefs, and avoid any hurtful confequences. I fhall therefore conclude with a few cautions that fhould be obferved very accurately.

1. Before a courfe of milk is begun, the ftate and condition of the ftomach muft be carefully inquired into: whether it will bear milk, and have a fufficient degree of ftrength to concoct, digeft, and then difcharge it. For, if that be weak and infirm, if it be troubled with wind and phlegm, or be loaded with a croud of acid humours, milk muft not be taken; becaufe, until thefe things are remedied, that will curdle and ftagnate, and corrupt, and increafe the flatulence and uneafinefs. It will be proper therefore to cleanfe and relieve the ftomach firft, either downwards, by a gentle dofe of manna, or, where the cafe will allow, by a vomit with a grain or two of emetic tartar. 2. Great care muft be had that the milk be not turned into curd. And, therefore, where the food is apt to grow acid in the ftomach, as is the cafe with old and hypochondraic people, it is advifeable to give abforbent, earthy, and alcaline medicines, mixed with the milk, adding likewife fome ftomachic carminative effence, or volatile oily falt. 3. When the patient has drank milk for fix or eight days, a gentle dofe of manna fhould be given, to purge the bowels, and carry off whatever foulnefs the ftomach may have contracted, that the farther efficacy of the milk be not retarded. 4. It is beft to drink it at firft, fparingly, three or four ounces, and then, to increafe the draught gradually, that the ftomach be not too fuddenly oppreffed, and conceive a diflike and loathing to the remedy. 5. A proper regulation of diet muft be obferved during the courfe of milk. The lightnefs of food muft be chiefly confulted; avoiding not only meats hard of digeftion, but alfo thofe that are reckoned to afford little nourifhment, and likewife all flatulent victuals, fummer fruits, and acids of all kinds; abftaining from all malt-liquors, and wines, except a fmall quantity of the foundeft Spanifh wines. Nor fhould any bread be ufed that is lumpifh and fermented, but what is made of the cleaneft and fineft wheat flour. *Hoffman.*

A'STAROTH, an idol of the Philiftines, which Samuel commanded the Jews to pull down. It was alfo the name of the falfe deity of the Sidonians, adored by Solomon, when he turned idolater. The word fignifies a flock of fheep and riches: and fome fay, that, as Jupiter Ammon was adored under the fhape of a ram, fo Juno Ammon, or the moon, was worfhipped under the form of an ewe. But others believe, that Aftaroth was king of Syria, thus called for his great wealth. Tho. Goodwin de Ritibus Hebræorum.

ASTA'RTE, a certain heathen divinity, called in fcripture the goddefs of the Sidonians. Solomon, in complaifance to his concubines, built altars, to this idol. It is generally thought that Aftarte is the fame with Atergati, or Derceto, fo much worfhipped by the Syrians. Tully believes this goddefs to be one of the four Venus's, and the fame that married Adonis. *Ælian. Tertul. in Apologet. Cic. de Nat. Deor. l.* 3.

ASTE'RISCUS, in botany, the name of a genus of plants, the characters of which are thefe: the flower is of the radiated kind; its difk is compofed of feveral flofcules, and its outer edge of femi-flofcules. Thefe are all placed on the embryo feeds, and are inclofed in a cup of a ftellated form, the

parts

parts of which ſtand out beyond the flower. The embryo's finally become flat and marginated ſeeds.

The ſpecies of Aſteriſcus, enumerated by M. Tournefort, are ſeven.

ASTEROPO'DIUM, in natural hiſtory, the name given by authors to a kind of extraneous foſſil, of an imbricated texture, compoſed of a number of ſmall convex or concave plates, and ſerving, when intire, as a baſe, or root, to the aſteria, or ſtar-ſtone.

It is very plain, that this is the remains of ſome animal body, probably of the ſtar-fiſh kind, to which the aſteriæ have alſo once belonged; but our imperfect knowledge in the animal hiſtory has not yet aſcertained us of the particular creature; the moſt probable conjecture is, that it is the Magellanic ſtar-fiſh, the rays of which nicely and exactly repreſent ſome of the more perfect Aſteropodia.

ASTRÆ'A, in mythology, the daughter of Aſtræus and Themis. She was accounted the mother of natural juſtice, or that with which we are born; not that which is enforced by the fear of human laws. She lived on earth, as long as the golden age laſted; but, when mankind, blackened with enormous crimes, became deaf to her repreſentations, ſhe flew away to heaven, where ſhe placed herſelf, according to the poets, in the ſign Virgo. She ſeems to have forſaken the earth with regret, and would willingly have ſtaid, but an univerſal depravity drove her away. Baniſhed from cities, ſhe retreated into the country and reſided among the ſhepherds and huſbandmen, till vice prevailed and drove her alſo from this aſylum. She is repreſented, according to Aulus Gellius, by the figure of a virgin; her aſpect ſtern, her air mournful; which does not, however, leſſen her dignity: ſhe holds a pair of ſcales in one hand and a ſword in the other.

ASTRAGALOI'DES, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and its piſtil, which ariſes from the cup, ſomewhat reſembles at its extremity a ſmall boat in ſhape, and contains ſeveral kidney-ſhaped ſeeds. See *Plate* IV. *fig.* 30.

There is only one known ſpecies of this genus, which is the Portugal Aſtragaloides, called by ſome the wool aſtragalus, with thick roots. *Tourn. Inſt. p.* 398.

ASTRA'GALUS, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and its piſtil, which ariſes from the cup, covered with a membraneous ſheath, finally becomes a bicapſular pod, containing kidney-ſhaped ſeeds. To this it may be added, that the leaves ſtand in pairs on the middle ribs, the end of each of which is terminated by a ſingle leaf. *Tourn. Inſt.*

The root of this plant, drank in wine, ſtops a looſeneſs, and provokes urine. Dried to a powder, it is, with good effect, ſprinkled on old ulcers, and ſtops bleeding. *Lemery, des Drog.*

ASTRA'NTIA, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flower is of the roraceous kind, conſiſting of ſeveral petals, the ends of which are uſually bent backwards, and which are diſpoſed in a circular form, on a cup which afterwards becomes a fruit, compoſed of two ſeeds, involved in a curled calyptra. The flowers of this genus are collected into a ſort of head, and ſurrounded with a leafy crown. Some of the flowers of this genus of plants are barren, and the cups of theſe are wider. See *Plate* IV. *fig.* 31.

This plant is cultivated in the gardens of botaniſts, and flowers in July. Its black and fibrous roots are only uſed in medicine, which are ſaid to purge melancholic humours. Hildanus preſcribes it alſo for the cure of a ſchirrous ſpleen. *James's Med. Dict.*

ASTRI'NGENTS (*Dict.*)—Among the ſeveral claſſes of corroborative medicines, that of Aſtringents is none of the leaſt conſiderable and important. The ſeveral ſubſtances which come under this denomination, are alſo by the Latins ſtiled vulnerary, and by the Greeks, traumatic medicines. Their virtues, in general, conſiſt in a certain fixed and gently conſtrictive principle; by means of which, they brace up the parts and fibres that are too much relaxed, corroborate thoſe which are weakened, and conſolidate and agglutinate ſuch as are corroded and wounded.

Aſtringent medicines operate by means of a conſiderably fixed terreſtrial principle, in conjunction with an acid; and as, by conſtructing the too much relaxed fibres, they free them from a congeſtion and ſtagnation of humours; ſo, by bringing them into a nearer contract with each other, they promote their conſolidation and coaleſcence. But this conſtrictive virtue is not equally ſtrong and powerful in all medicines of this claſs.

If ſkill and uncommon caution are requiſite in the uſe of any medicines whatever, they are certainly ſo in the adminiſtration of Aſtringents; for ſince not only the ſoundneſs of the body in general, and of its ſeveral parts, but alſo life itſelf, is maintained and preſerved by the perpetual, progreſſive, and circulatory motion of ſufficiently attenuated and fluid humours, through the compages of the body, which is almoſt quite vaſcular, and compoſed of inconceivably minute and ſlender ducts; and ſince, at the ſame time, ſuch are the natures and properties of Aſtringents, as to inſpiſſate our fluids, when mixed with them, and brace up the pores and ducts of our ſolids; it is therefore obvious to every one, that remedies of this claſs muſt be unfriendly to the very natures, and vital motions, of animal bodies; for which reaſon they are not ſo ſafe and ſecure as ſome may imagine, unleſs when uſed with the utmoſt care and circumſpection: for daily experience convinces us, that medicines of an aſtringent quality, raſhly and unſkilfully applied, for ſtopping hæmorrhages or fluxes, produce numberleſs fatal conſequences, and generally bring on ſlow fevers, cachexies, œdematous ſwellings, ſpaſmodic diſorders, cholics, and hypochondriacal indiſpoſitions: for this very reaſon we are carefully to guard againſt the imprudent and immoderate uſe of the Peruvian bark, for carrying off the paroxyſms of intermitting fevers; ſince, by its violent aſtringency, the viſcid bilious, and ſalival ſordes, lodged in the primæ viæ, and which ought to be diſcharged, are ſo much the longer ſhut up and retained; by which means, a ſtill more formidable diſorder is ſometimes brought on.

If neceſſity ſhould, at any time, call for the uſe of Aſtringents of this nature, they are not to be adminiſtered all at once, but ſucceſſively, in gentle doſes, and in conjunction with a ſufficient quantity of ſome proper liquid; preſcribing, at the ſame time, a due degree of exerciſe for the patient, which I always do, when I either preſcribe the Peruvian bark, or any medicines whatever of the chalybeate kind.

It is highly unſafe and dangerous to repreſs exceſſive vomitings, diſcharges of bloody urine, hæmorrhages of the noſe, uterus, or anus, and ſpittings of blood, by means of Aſtringents; ſince the patients are always ſure to ſuffer by ſuch a practice, unleſs the ſpaſms, on which the diſcharges of blood, for the moſt part, depend, as much as effects do upon their immediate cauſes, are firſt ſoothed, the violent and impetuous motions of the fluids checked, and the exorbitant affluence of humours derived to other parts.

The traumatic, or vulnerary herbs, and decoctions of them, are of very ſingular and uncommon ſervice, not only in wounds, eroſions, and ſolutions of continuity, but alſo in ſome diſeaſes of a chronical and violent nature, ſuch as a phthiſis, ſcurvy, cachexy, and diſorders ariſing from the ſtone, when theſe indiſpoſitions draw their origin from the tone of the viſcera and glands being weakened, or from a preternatural ſtagnation of the juices. But we ought, at all times, carefully to avoid uſing them in caſes where there is too great an obſtruction of the veſſels, a conſtriction of the fibres, or in a phthiſis, when the lungs are full of hard tumors and tubercles: however, in other caſes, infuſions of vulnerary and gently aſtringent medicines are of ſingular ſervice, and produce excellent effects; eſpecially in preventing ſabulous and ſtony concretions in the kidneys, which, for the moſt part, ariſe from theſe organs being too much relaxed or ulcerated. Upon this ſubject, I would recommend Hencherus's Diſſertation, concerning the uſe of Aſtringents in the ſtone. This intention is alſo very well anſwered by infuſions of yarrow and its tops, of Paul's betony, ground-ivy, ſtrawberries, agrimony, and the bark of the Egyptian thorn-root. In involuntary diſcharges of the urine, ariſing from too great a relaxation of the ſphincter muſcle of the bladder, whether in children or in adults, I have found infuſions of this nature produce very happy effects, applying externally, at the ſame time, rectified ſpirits of wine.

In caſes where the external parts are hurt or wounded, well rectified ſpirit of wine proves by itſelf, a noble and efficacious vulnerary; ſince it puts a ſpeedy ſtop to defluxions of the blood and humours; and is of ſingular ſervice, where the more ſenſible nervous and tendinous parts have ſuffered by too great an effuſion of blood; for ſpirituous liquors not only coagulate the juices of the human body, as we find by making the experiment upon blood and lymph, but alſo, by removing the ſuperfluous humidity, render the fibres tenſe and rigid, and, by bracing them more ſtrongly up, prevent ſtagnations of the blood, and carry off pains and inflammations. *Hoffman.*

ASTROMETEOROLO'GIA, the art of foretelling the weather, and its changes, from the aſpects and configurations of the moon and planets.

This makes a ſpecies of aſtrology, diſtinguiſhed by ſome under the denomination of meteorological aſtrology.

Dr. Goad publiſhed a large work, in folio, expreſs on this ſubject, in 1686, which he afterwards tranſlated from Engliſh into Latin, and publiſhed it in London, 1690, quarto, containing a ſort of ſyſtem of prognoſtications of the weather. To the ſame head alſo belongs Coke's Meteorologia, firſt publiſhed in Engliſh, and ſince in High Dutch, at Hamburgh, 1691, octavo.

ASTRONO'MICAL *Sector*, a very uſeful mathematical inſtrument, made by the late ingenious Mr. Graham.

It is allowed that a micrometer is the moſt accurate and convenient inſtrument for obſerving the place of a planet or comet, when it happens to be near enough to any known ſtar, by taking the differences of its right aſcenſion and declination from thoſe of the ſtar. But this being frequently impracticable, by reaſon that many large places in the heavens

vens are void of stars, whose places are known; it is necessary to have recourse to moveable quadrants, or sextants, furnished with telescopic sights, for taking larger distances. But, besides the difficulty and charge of procuring good instruments of this kind, the great trouble and uncertainties, in observing with them, are very notorious, arising chiefly from the difficulty the observers find in making their observations, as each telescope correspond together at the same instant, while the instrument is following the diurnal motion of the heavens. The lovers of astronomy are therefore much obliged to the ingenious Mr. George Graham, F. R. S. not only for many useful improvements in the mechanism of several astronomical instruments, but also for contriving a very commodious and accurate one for the purpose aforesaid; that is, for taking such differences of right ascension and declination as are too large to be observed through a fixed telescope; and yet with equal facility and exactness too in proportion to the radius of the instrument. I will first give an idea of it, and then describe the particulars of the mechanism.

Let AB (*plate* V. *fig.* 1.) represent an arch of a circle, containing ten or twelve degrees well divided, having a long plate CD for its radius, fixed to the middle of the arch at D. Let this radius be applied to the side of an axis HFI, and be moveable about a joint fixed to it at F, so that the plane of the sector may be always parallel to the axis HI; which being parallel to the axis of the earth, the plane of the sector will always be parallel to the plane of some hour circle. Let a telescope CE be moveable about the center C of the arch AB, from one end of it to the other, by turning a skrew at G; and let the line of sight be parallel to the plane of the sector. Now, by turning the whole instrument about the axis HI, till the plane of it be successively directed, first to one of the stars, and then to another, it is easy to move the sector about the joint F into such a position, that the arch AB, when fixed, shall take in both the stars in their passage, by the plane of it, provided the difference of their declinations does not exceed the arch AB. Then, having fixed the plane of the sector a little to the westward of both the stars, move the telescope CE by the skrew G; and observe, by a clock, the time of each transit over the cross hairs, and also the degrees and minutes upon the arch AB, cut by the index at each transit; then, in the difference of the arches, the difference of the declinations, and by the difference of the times, we have the difference of the right ascensions of the stars.

The mechanism of the principal parts of the instrument is this: upon the side of an iron axis HIT (*fig.* 2.) wrought square, and near the top of it, there is fixed a broad circular plate, *abc*, of solid brass; upon which there lies a brass cross, KLMN, which turns about a joint at the center F: at the end of the cross plate MN are erected two equal perpendicular arms O and P, whose extremities are fixed by the skrew *de* to the backside of the radius CD; which is strengthened by a long brass rib on its backside, placed edgways from one end to the other, as represented in *fig.* 4. The arms OP are no longer than is necessary for the sector ABC to turn about the joint F quite clear of another circular plate QR; which is fixed to the upper basis of a brass cylinder I, the iron axis HF being put through a square hole in the middle of them both, and immoveably fixed in it. ST represents a long substantial plate of brass, having two short plates, VX and YZ, fixed perpendicular to the ends of it. Let us suppose the length of the plate TS to be parallel to the earth's axis, and to be firmly fixed in this position upon a pedestal, or otherwise, with its flat sides facing the north and south. Remove the axis HI, and place the conical hole, made in the end H, upon a conical point of a skrew-pin at Y; and the cylinder I into the slit VZX, whose parallel sides VX embrace, while it rests against two points of an angular notch in the bottom of the slit at Z. By this means, the whole instrument will always turn true about one and the same imaginary line. When the sector is turned about the joint F (*fig.* 2.) till the radius CD becomes parallel to the axis HI, *fig.* 4. represents a section of the whole instrument, made by a plane passing at right angles through the radius CD, and through the rib on the backside of it, and through the axis HI, and through the supporter ST. The several parts of the instrument are here denoted by the same letters in both figures. The arms O and P have two slits through the middle of their ends, to receive the edge of the rib CD. The circular plate *ac* is fixed to the axis by the skrews *bi*. The brass rod *gk* is skrewed into the axis HI, and carries a brass ball, *lm*, that slides along it, and is fixed by a skrew *m*, at a proper place for ballancing the weight of the sector and telescope placed on the opposite side of the axis. At the top of the supporter ST there is an hold-fast *nopqrstv*, whose cavity *nopq* receives the circular plate QR. The end *q*, of a springing-plate *pq*, is fixed by a skrew *r* to the inside of the upper plate *rs*, while its other end *p* may be pressed down upon the circle Q, by twisting the knob of a skrew *t*, which works in a socket *v*. And to prevent this pressure from dislocating the plane of the circle QR, and, consequently, the position of the axis HI, the hold-fast *nopq* has liberty of yielding or turning upon the ends of two skrew-pins, that go into two conical holes, in the opposite edges of the under plate *no*: one of these skrews is seen at *n*; and the fixed piece that they skrew into, is represented separately at full view at *nxyz*, *nz* being the point that the hold-fast turns upon. By this means, the same skrew at *t* causes the upper and under plates of the hold-fast *nopq* to compress the circle Q with equal forces. To the arm O there is fastened such another hold-fast, which so compresses the circle *ac*, and the cross plate MN, as to stay the sector and telescope in any given position, from turning about the joint F. This joint is nothing else but a cylindrical pin, passing through the plates MN, *ac*. The flat head of the pin is fixed by three small skrews to the plate MN; and to the opposite end of this pin a circular springing-plate is fixed by a skrew, that skrews into the end of the pin. And the joint C, at the center of the sector ABC, is made in the same manner.

Fig. 3. represents the skrew-work upon the backside of the limb AB, contrived for moving the telescope, by twisting the knob *g*. Here *gab* is a long straight skrew, which works through a skrew-hole in a brass head *c*; whose neck is moved in a long circular slit *de*, cut through the limb: the other end of this neck turns round in a hole in the nonius-plate (one end of which is fixed to the telescope) and draws it along the limb; *h* and *i* are the heads of two skrews, whose shanks go through a springing-plate, to make the motion steady, and through the slit *de*; and are skrewed into the nonius-plate on the other side of the limb. Since the length of the skrew *ab* must have a small angular motion, while it carries the head *c* along the arch *de*, the shank of it, near the end *a*, turns round in a hole made in a short flat axis *mn*, placed perpendicular to the limb, and held so by an arm *no*, while the other end *b* moves in a slit *p*, parallel to the limb, being cut in a small plate fixed perpendicular to the limb. The long skrew *gab* is kept from slipping backwards and forwards through the hole in the axis *mn*, by shoulders or nuts fixed on each side.

The dimensions of this instrument are these: the length of the telescope, or the radius of the sector, is 2½ feet; the breadth of the radius, near the end C, *fig.* 2. is 1¼ inch; and, at the end D, two inches. The breadth of the limb AB is 1½ inch; and its length six inches, containing ten degrees divided into quarters, and numbered from either end to the other. The telescope carries a nonius or subdividing plate, whose length, being equal to sixteen quarters of a degree, is divided into fifteen equal parts; which, in effect, divides the limb into minutes, and, by estimation, into smaller parts. The length of the square axis HIF is eighteen inches, and of the part HI twelve inches; and its thickness is about a quarter of an inch; the diameters of the circles QR and *abc* are each five inches: the thickness of the plates, and the other measures, may be taken at the direction of a workman.

This instrument may be rectified, for making observations, in this manner: by placing the intersection of the cross hairs at the same distance from the plane of the sector the plane described by the line of sight, during the circular motion of the telescope upon the limb, will be sufficiently true, or free from conical curvity; which may be examined by suspending a long plumb-line at a convenient distance from the instrument; and, by fixing the plane of the sector in a vertical position, and then by observing, while the telescope is moved by the skrew along the limb, whether the cross hairs appear to move along the plumb-line.

The iron axis *bfo* (*fig.* 5.) may be elevated nearly parallel to the axis of the earth, by means of a small common quadrant; and its error may be corrected, by making the line of sight follow the circular motion of any of the circum-polar stars, while the whole instrument is moved about its axis *bfo*, the telescope being fixed to the limb. For this purpose, let the telescope *kl* be directed to the star *a*, when it passes over the highest point of its diurnal circle, and let the division, cut by the nonius, be then noted: then, after twelve hours, when the star comes to the lowest point of its circle, having turned the instrument half round its axis, to bring the telescope into the position *mn*; if the cross hairs cover the same star supposed at *b*, the elevation of the axis *bfo* is exactly right; but if it be necessary to move the telescope into the position *μν*, in order to point to this star at *c*, the arch *mμ* which measures the angle *mfμ* or *bfc*, will be known; and then the axis *bfo* must be depressed half the quantity of this given angle, if the star passed below *b*; or must be raised so much higher, if above it; and then the trial must be repeated, till the true elevation of the axis be obtained. By making the like observations upon the same star on each side the pole, in the six o'clock hour-circle, the error of the axis, toward the east or west, may also be found and corrected, till the cross hairs follow the star quite round the pole. For supposing *aopbc* to be an arch of the meridian (or in the second practice of the six o'clock hour-circle) make the angle *afp* equal to half the angle *afc*, and the line *fp* will point to the pole; and the angle *ofp*, which is the error of the axis, will be equal to half the angle *bfc* or *mfμ*, found by the observation; because the difference of the two angles *afb*, *afc*, is double the difference of their halves *afo* and *afp*. Unless the star be very near the pole, allowance must be made for refractions. *Smith's Optics.*

A'STROSCOPE, *astroscopium*, a kind of astronomical instrument, composed of two cones; on whose surface the constellations,

ſtellations, with their ſtars, are delineated; by means whereof, the ſtars may eaſily be known.

The Aſtroſcope is the invention of William Schuckhard, formerly profeſſor of mathematics at Tubingen, who publiſhed a treatiſe expreſly on it, in 1698.

ASTROSCO'PIA, the art of obſerving and examining the ſtars, by means of teleſcopes, in order to diſcover their nature and properties.

A'STRUM, or ASTRON, a conſtellation, or aſſemblage of ſtars: in which ſenſe it is diſtinguiſhed from aſter, which denotes a ſingle ſtar.

Some apply the term, in a more particular ſenſe, to the great Dog, or, rather, to the great bright ſtar in his mouth.

A'TE, in mythology, a miſchievous and ill-natured goddeſs, who took delight in engaging men in troubles and quarrels, perverting their underſtanding, and dulling their reaſon. There was no way to be ſecured from her, but by having recourſe to the Lites, daughters of Jupiter, who ſaved men from her anger with this circumſtance, that, the more ſhe was in a paſſion, the leſs power they had with her, &c. This Ate is nothing elſe but the evil and injuſtice we commit; which is the real ſource of our trouble and miſfortunes. The Lites are our prayers, which we are to make uſe of in our calamities. Laſtly, it is evident, that, when our crimes are very great, then we meet with the greater difficulties in obtaining our pardon.

ATHA'NATES, or the immortal, a name the Perſians gave a body of 10000 choice men, which was always kept complete, by filling up the number, as ſoon as any were killed, or died: they had great confidence in this body of men, and never engaged them, but in deſperate caſes. Q. Curtius ſpeaks of them thus: Proximi ibant quos Perſæ immortales vocant ad decem millia.

ATHA'NOR (*Dict.*) *plate* V. *fig.* 10. repreſents an Athanor furnace. *a a a a*, the tower of the Athanor, or chief furnace, which receives the fuel of the fire: the pricked lines indicate the thickneſs of the wall. *b b b b*, the inner ſides which form the cavity, and are each ten inches long. *c*, the door of the aſh-hole. *e*, the upper door. *d*, the grate which is placed even with the bottom of the door *e*. *f*, the cover wherewith the upper aperture of the tower is ſhut. *g g*, a flue, through which the fire aſcends from the tower into the firſt furnace. *h h h h*, a hollow priſm, which forms the firſt ſecondary furnace. *i i*, a ſemi-cylindrical arch, wherewith the aforeſaid priſm is cloſed up. *k k k k*, an iron-plate coated within, wherewith the firſt ſecondary furnace is ſhut. In this plate is a round hole, through which the neck of the veſſel 7 may be paſſed. *n*, iron-bars. *o o o o*, iron-hooks, faſtened to the wall, to receive the iron-bars. *q q q q*, the funnel of the furnace. *r*, an iron-plate, wherewith the funnel may be ſhut. *t t*, another flue, through which the fire paſſes from the firſt ſecondary furnace to the ſecond. *u u u u*, another ſecondary furnace cylindrical. *v v*, its upper circular aperture, ſloped at the fore part, to receive an iron-pot, which is to be hung in this ſecondary furnace. *z*, a flue, which conveys the fire from the ſecond to the third furnace. 1 1 1 1, the third ſecondary furnace, having an iron-pot, like the ſecond. 2222, the ſecond funnel. 3, a plate to ſhut the funnel. 4, an aperture, which leads from the third furnace into the funnel. 5 5 5, the third funnel. 7, an earthen retort, placed in the firſt ſecondary furnace, with its neck through the hole in the door. 8, a receiver. 9, a glaſs-retort, placed in the iron-pot, belonging to the ſecond ſecondary furnace; which pot is filled with ſand. 10, a receiver. 11, a glaſs cucurbit, with its head placed in the pot of the third furnace. 12 12, Stands which ſupport the receivers, and which may be raiſed or lowered by the help of ſcrews.

Uſes of the ATHANOR. You muſt put in, at the upper arch-door *e*, a ſemi-cylindrical muffle, twelve inches long, of the ſame heighth and breadth of the door, three quarters of an inch thick, and open behind, being ſhut there by the hinder part of the Athanor. For this purpoſe, a tile muſt be placed on the grate *d*, to ſupport the muffle. Under this muffle you may place your cement-pots, or ſuch bodies as muſt be calcined with a long and violent fire; which may be done without a muffle, though not ſo well. In the firſt ſecondary furnace, *h h h h*, *i i*, you may perform the moſt violent diſtillations, with an open fire; for retorts, and other veſſels, may be introduced into it, by taking away the door *k k k*, and placed either upon the hearth itſelf, or on a particular ſupport of ſtone. But you muſt be careful to place thoſe veſſels in ſuch a manner, that their necks may paſs through the hole in the door *k k*. You may cloſe all the crevices of the door with lute. To the neck of the retort apply a cylindrical ſegment ten or twelve inches long, that the heat of the vapours may be gradually diminiſhed, leſt the receiver, which muſt be of glaſs, ſhould ſplit. The receiver muſt be luted to the other orifice of the ſaid ſegment, and ſupported by a kind of trivet.

In this chamber, inſtead of diſtillations, you may make cementations, calcinations, &c. in which caſe, the round hole, in the iron-plate *k k*, muſt be ſhut.

The ſecond and third ſecondary furnaces ſerve chiefly to perform ſuch operations as are made in baths of ſand, aſhes, or filings. You may alſo make in theſe furnaces diſtillations by a reverberating fire, as in the firſt; only the fire is leſs violent in theſe, though ſufficient for diſtilling aqua fortis: in order to this, you muſt take out the iron-pot, and invert it on the mouth of the furnace; by this means, the ſegment cut out from the pot, together with that cut out from the ſide of the cavity, will form a hole for the neck of the retort.

All the apparatus being thus prepared, you muſt introduce, through the top of the tower *b b b b*, a few burning coals; and then a ſufficient quantity of fuel, ſo that the tower may be entirely filled, or only in part, according to the nature of the operation. Then immediately put on the iron-cover *f*, and cloſe exactly all the crevices with lute; for, if you neglect this caution, all the fuel contained in the tower would immediately be kindled, which might be attended with very bad conſequences.

Manner of regulating the fire.—The fire may be made very ſtrong in the firſt chamber *h h h h*, *i i*, by leaving the door of the aſh-hole *c*, and the funnel *q q q q*, of the chamber, quite open, and the fire have free liberty to paſs from the tower into this cavity. But the cloſer the funnel is ſhut, together with the door of the aſh-hole, the more the violence of the heat diminiſhes: and this will be ſoon effected, if the iron ſlider, which ſeparates this cavity from the tower, be partly let down. Obſerve alſo, when the ſtrongeſt fire is required, that the hole in the door *k k* be cloſely ſtopped; becauſe, when open, the air, by ruſhing violently through it, cools the bodies placed in that cavity. At the ſame time diſtillation, or ſome other proceſs, may be performed, and with the ſame fire, in the ſecond and third furnaces; for the fire penetrates from the firſt cavity into the ſecond, and increaſes, when the funnel 2 2 2 2, erected on it, is opened. But, before you do this, the funnel of the firſt cavity muſt be ſhut as much as that of the ſecond is opened. By the ſame means, you may hinder the fire, which ſerves for the operations made in the two firſt cavities, from going out through their funnels, and force it out through the funnel 5 5 5, by which means it will alſo act upon the bodies placed in that cavity: for, the more the funnel erected on the third cavity is open, the more one or both the funnels of the other cavities muſt be cloſed: whence it is plain, that you cannot have the ſtrongeſt fire in the third cavity, unleſs there be an equal degree of fire in the other two; but, on the contrary, the heat in the third cavity may be rendered leſs, by cloſing its funnel, though it be violent in the others. The ſame is true of the ſecond cavity, with regard to the firſt. You cannot make the ſtrongeſt fire under the muffle placed within the upper door *e*, of the tower, unleſs you have an equal fire in the firſt cavity; which fire may, conſequently, be increaſed, by ſhutting the door quite againſt the muffle; and diminiſhed, by opening it; there being, at the ſame time, an equal heat in the firſt chamber, and in the following ones.

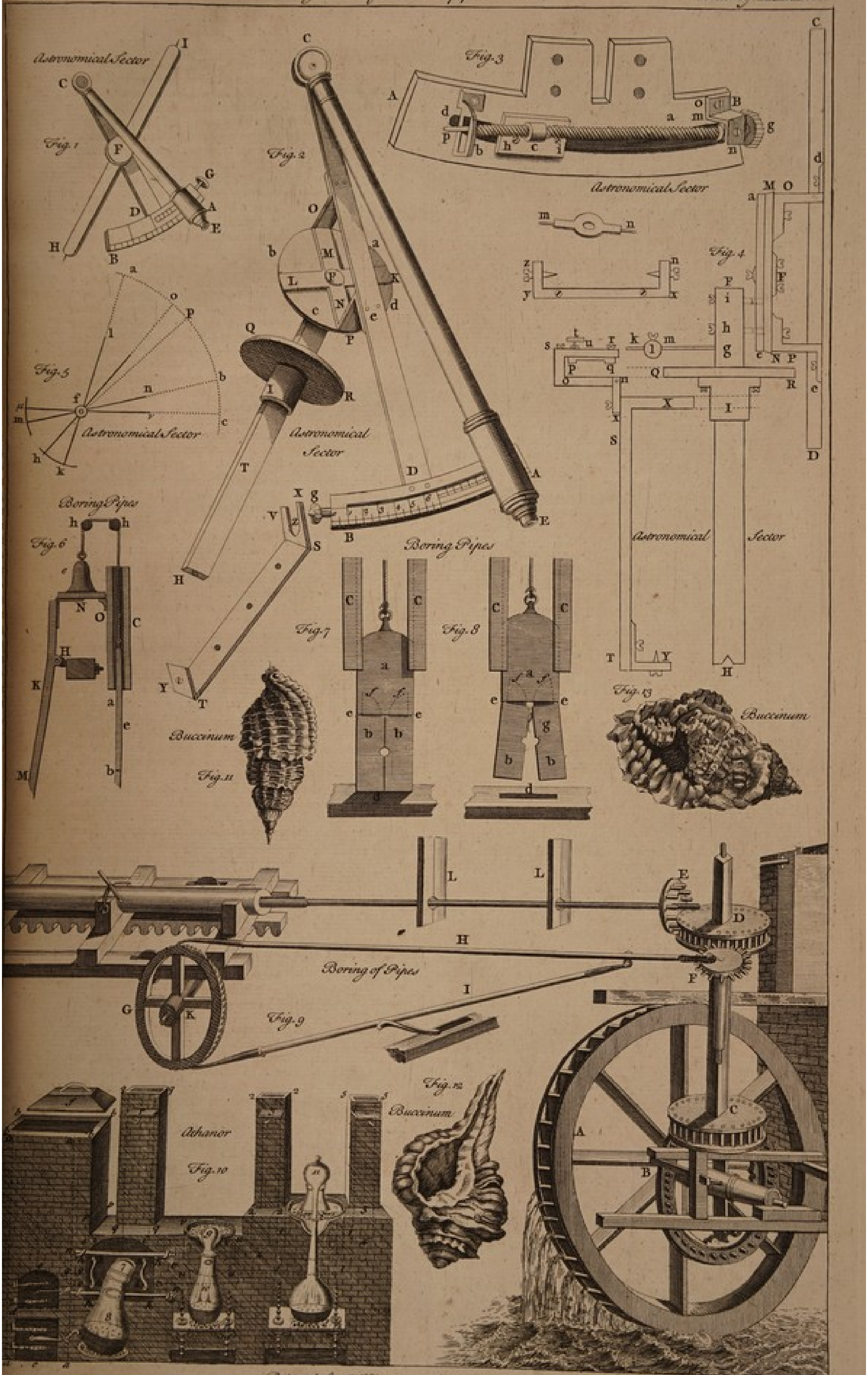
ATHEMADOU'LET, ATAMADOULET, or ETMADOULET, is the prime miniſter in the Perſian empire. The word is Arabic, compoſed of itimade, and doulet, which is the truſt of majeſty, or, according to Tavernier, the ſupport of riches. His office is the ſame as the grand vizir's in Turky, and may be compared to the antient mayors of the palace in France. In regard all the affairs of the kingdom paſs through his hands, he ought to be rather a gown-man than a ſoldier; and herein he only differs from the grand vizir, who is always to be at the head of an army, and, for every ſlight fault, or diſtaſte, is ſubject to be ſtrangled by the grand ſignior; whereas in Perſia, where the government is milder, the prime miniſters generally die in their beds; or, if they are depoſed, they are only exiled to ſome frontier city, where they live as private men. When the king is young, the prime miniſter has a hard game to play, for then the favourite eunuchs and the ſultaneſſes diſannul and cancel, in the night, whatever orders he makes in the day-time. The Athemadoulet is great chancellor of the kingdom, preſident of the council, ſuperintendant of the finances, and has the charge of commerce and all foreign affairs; he is, in effect, the vice-roy of the kingdom, and iſſues the king's mandates, or orders, in this ſtyle, Benda derga ali il alia Etmadoulet, that is, I, who am the ſupport of the power, the creature of this port, the higheſt of all ports. He draws, every lunar month, a thouſand tomans from the treaſury for his expences; which, in the year, amount to 45000 l. ſterling. This, however, is the leaſt of his revenue; for, having in his gift all the places of the government, war, finances, &c. he makes what advantage he pleaſes of them: moreover, as all the governors of provinces, and officers of the court, are obliged to ſend preſents to the Sophy, they dare not forget the Athemadoulet. He has under him ſix vizirs, and two ſecretaries.

ATHLE'TIC *Habit*, in medicine, denotes a ſtrong, hale conſtitution of body.

Anciently it ſignified a full, fleſhy, corpulent ſtate, ſuch as the athletæ endeavoured to arrive at.

The Athletic habit is eſteemed the higheſt pitch of health; yet it is dangerous, and the next door to diſeaſe; ſince, when the body is no longer capable of being improved, the next alteration muſt be for the worſe.

ATLA'NTIDES, in aſtronomy, a denomination given to the Pleiades, or ſeven ſtars, ſometimes alſo called Vergiliæ. They are thus called, as being ſuppoſed, by the poets, to have been the



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the daughters of Atlas, or his brother Heſperus, who were tranſlated into heaven.

A'TLAS, in commerce, a ſilk-ſattin, manufactured in the Eaſt-Indies. There are ſome plain, ſome ſtriped, and ſome flowered, the flowers of which are either gold, or only ſilk. There are Atlaſſes of all colours, but moſt of them falſe, eſpecially the red and the crimſon.

It muſt be owned, that the manufacture of them is wonderful and ſingular; and that, eſpecially in the flowered Atlaſſes, the gold and ſilver are worked together in ſuch a manner as no workman in Europe can imitate: but yet they are very far from having that fine gloſs and luſtre which the French know how to give to their ſilk-ſtuffs.

Among the ſeveral ſorts of Atlaſſes, the moſt conſiderable are, the cotonis, the caucanias, the cotonis-bouilles, and the bouilles-chaſmay, or charmay. The Atlaſſes cotonis are thus called, becauſe the ground of them is cotton, and the reſt ſilk. The caucanias are ſtriped ſattins, and thoſe of them which ſeem moſt ſilky, are ſtiled quenkas. The calquiers are ſattins made after the Turkiſh manner, or like Hungary point. The bouilles-cotonis and bouilles-charmay are thick ſilks, like thoſe ſtrong taffeties made at Tours in France.

There are Atlaſſes from four French ells and $\frac{4}{5}$ in length, by $\frac{3}{5}$ in breadth, to 14 ells in length, by $\frac{7}{8}$ in breadth. Thoſe that come near to half the uſual length are called half-pieces.

A'TMOSPHERE (*Dict.*)—There have been often ſeen in the Atmoſphere ſome very luminous parts, even near the zenith about midnight. It has been thought that theſe luminous parts are nothing elſe but terreſtrial exhalations floating in the air, at a prodigious altitude, and thereby reflecting the light of the ſun, which they are expoſed to, at that great height, to our eyes.

But Mr. Cotes juſtly obſerves, that it will be next to impoſſible to give any tolerable account, how theſe exhalations can be denſe enough to reflect ſo copious a light at that vaſt diſtance, and at the ſame time be ſupported by a medium ſo much rarer than the air we breathe in. It ſeems, therefore, more probable, that theſe extraordinary lights proceed from ſome ſelf-ſhining ſubſtance, or aerial phoſphorus.

A ſurprizing appearance of this kind was ſeen at Cambridge, on the 20th of March, in the year 1706. It was a ſemicircle of light, of about two thirds of the ordinary breadth of the milky-way, but much brighter. The top of it paſſed very near the zenith of that place, inclining about four or five degrees to the north; it croſſed the horizon at a very ſmall diſtance from the weſt, towards the ſouth, and again, about as far from the eaſt, towards the north. It was moſt vivid and moſt defined about the weſtern horizon, and moſt faint about the zenith, where it firſt began to diſappear. There was at the ſame time an Aurora borealis. The ſame appearance was ſeen in Lincolnſhire, at the diſtance of about 70 miles north of Cambridge, and there the ſemicircle ſeemed to lie in the plane of the equator. From theſe two obſervations compared together, it may be collected, that the matter, from which that light proceeded, was elevated above the earth's ſurface between 40 and 50 miles. *Cotes's Hydroſt. Lect.*

F. de Lana thought he had contrived an aeronautic machine for navigating the Atmoſphere: Sturmius, who examined it, declared it not to be impracticable: but Dr. Hook was of a different opinion, and detected the fallacy of the contrivance. Roger Bacon long before propoſed ſomething of the ſame kind. The great ſecret of this art, is to contrive an engine ſo far lighter than air, that it will raiſe itſelf in the Atmoſphere, and, together with itſelf, buoy up and carry men with it. The principle on which it is to be effected, is by exhauſting the air of a very thin light, yet firm, metalline veſſel, with an air-pump.

But the hopes of ſucceſs in ſuch an enterprize will appear very ſmall, if it be conſidered, that if a globe were to be formed of braſs, of the thickneſs only of $\frac{1}{8}$ of an inch, that globe muſt be above 277 feet in diameter, to ſwim in the air; and if, as de Lana ſuppoſes, the diameter of the globe were but 25 feet, the thickneſs of the metal could not exceed $\frac{1}{37}$ of an inch.

A'TRIPLEX, *Orach*, in botany, the name of a genus of plants, the characters of which are theſe: the flower has no petals, but is compoſed only of a number of ſtamina and a piſtil, ariſing from a five-leaved cup. The piſtil finally becomes a flat orbiculated ſeed, incloſed in the cup in the manner of a capſule. Some ſpecies of Atriplex have alſo another ſort of fruit, placed in a different part of the plant, not in that of the flowers. The embryo's of this fruit are large, and conſiſt of two angular leaves, which nicely incloſe and ſurround a ſeed of a roundiſh figure.

This plant is ſometimes cultivated in gardens as a culinary herb, being uſed as ſpinach, and, by ſome, much preferred to that herb: but there are few in England that are fond of it. It is to be ſown in the ſpring as ſpinach, and muſt be eaten, while it is young; for, when it is run up to ſeed, it is very ſtrong. If ſuffered to ſcatter its ſeed in a garden, it will make itſelf a laſting inhabitant, without farther trouble; the ſeeds often remain many years in the ground, and, every time it is turned up, ſend up new plants. *Miller's Gard. Dict.*

All the ſpecies of Atriplex are cooling and emollient. The leaves are ſometimes uſed in clyſters, and in cataplaſms, intended to ſoften tumors, and to abate pains. Some give the ſeeds internally as diuretics, and others recommend them againſt diſorders of the uterus and menſes. *Quinſ. Diſ.*

A'TROPOS, in the ancient mythology, one of the Parcæ, or fatal ſiſters; the other two were Lacheſis and Clotho.

ATTE'NTION, conſidered logically, means an operation of the mind, by which it applies itſelf more particularly to ſome part of a compound object, to arrive at a more clear and diſtinct idea of that part than the other whereof it is compoſed. Thus, in a play, the moſt lively and intereſting ſcenes draw our Attention principally, fill the whole ſoul, and abſorb or exclude our ideas of any other. Attention, like a microſcope, enlarges the objects it is applied to, and a thouſand properties are diſcovered by this Attention, that eſcaped a curſory view.

To increaſe Attention, we muſt baniſh every thing that may interrupt it, and ſeek every means to ſtrengthen and aſſiſt it. Our ſenſes are apt to divert our Attention; new ſenſations obſcure, efface, and obliterate acts of imagination. Yeſterday, you ſaw a fine piece of painting, were ſo ſtruck with it, its idea quite poſſeſſed you; another, offered to your view to-day, drives the former out of your imagination; thus external objects deſtroy Attention. For this reaſon ſome pray with their eyes ſhut, or directed ſteadily towards ſome fixed and immoveable point. Students chuſe a room remote from noiſe and the interruption of external objects, and the ſtudies of the night have been more ſucceſsful than thoſe of the day, becauſe a more univerſal calm and ſilence reigns.

The hurry of the imagination deſtroys Attention as much as that of our ſenſes; after a play, it is difficult to reſume our ſtudies immediately; next day ſome images will recur, apt to divert us and interrupt our attention. The ſenſes, the imagination, and the paſſions operate upon the ſoul and give it a kind of modification. All, therefore, who would apply themſelves ſtrenuouſly to the diſcovery of truth, ſhould be careful to avoid ſtrong and immoderate ſenſations, a great noiſe, a glaring light, exceſs of grief, or joy, &c. they ought to keep their imagination free from any thing that weakens or diſquiets the mind. They ought eſpecially to controll their paſſions, which, let looſe, make very powerful impreſſions on the ſoul and body, and exerciſe a ſtrange dominion over both. Yet the paſſions and the ſenſes may be made of uſe to preſerve our Attention. As, for inſtance, a deſire of diſcovering truth, rendering ourſelves uſeful to our neighbours, and improving ourſelves, is highly laudable, and tends to fix our Attention; but our Attention is fixed alſo by motives much leſs generous and noble, a thirſt of fame, deſire of riches, nay, even vanity. Experience ſhews us the ſenſes are of no ſmall ſervice to fix the Attention, for they have a natural connection with our ſituation; a man, retired to meditate in a ſolitary cell, will be alarmed, diſtracted, and his Attention intirely deſtroyed by an unexpected noiſe, or intermiſſion of adventitious light; ſo, if on the contrary, I reflect ſtrongly on an object amidſt day-light and noiſe, that idea baniſhes all others and poſſeſſes me; thus light and noiſe are no interruptions to Attention, but ſerve to fix it more ſtrongly. It is, in ſhort, a habit of the mind; and the philoſophers, who have ſhut their eyes to help their meditation, have furniſhed us with nothing but chimæra's. Had Deſcartes kept his eyes open to have ſurveyed the univerſe with Attention, inſtead of ſinking into meditation, he would never have publiſhed ſuch dreams as he has for a plan of the univerſe. Attention is progreſſive, and the power of it may be acquired, but depends, in ſome meaſure, on the conſtitution. Julius Cæſar could dictate to four ſecretaries; ſome no noiſe diſturbs, nothing interrupts; others the lighteſt accident.

Habit does all; we know not our ſtrength till we try it; the ſoul is as flexible and capable of impreſſions as the body; is ſo connected with it, that, like the body, it grows, improves, and ripens. Fixing our Attention properly will diſpel the gloom of ignorance, poliſh off the ruſt of idleneſs, cultivate the mind, and conduct human reaſon right in the purſuit of truth and ſcience.

ATTRA'CTION (*Dict.*)—All philoſophers agree that there is a certain force by which the primary planets tend towards the ſun, and the ſecondary planets towards their primary. As we ought carefully to avoid multiplying principles, and impulſe is the moſt known and leaſt controverted principle of the motion of bodies, it is clear, a philoſopher ought to attribute this impelling power to a fluid. To this notion, the vortices of Des Cartes owe their birth, and this opinion ſeemed more plauſible, becauſe it accounted for the motions of the planets by the circular motion of the matter of the vortices, and their tendency towards the ſun by the centrifugal force of the ſame matter. But an hypotheſis is not to be admitted which accounts only for general phænomena; particular phænomena are the teſts of an hypotheſis, and the failure of the Carteſian ſyſtem in theſe overturned it. The doctrine of vortices is therefore juſtly exploded, as ſo many difficulties attend it which never can be ſurmounted; for, if the

the planets move by virtue of the action of a fluid, this fluid muſt have contrary properties, it muſt impel in one intention, and in another make no reſiſtance, an apparent abſurdity; and the remedy is worſe than the diſeaſe, for the force by which the planets tend towards the ſun on this hypotheſis muſt be aſcribed to an occult quality, which is ſaying nothing at all: and Ariſtotle, who perhaps invented the term, is much more pardonable than many modern philoſophers who have blindly followed him.

We may therefore truly aſſert, that Attraction is a primordial quality of matter: nor is it perhaps poſſible to explain the celeſtial bodies on the principle of impulſion. If Sir Iſaac Newton ſeems to waver in ſome part of his works concerning the nature of Attraction, and admits of an impelling power, there is reaſon to think it was a kind of tribute he choſe to pay to the prejudice, or rather the general opinion of the age he lived in, than his real ſentiment; becauſe he permitted Mr. Cotes, his diſciple, to adopt Attraction without reſerve, as may be ſeen in the preface to the ſecond edition of his Principia; and this preface was written under the eye of Sir Iſaac, and had his approbation. Beſides, Sir Iſaac admits a reciprocal Attraction among the celeſtial bodies, and this very opinion ſeems to ſuppoſe Attraction a quality inherent in bodies. But be that as it may, according to Newton, the attractive force decreaſes in an inverſe ratio to the ſquares of the diſtances: this learned philoſopher has ſolved a great part of the celeſtial phænomena on this ſingle principle, and all who have tried to account for them ſince, on the ſame principle, have ſucceeded to a ſurprizing degree of exactneſs. The motion of the moon's apogee which was pretended to be irreconcileable to this ſyſtem, is now found to be intirely conformable to it, and does honour to the Newtonian ſyſtem. All the other inequalities of the motion of the moon, which are very conſiderable, may alſo eaſily be accounted for by the ſyſtem of Attraction, and demonſtrated by calculation.

All the phænomena hitherto obſerved demonſtrate a mutual tendency of the planets towards each other; wherefore, we muſt admit this for a truth on its own evidence: and, though we ſhould be forced to acknowledge this a primordial and inherent quality in matter, we may venture to ſay, that the difficulty of conceiving ſuch a cauſe would be a very weak argument againſt its exiſtence. No one doubts but that a body which meets another, communicates motion to it, but have we an idea of the power by which this communication is made? The vulgar eye here perhaps penetrates as far as that of the philoſopher. No body is ſurprized at ſeeing a ſtone fall; they have always ſeen it; philoſophers, well acquainted with the effects of impulſion, have never troubled themſelves about the cauſe which produces them. Now, if every body which meets another, ſhould ſtop without communicating motion to it, a philoſopher would be as much aſtoniſhed at this phænomenon, as a common man at ſeeing a heavy body ſuſpended in the air. If we underſtood wherein the impenetrability of matter conſiſts, we ſhould not perhaps be clearer about the nature of the impelling power. We only ſee, that, in conſequence of this impenetrability, the ſhock of one body againſt another muſt be followed by ſome change either in both or one of the bodies; but we know not, and perhaps never ſhall, by what power this change is effected; and why, for inſtance, a body which ſtrikes againſt another ſhould not always continue at reſt after the ſhock, without communicating a part of its motion to the body which reſiſts it. It is apprehended Attraction contradicts the notion we have of matter; but, if we enquire attentively we ſhall find theſe ideas no ways repugnant. The univerſe is concealed from us by a curtain, we ſee only ſome part of it; were that drawn up on a ſudden, we ſhould be ſurprized to ſee what paſſes behind it. Beſides, the pretended inconſiſtence of Attraction with the nature of matter is ſolved by admitting an intelligent being, who could as eaſily ordain bodies to act on each other at a diſtance, as in contact.

M. de Maupertuis, in his diſcourſe on the figures of the planets, has given an idea of the ſyſtem of Attraction with remarks on it; and the ſame author obſerves, in the Mem. Acad. 1734, that, long before Sir Iſaac Newton, Roberval de Fermat and Paſcal thought gravity an attractive power, and inherent in bodies. We will add, that Hook had the ſame notion, and foretold that all the motions of the planets would one day be accounted for on this ſingle principle. Theſe reflections, by increaſing the number of great men who were of the ſame opinion with Sir Iſaac, take nothing from his glory; for, as he was the firſt who actually demonſtrated this principle, he is properly the author of it.

The ingenious Dr. Knight has juſt publiſhed a treatiſe, in which he has endeavoured to demonſtrate that all the phænomena in nature may be explained by Attraction and repulſion. See MAGNETISM and REPULSION.

ATTRACTION *of Mountains*. If it be admitted that all parts of the earth attract each other mutually, it muſt be granted that there are mountains on it, whoſe magnitude is conſiderable enough to make a ſenſible Attraction. Let us ſuppoſe the earth a globe of an uniform figure, whoſe radius is equal to 1500 leagues, and ſuppoſe a mountain on the ſurface of ſome part of this globe one league in heighth, it is eaſy to demonſtrate, that a weight placed at the bottom of this mountain ſhall be attracted horizontally by the mountain, with a force equal to a 3000th part of the weight; ſo that a pendulum or plumb-line, placed at the bottom of this mountain, muſt deviate from a perpendicular about a minute; the calculation is not difficult, and this may be admitted by way of ſuppoſition. From whence it follows, that, when we obſerve the elevation of a ſtar at the foot of a great mountain, the plumb-line muſt deviate from a perpendicular; and an obſervation of this kind, certainly, would afford a very ſtrong proof in favour of the ſyſtem of Attraction; but it may be objected, how ſhall we be ſure the plumb-line actually deviates from a perpendicular, as the direction of the plumb-line only determines the vertical ſituation of the ſtar? This difficulty is eaſily ſurmounted.

Let us ſuppoſe a ſtar on the north of the mountain, and the perſon who is to make his obſervation placed on the ſouth, if the Attraction of the mountain acts ſenſibly on the plumb-line, it will deviate from a perpendicular towards the north, and, conſequently, the apparent zenith of the ſtar will go back towards the ſouth, and ſo the diſtance of the ſtar on which the obſervation is made in the zenith, muſt be greater than if there was no Attraction.

After having made this obſervation, if we go at a diſtance from the mountain, on a right line towards the eaſt or weſt, ſo far, that the Attraction no longer operates, an obſervation, made in this new ſtation, will ſhew the ſtar at a leſs diſtance than in the former.

But there is another and better method. It is certain, that, if the plumb-line on the ſouth ſide of the mountain deviates towards the north, the plumb-line on the north ſide muſt deviate towards the ſouth, and the zenith of the ſtar, which in the firſt caſe went back towards the north muſt, in the latter, advance towards the ſouth. Therefore, taking the difference of theſe two diſtances, and dividing it into two equal parts will ſhew how much the pendulum has deviated from a perpendicular by the Attraction of the mountain.

The whole theory is clearly explained, with ſeveral remarks, in an excellent Memoir of M. Bouguer's, printed in the year 1749, at the end of his book on the Figure of the Earth. In which he gives an account of the obſervations he made in company with M. Condamine, on the north and ſouth ſides of the great mountain Chimboraco, in Peru; the reſult of his obſervations is, that the Attraction of this great mountain cauſes a deviation of the plumb-line from its perpendicular of 7″ and a half. Mr. Bouguer judiciouſly remarks, that the greateſt mountain is a trifle compared to the vaſt body of the terreſtrial globe; and that a hundred obſervations, where no ſenſible Attraction is found, prove nothing againſt the Newtonian ſyſtem; but that this made at the foot of the vaſt mountain Chimboraco, which is in favour of the doctrine of Attraction, deſerves the attention of all philoſophers.

AU'DIANISM, the ſyſtem or ſentiments of Audius and his followers; particularly as to the belief of the human figure of the Deity.

Audianiſm amounts to the ſame with Anthropomorphiſm.

Audianiſm appears to be much earlier than Audius: many, both among the antient Jews, Heathens, and primitive Chriſtians, ſeem to be given into ſentiments much like thoſe of the Audians. Not to mention that M. le Clerc makes Moſes the patriarch or founder of Audianiſm: it is certain, the antient Sadducees, the Ebionites, Seleucus, Hermias, Melito biſhop of Sardis, Tertullian, and others, held the Deity corporeal.

A'VENUES (*Dict.*)—The Engliſh elm will do in all grounds, except ſuch as are very wet and ſhallow; and this is preferred to all other trees, becauſe it will bear cutting, heading, or lopping in any manner, better than moſt others. The rough or ſmooth Dutch elm is approved by ſome, becauſe of its quick growth; this is a tree that will bear removing very well; it is alſo green almoſt as ſoon as any plant whatever in ſpring, and continues ſo as long as any, and it makes an incomparable hedge, and is preferable to all other trees for lofty eſpaliers. The lime is valued for its regular growth, and fine ſhade: the horſe cheſnut is proper for all places that are not too much expoſed to rough winds. The common cheſnut will do very well in a good ſoil, and riſes to a conſiderable height, when planted ſomewhat cloſe, though, when it ſtands ſingle, it is rather inclined to ſpread than grow tall. The beech is a beautiful tree, and naturally grows well with us in its wild ſtate, but it is leſs to be choſen for Avenues than the before-mentioned, becauſe it does not bear tranſplanting well, but is very ſubject to miſcarry. Laſtly, the abele is fit for any ſoil, and is the quickeſt grower of any foreſt-tree. It ſeldom fails in tranſplanting, and ſucceeds very well in wet ſoils, in which the others are apt to fail. The oak is but little uſed for Avenues, becauſe of its ſlow growth.

The old method of planting Avenues was with regular rows of trees, and this has been always kept to till of late; but we have now a much more magnificent way of planting Avenues: this is by ſetting the trees in clumps or platoons, making the opening much wider than before, and placing the clumps of trees at about three hundred feet diſtant from one another. In each of theſe clumps there ſhould be planted either feven or nine trees; but it is to be obferved, that this is only to be practifed where the Avenue is to be of fome confiderable length, for, in fhort walks, this will not appear fo fightly as fingle rows of trees. The Avenues made by clumps are fitteft of all for parks. The trees in each clump fhould be planted thirty feet afunder, and a trench fhould be thrown up round the whole clump, to prevent the deer from coming to the trees to bark them. *Miller's Gard. Dict.*

A'VERAGE, in agriculture, a term ufed by the farmers in many parts of England, for the breaking of corn fields, eddifh, or roughings. The word fignifies, in law, either the beafts which tenants and vaffals were to provide their lords on certain occafions, or, among the merchants, the money laid out to repair loffes by fhipwreck. In the firft of thefe fenfes, the word is derived from averium, a labouring beaft: in the fecond, from averia, goods or chattles, from the French, avoir, to have or poffefs. In the laft, or the farmer's fenfe, it may be derived from haver, an Englifh name for oats, or from averia, beafts, being as much as feeding for cattle or pafturage. *Ray's Englifh Words.*

AVE'RRHOISTS, a fect of Peripatetic philofophers, who appeared in Italy fome time before the reftoration of learning, and attacked the immortality of the foul.

They took their denomination from Averrhoes, a celebrated interpreter of Ariftotle, born at Cordova in Spain, in the twelfth century, from whom they borrowed their diftinguifhing doctrine. The founder of this fect, Averrhoes, is fometimes called the commentator, by way of eminence, as being fuppofed to have entered beft of all the commentators into the fentiments of the philofopher; infomuch that fome have pretended the foul of Ariftotle had migrated into the body of Averrhoes.

The Averrhoifts, who held the foul was mortal, according to reafon, or philofophy, yet pretended to fubmit to the chriftian theology, which declares it immortal. But the diftinction was held fufpicious; and this divorce of faith from reafon was rejected by the doctors of that time, and condemned by the laft council of the Lateran, under Leo X, yet it was ftill maintained covertly: Pomponatius, Cæfalpinus, and others, were fufpected of it. But the corpufcular philofophy, now introduced into Italy, feems almoft to have extinguifhed Averhoifm.

A'VERTI, in horfemanfhip, is applied to a regular ftep or motion enjoined in the leffons. *Guill. Gent. Dict.*

AU'GUR *(Dict.)*— The college of Augurs was firft inftituted by Romulus, who was himfelf very expert in the art of foothfaying. Their number at firft was but three, one out of every tribe; then Servius Tullius added a fourth, and chofe them out of the nobility. Afterwards Quintus and Cælius Agellinus obtained that five fhould be elected out of the commonalty; the fenate at the fame time decreeing, that their number fhould not exceed nine. Notwithftanding Sylla added fix more, the eldeft whereof was called mafter of the college. They preceded all other orders of priefts, and were never depofed, nor any fubftituted in their places, though they fhould be convicted of the moft enormous crimes. When the Augur made his obfervations, he fat upon a high tower in a clear day, holding a crooked ftaff or liturus in his hand, clad in his foothfaying robe, called læna, with his face directly eaft: thus placed, he quartered out the heavens into fo many regions, obferving in which region the bird appeared, and then killing his facrifices, and having faid certain prayers, called effata, he proceeded to divination. The myftery of foothfaying came firft from the Chaldeans, who taught it the Greeks among whom Amphiaraus, Mopfus, and Colchis, were very eminent: from the Greeks it paffed to the Hetrurians, or Tufcans, and from the Tufcans to the Romans.

AU'GUST, called by the Romans, Sextilis, is the eighth month of the year, according to our method of computing, beginning with January. But is was the fixth with the Romans, who, for that reafon called it Sextilis; which name was changed to Auguftus, from Auguftus Cæfar, becaufe this emperor, being returned from the Gauls, in the 746th year of Rome, endeavoured to reform the calendar; on which occafion, and, in honour of whom, Sextilis was changed to Auguftus. Others alledge, the reafon was, becaufe he was firft made conful in this month, and becaufe he gained great victories in it. The Turks have alfo taken this name from the Greek or Roman calendars, fince they call it Agoftos.

This month was under the protection of the goddefs Ceres, and had the following remarkable feafts and facrifices On the firft, to Mars and Hope. 2. On account of Cæfar's fubduing Spain. 3. To Salus on the Quirinal mount. 7. To Hope. 8. To Soli Indigeti on the Quirinal mount. 10. To Ops and Ceres. 11. To Hercules in the circus Flaminius. 12. To the Lignapefia. 13. To Diana in the filva Aricina. To Vertumnus. The feaft of flaves and fervant-maids. 17. Portumnalia to Janus. 18. Confualia. The rape of the Sabine virgins. 19. The laft Vinalia. The death of Auguftus. 20. Vinalia Ruftica, the grand myfteries. 23. The Vulcanalia in the circus Flaminius. 24. The Feriæ of the moon. 25. Opibonfivæ, in the capitol. 27. Volturnalia. 28. To Victory in the court. 29. The ornaments of the goddefs Ceres are fhewn. About the twenty-firft of this month the fun enters the fign Virgo.

AUGUST, is reprefented in painting, by a naked man, with his hair difhevelled and drinking out of a cup. Before him is a kind of fan, which feems to be made of a peacock's tail. Upon the ground are three large melons. *Dant, Roffi, and Mounfaucon's Antiquities.*

AUGUSTE'UM *Marmor*, in the natural hiftory of the antients, a name given to the common green and white marble, fo frequent in ufe with us for tables, &c. and called by our artificers Egyptian marble. The Romans, however, made a diftinction between the differences of this marble, in regard to the difpofitions of its veins; for thofe pieces of it which had the white matter difpofed into a fort of arches, were called the Auguftan marble, while thofe which had the white in a more diffufed and regular form, were called the Tiberian marble. But thefe are too flight diftinctions; for the fame block of marble, nay, fometimes the compafs of the fame table, affords us both the Auguftan and Tiberian kind. *Hill's Hiftory of Foffils.*

A'VIS, a military order in Portugal, inftituted by Alphonfus I, after he had won the city of Evora from the Moors, called the fraternity of St. Mary of Evora: it was confirmed by Innocent IV. in 1234. They wore a black Ciftercian habit, and bare for their arms a crofs flower-de-lis in a field, Or, having for their creft, two birds fable. *Vafconcellos, Le Mire, Orig. Ordin. Equeft.*

AU'RA, in chemiftry, a certain fine and pure fpirit, found in every animal or vegetable body; but fo fubtile, as only to be fufceptible by its fmell and tafte, or other effects, not found in any other but that body. This Aura exhibits the proper characters of the body, by which it is accurately diftinguifhed from all others; but is itfelf too fine and thin to be feen by the eyes, though armed with a microfcope; or felt by the hands; and, withal, is extremely volatile; fo that, when pure and fingle, it flies off by its great mobility, mixes with the air, and is received into the great chaos of all volatiles, and there, ftill retaining its fame nature, it floats till it falls down in fnow, hail, rain, or dew, when it again enters the bofom of the earth, impregnates it with its prolific virtue, and is at length received by other juices of the earth, and conveyed into the bodies of animals and vegetables, and, by this revolution, paffes into new bodies, whofe mafs it animates and directs. This fubtile fluid is lodged in the oil of the body, to prevent its being diffipated and thrown off, and hence it is, that all the antient alchymifts fay fpirit refides in fulphur. *Boerh. Chem.*

AURI'CULA *Urfi, bear's ears*, or, as they are vulgarly called, Auriculas, in botany, a diftinct genus of plants, the characters of which are thefe: the flower is funnel-fhaped, confifting of one leaf, divided into feveral fegments at the rim. The piftil arifes from the cup, and is fixed in the manner of a nail to the hinder part of the flower. It afterwards ripens into a roundifh fruit, partly covered by the calx, and, opening at the top, is feen to be full of fmall feeds, fixed to a placenta.

Tournefort has enumerated twenty-feven fpecies of Auricula urfi.

The varieties, raifed by feeds from thefe fpecies, are endlefs, and are one of the greateft ornaments of the Dutch and Englifh gardens.

The feveral fpecies of Auricula, when not in flower, are known by their thick hoary leaves, which are ufually terminated by a point.

Though this herb is feldom kept in the fhops, it neverthelefs ftands recommended as a vulnerary, and as fuch is found of fervice, both for internal and external purpofes. Mixed with ointments and plaifters, it is reckoned good in ruptures. Four or fix fpoonfuls of the water, in which it has been boiled, taken every morning, are faid to cure coughs and ulcers of the lungs. The juice of its flowers removes fpots of the face, and beautifies the fkin; and with the fame intention fome diftil a water from it.

AURO'RA *(Dict.)*—The poets and painters have perfonified Aurora. Homer defcribes her as a young virgin having her hair difhevelled, and hanging loofe about her fhoulders; being of the colour of the pureft gold, fitting in a golden chair, with all her veftments of that hue and colour.

Virgil defcribes her, as coming, at the very inftant of fable night's departure, with one of her hands full of rofes, gilliflowers, and lilies, taken out of a bafket which fhe carries in her other hand, befprinkling them on the marble pavement of the lower heaven, adorning the fun with unfpeakable beauty.

She is alfo reprefented as a young virgin with carnation wings, and a yellow mantle, in her forehead a ftar, and golden funbeams from the crown of her head, riding upon Pegafus; with a phial of dew in one hand, and various flowers in the other, which fhe fcatters upon the earth.

She is alfo defcribed, holding in one hand a flaming torch, and drawn in a gorgeous chariot, befpangled with ftars, by winged Pegafus; which favour fhe is feigned to have obtained from Jupiter, by many importunate requests, presently after the downfal of Bellerophon.

She is fabled to be the herald and messenger of Phœbus, and as receiving her being from the virtue of his beams; and is no other than that rubicund and vermilion blush of the heavens, which the sun's first appearance works in the orient, and from thence descending beautifies our hemisphere, with such resplendency.

She is also painted in a purple robe, and a blue mantle fringed with silver.

Aurora *Borealis*.— Under this article in the Dictionary, we have mentioned several hypotheses to account for this phænomenon; we shall here give another, published by an anonymous author in the Universal Magazine.

Suppose the earth a great magnet,—that magnetic effluvia are constantly issuing great quantities from its north pole, and that these move from the north to the southward, in the direction of what is called the magnetic meridian—that these effluvia are of a martial or ferrugineous nature, nothing being magnetical but a substance of that kind, and vice versa.

Iron and sulphur, even in their gross bodies, mixed with a little water, are exceeding apt to take fire, much more so, when highly subtilized and attenuated.—The hot mineral waters, probably, arise from this, and so may volcano's—all chymists know with what eagerness sulphur acts upon iron.

Several burning mountains or volcano's have been discovered of late years, in and about the north-polar regions, which cast up sulphureous vapours, to an immense height.—There are springs near them the hottest in the world, their heat even equalling that of boiling water.—May not those sulphureous vapours, blended with the magnetic or ferrugineous effluvia, catch fire and fulgurate?—The vapour or fume of iron dissolved in spirit of vitriol is most readily set on fire.—May not the magnetic effluvia give them a kind of magnetic direction? We see, in fact, the lucid columns, or radiating flashes, of the Aurora borealis, almost always shot off from the north to the south, correspondent, in a great measure, to the magnetic meridian.—And I have constantly observed the corona, concourse, or concentration, if I may so call it, of these lucid rays near the zenith, so much to the east of it, as answered nearly to the western declination of the common magnetic needle; that is, a straight line, drawn from one to the other, would be nearly in the direction of the magnetic meridian.—I think I never observed the corona to the westward of it.—What seems not a little to confirm this notion is, that, during the appearance of a considerably great and vivid northern light, the magnetic needle suffers very great agitations; caused, probably, by the colluctation and explosion of the sulphureous and magnetic effluvia: this is more particularly observed in Sweden, and the northern parts of Europe, as being near the source of these effluvia.

But, farther, as we scarce ever see an Aurora borealis, but when the wind blows from some point, or other, between the east and west of the northern semi-circle, this, also, may help to drive the sulphureous, coruscating vapours southward.—And when the wind is very strong from E. N. E. or W. N. W. it may not a little alter their magnetic direction or current. I have several times observed, when a strong north-easterly wind hath blown some faint appearances of a northern light here and there, abundance of small, lucid, coruscating nubeculæ scattered up and down the hemisphere, now suddenly appearing, then disappearing; so that I imagined the wind had dispersed the fund of the luminous vapours; for we see such lucid, vibrating, broken, small clouds after the grand explosion, and at the end of a common Aurora borealis. Nay, frequently, such small, bright, flashing clouds are seen up and down the heavens, without any other appearance of an Aurora borealis, the lucid vapours being then but in small quantities, and much scattered: but it is remarkable, that these little, flitting, luminous clouds seemed always in a vibrating, tremulous motion, and moving very fast from north to south, though sometimes there was little or no wind. These nubeculæ were so extremely thin, that even stars of the third or fourth magnitude were seen through them.

Those northern lights are seen vastly more frequent, more bright, more beautiful, and variously coloured, in the northern parts of Europe, than here; and here much more lucid, large, and fragrant, than to the southward; because, in the polar regions, the magnetic effluvia are vastly more strong and copious, and the neighbouring volcano's send up immense quantities of sulphureous vapours (which cannot but rise very high in such a dense, cold atmosphere) and these, as it were, fermenting with one another, catch fire. In Sicily, and the surrounding seas, they see luminous appearances, very near resembling those of the Aurora borealis, when Vesuvius or Ætna burn; and these rays are commonly of various colours, as those of the northern lights, viz. red, yellow, greenish, crimson, &c. Possibly both the one and the other are tinged by some mineral substances from the volcano's. For, though globules of rain may reflect light of different colours, there seems to be nothing in the matter of an Aurora borealis that is apt to do it: besides, it is unquestionable that the Aurora borealis shines by its own light, and not from the sun, as well as the lights of Vesuvius. We well know that different minerals will tinge flame of different colours. May not then the diversity of colours of an Aurora borealis be another argument that it arises from the exhalations of volcano's?

The sulphureous vapours of vulcano's are shot up to an inconceivable height (sometimes even great stones are thrown up from them to four or five hundred feet, and the ashes vastly higher, so as oftentimes to be carried by the wind, fifty or an hundred miles, nay, leagues) so high, indeed, that they may retain very little gravity, their centripetal force continually decreasing, as their distance from the earth increases—and their centripetal force will be much increased by their revolving about the axis of the earth, in a very large circle.—But, farther, sulphureous vapours have a kind of a vis centrifuga, and will rise in vacuo, whereas all other vapours sink. It is certain, the fumes of gun-powder will rise to the top of a tall exhausted receiver, and even prove lucid, though the gun-powder itself doth not flash. Thus, the vapours over Vesuvius are sometimes very lucid, though the crater may not, at that time, actually belch out flame.

We know sulphureous vapours are sometimes carried to an astonishing height, and collected into vast bodies of inflammable matter, far above the gross terrestrial atmosphere.—The great Dr. Halley, from very just observation, estimated the meteor of the 19th of March, 1718-19 (which cast such an amazing brightness, and made such a very loud displosion) to be very near seventy miles perpendicular altitude, above the surface of the earth; whence it was seen over a great part of Europe, at one and the same time. Now if such a gross body of sulphureous vapours, as this, could be sustained at the very top of our atmosphere, or even in the æther above it, how much higher may we suppose the mere subtile vapour of the lumen boreale to be carried?—This will account for the great height and distance some of the northern lights are seen at, without having recourse to monsieur Mairan's zodiacal light, or professor Euler's impulsion of the sun-beams.

It is possible these vapours, when carried to such a vast height, and in a medium so exceeding rare, may actually become lucid, especially when mixed with the ætherial nitre, as the fumes of gun-powder mount and shine in vacuo. Indeed, this phænomenon of the gun-powder suggests to me, that a highly subtilized aerial nitre always enters the composition of an Aurora borealis (for it is every-where diffused throughout the whole atmosphere) and nothing is more like the vivid pearl-coloured flashes of an Aurora, than a deflagration of nitre and sulphur; and the flame may be tinged with red, green, yellow, &c. by the addition of different minerals. Certainly, nitre, sulphur, and iron are greatly disposed to inflame and coruscate. The Arctic regions abound with nitre.—The northern lights are vastly most frequent in cold seasons, when the atmosphere is greatly stocked with nitre.—It is scarce to be doubted, but that common lightning abounds with all these principles.

Hence may arise another conjecture, that, as lightning is certainly of an electrical nature, so possibly may be the matter of an Aurora borealis.—The incredible swiftness of its flashes, and the instantaneous propagation of its coruscations through all the northern part of the hemisphere, seem to favour such a thought. May the luminosity be conveyed on the magnetic effluvia, as the electric on an iron wire? But this is, I fear, indulging too far in whimsy.

The accounts we have had from Iceland, Greenland, and other places within the Arctic circle, by the whale-fishers, and some others, that have been given by the jesuits, &c. who travelled to the north-east parts of China and Tartary, assure us, that there are several volcano's in these parts, some of which have broken out within these few years. Is it not then the fresh erruptions of some of these volcano's, that have produced the northern lights, so common of late years? Before this present century began, it is certain, they did not appear even in Sweden, Norway, and Lapland, or, at least, very seldom; whereas monsieur Maupertuis says, they are now almost constant in these countries, during the winter months. Is it not then the more frequent and violent eruptions of these volcano's, that make the Aurora borealis more common and more illustrious? And is it not the cessation of these eruptions, that puts a stop to these luminous phænomena, as we know they cease for weeks, for months, for years; and that too, when all other circumstances seem to favour their productions? They appear vastly more frequent and great, in the most northern countries, as they lie near the source of the magnetic effluvia and sulphureous vapours. Doth not an appearance of a kind of these nocturnal lights and coruscations in Sicily, &c. on the eruption of Vesuvius, and sometimes merely from the sulphureous exhalations issuing from it, without actual flames, seem to confirm this opinion? Moreover, it is not altogether improbable, that sulphureous exhalations from more southern volcano's, swimming on the top of the atmosphere, and revolving, with the earth, round its axis, may be carried towards the pole, and contribute somewhat to the formation of an Aurora borealis?

Mr. de Maupertuis, in the relation of his voyage to the north, describes the Auroræ boreales, which appear in Lapland, during the winter, in this manner: " If the earth, says he,

makes

makes a dismal appearance in these climates, the heavens exhibit a most delightful prospect. As soon as the nights begin to grow dark, lights of a thousand colours and a thousand forms bespangle the sky, as if they were ambitious of compensating the earth for the absence of the sun. These lights have no certain situation as in the southern countries; for, though we often see a luminous arch fixed towards the north, yet they seem indifferently to possess every region of the sky. They begin sometimes with forming a kind of mantle, of clear and moveable light, the extremities of which terminate the horizon, and which rapidly overspread the whole sky with a motion, resembling that of a fisherman's net, preserving a sensible perpendicular direction towards the meridian. After these preludes, all lights generally unite near the zenith, and form a kind of corona.

Sometimes streams of light like those we see in France, towards the north, are seen towards the south; sometimes they are seen in the north and south both together; their summits meet, as their extremities separate, in descending towards the horizon. I have seen some quite of another direction, whose summits touched each other almost to the zenith; some have, besides, several concentric arches. Their summits all point towards the meridian, but with some declination towards the west, but that varies and is at sometimes insensible; some of these arches, after having extended to their largest amplitude above the horizon, open, and form the half of a large ellipsis.

There would be no end of enumerating all the forms these lights assume, and the motions in which they are directed; they sometimes emit streaks of scarlet.

Mr. de Maupertuis tells us, that, notwithstanding his being accustomed to these phænomena, one he saw at Oswer Tornea, on the 18th of December, 1736, drew his admiration; towards the south a large tract of the heavens appeared tinged with as lively a red, as if the whole constellation of Orion had been dipped in blood. This light, which was at first fixed, afterwards began to move, put on different colours and formed a dome, whose summit was a little inclined towards the south-west of the zenith, and that the brightest moon-light did not obscure this phænomenon. Mr. de Maupertuis observes, that red lights are uncommon in that country, and that the people look on them as ominous. The same learned person has given a very elegant solution of a geometrical problem relating to the Aurora borealis, in the Mem. Academ. 1733.

Mr. Monnier, in his Astronomical Institutions, observes, as well as M. de Maupertuis, that in Sweden there is scarce a winter-night, wherein these Auroræ boreales are not visible, even in every region of the hemisphere; a circumstance which ought particularly to be attended to, for the better explanation of these phænomena. M. Monnier thinks the matter of the Auroræ boreales analogous to that of the tails of the comets.

AU'RUM *musivum*, the antient name of what has been since called Aurum mosaicum. This old name is brought into use again in the London Dispensatory; the preparation directed to be made in the following manner: take tin one pound, flour of brimstone seven ounces, sal armoniac and purified quicksilver, of each half a pound; melt the tin, and add to it the quicksilver; and, when this is cold, reduce it to powder, and mix it with the other ingredients: then sublime the compound in a matrass, and the Aurum musivum will be found under the part sublimed, with a small quantity of foulness at the bottom. *Pemberton's Lond. Disp.*

AURUM *sophisticum*, mimic gold, a chymical preparation, made as follows: take fine distilled verdigrease, eighteen ounces; crude Alexandrian tutty, four ounces; borax, twelve ounces; salt-petre, one ounce and an half; pulverize, and mix them all together, tempering them with oil, to the consistence of a plaister; then put a German crucible into a wind furnace, heat it red-hot, and, putting your mass into it, let it be covered, and the furnace filled with coals over the crucible. When the mass is melted, let it cool of itself, then break the crucible, and you will find, at the bottom, a fine regulus, like gold, weighing about four ounces; which, being malleable, may be wrought into any form.

AUX, in astronomy, that point in a planet's path, or orbit, wherein it is at its greatest distance from the center of the world.

Hence the ancients, who considered the earth as the center, use Aux in the same sense with apogee. Among the moderns, on the contrary, it denotes the aphelion.

Some also use Aux to denote the arch of the ecliptic, intercepted between the first point of Aries, and the point wherein the sun, or a planet, is at its greatest distance from the earth.

AWA'RD (*Dict.*)—

1. The arbitrators ought to give their Award within the time limited by the compromise, and it will be null, if it were given after the said time is expired; for their power is then at an end, and they are no longer arbitrators.

2. The parties may give power to the arbitrators to prolong the time; and, in this case, their power lasts during the time of their prorogation.

4. If the compromise regulates a certain time for instructing the cause which the arbitrators are to decide, they cannot give their Award till the said time is expired.

4. The arbitrators having once given their Award, they cannot retract it, nor change any thing in it; for the compromise was only to give them power to give an Award; and, when that is done, their power is at an end; but their power is not at an end by an interlocutory sentence, or an incident in the cause; and they may give different interlocutory sentences, on such incidents, as often as occasion requires.

5. If there are several arbitrators named by the compromise, they cannot give their Award, unless they all see the process, and give judgment of it together; and, although the greater part had given the Award in the absence of one who was named with the others, yet the Award would be null, because the absent person ought to have been one of the judges; and, had he been present, he might have been able, by his reasoning, to bring the other arbitrators over to his opinion.

6. The arbitrators can judge of nothing else, besides that which is submitted to their judgment by the compromise; and they must observe the conditions which are there prescribed; and, if they judge otherwise, their Award is null.

Where there appears a manifest error in the body of an Award, in some cases there may be relief against it in equity; but, where the error does not appear without unravelling of it, and examining into matters of account, not relievable. 1 *Vern.* 158.

A'ZAB, in the military orders of the Turks, signifies a particular body of the soldiery taken in, or added first to the janizaries, but now become a separate body from them.

The word, in the oriental languages, signified an unmarried person; and the original order of those was, that they should be single men.

AZE'LFOGE, in astronomy, a fixed star of the second magnitude, in the Swan's tail.

Hevelius assigns its longitude, for the year 1700, ♓ 1°. 16'. 45''. and its latitude northward, 59°. 57'. 53''.

A'ZIMUTH *Compass*.—Under the article *Magnetical* NEEDLE, in the Dictionary, we have given a description of a new sea-compass, which is the invention of the learned Dr. Knight; we shall here add the contrivance of the ingenious Mr. Smeaton whereby the Doctor's compass answers the purposes of an Azimuth and amplitude compass.

The cover of the wooden box being taken off, the compass is in a condition to be made use of in the bittacle, when the weather is moderate: but if the sea runs high, as the inner box is hung very free upon its centers (the better to answer its other purposes) it will be necessary to slacken the milled nut, placed upon one of the axes that supports the ring, and to lighten the nut on the outside, that corresponds to it. By this means, the inner box and ring will be lifted up from the edges, upon which they rest, when free; and the friction will be increased, and that to any degree necessary, to prevent the too great vibrations, which otherwise would be occasioned by the motion of the ship.

To make the compass useful in taking the magnetic Azimuth, or amplitude of the sun and stars, as also the bearings of headlands, ships, and other objects at a distance, the brass edge, designed at first to support the card, and throw the weight thereof as near the circumference as possible, is itself divided into degrees and halves; which may be easily estimated into smaller parts, if necessary. The divisions are determined by means of a cat-gut line, stretched perpendicularly with the box, as near the brass edge as may be, that the parallax, arising from a different position of the observer, may be as little as possible.

Underneath the card are two small weights, sliding on two wires, placed at right angles to each other; which, being moved nearer to, or farther from, the center, counterballance the dipping of the card in different latitudes, or restore the equilibrium of it, where it happens by any other means to be got too much out of level.

There is also added an index at the top of the inner box, which may be put on, and taken off, at pleasure; and serves for all altitudes of the object. It consists of a bar, equal in length to the diameter of the inner box, each end being furnished with a perpendicular stile, with a slit parallel to the sides thereof: one of the slits is narrow, to which the eye is applied, and the other is wider, with a small cat-gut stretched up the middle of it, and from thence continued horizontally from the top of one stile to the top of the other. There is also a line drawn along the upper surface of the bar. These four, viz. the narrow slit, the horizontal cat-gut thread, the perpendicular one, and the line on the bar, are in the same plane, which disposes itself perpendicular to the horizon, when the inner box is at rest, and hangs free. This index does not move round, but is always placed on, so as to answer the same side of the box.

When the sun's Azimuth is desired, and his rays are strong enough to cast a shadow, turn about the wooden box, till the shadow of the horizontal thread, or (if the sun be too low) till that of the perpendicular thread, in one stile, or the light through the slit in the other, falls upon the line in the index bar, or vibrates to an equal distance on each side of it, gently touching

touching the box, if it vibrates too far: obſerve, at the ſame time, the degree marked upon the braſs edge by the cat-cut line. In counting the degree for the Azimuth, or any other angle that is reckoned from the meridian, make uſe of the outward circle of figures upon the braſs edge; and the ſituation of the index bar, with regard to the card and needle, will always direct upon what quarter of the compaſs the object is placed.

But, if the ſun does not ſhine out ſufficiently ſtrong, place the eye behind the narrow ſlit in one of the ſtiles, and turn the wooden box about, till ſome part of the horizontal, or perpendicular thread, appears to interſect the center of the ſun, or vibrate to an equal diſtance on each ſide of it, uſing ſmoked glaſs next the eye, if the ſun's light is too ſtrong. In this method, another obſerver will be generally neceſſary, to note the degree cut by the nonius, at the ſame time the firſt gives notice that the thread appears to ſplit the object.

From what has been ſaid, the other obſervations will be eaſily performed; only, in caſe of the ſun's amplitude, take care to number the degree by the help of the inner circle of figures on the card, which are the complements of the outer to 90, and, conſequently, ſhew the diſtance from eaſt or weſt.

The Azimuth of the ſtars may alſo be obſerved by night; a proper light ſerving equally for one obſerver to ſee the thread, and the other the degree upon the card.

It may not be amiſs to remark farther, that, in caſe the inner box ſhould loſe its equilibrium, and, conſequently, the index be out of the plane of a vertical circle, an accurate obſervation may ſtill be made, provided the ſun's ſhadow is diſtinct; for, by obſerving firſt with one end of the index towards the ſun, and then the other, a mean of the two obſervations will be the truth.

Plate IV. *fig*. 33. is a perſpective view of the compaſs, when in order for obſervation; the point of view being the center of the card, and the diſtance of the eye two feet.

A B is the wooden box.

C and D are two milled nuts; by means whereof, the axis of the inner box and ring are taken from their edges, on which they move; and the friction increaſed, when neceſſary.

E F is the ring that ſupports the inner box.

G H is the inner box; and

I is one of its axes, by which it is ſuſpended on the ring E F.

K L is the magnet or needle; and

M a ſmall brace of ivory, that confines the cap to its place.

The card is a ſingle varniſhed paper, reaching as far as the outer circle of figures, which is a circle of thin braſs; the edge whereof is turned down at right angles to the plane of the card, to make it more ſtiff.

O is a cat-gut line, drawn down the inſide of the box, for determining the degree upon the braſs edge.

P Q R S is the index bar, with its two ſtiles and cat-gut threads; which, being taken off from the top of the box, is placed in two pieces, T and V, notched properly to receive it.

W is a place cut out in the wood, ſerving as an handle.


Fig. 1
Bac
The Whole Depth
Balance
Fig. 3
Fig. 2
Balance
Fig. 4
Fig. 5
Balance
Fig. 6
Balance
Fig. 7
Balance
Fig. 8
Balsamina
Barry pily
Fig. 11
Fig. 10
Burdock
Fig. 12
Bastion
Fortress
Fig. 9
The Butterfly
Fig. 32
Fig. 33
Belemnitæ
Fig. 34
The Bear
Fig. 36
Bidens
Fig. 37
Bistort
The Beaver
Fig. 35

B.

B Is one of thoſe letters which the eaſtern grammarians call labial, becauſe the principal organs, employed in its pronunciation, are the lips. It has a near affinity with the other labials P and V, and is often uſed for P, both by the Armenians and other orientals; as in Betrus for Petrus, apſens for abſens, &c. and by the Romans for V; as in amabit for amavit, berna for verna, &c. whence aroſe that jeſt of Aurelian, on the emperor Bonoſs, Non ut vivat natus eſt, ſed ut bibat.

B, in muſic, *b* is uſed to denote a flat, or the lowering of a ſound by a ſemi-tone minor. Thus A *b*, or *b* A, is the flat of A, or the ſemi-tone minor below A.

B *b*, quadro, or ♮, in the ſcale of muſical notes, ſignifies the ſound which is a tone above A, and a ſemi-tone below C.

BAA'L, or Bel, an Hebrew and Chaldaic word, which ſignifies lord, or mighty. It was the name of the idol of the Moabites and Phœnicians, and of moſt of the nations that bordered upon the Jews. It ſeems that the idolaters, amongſt them, pretended to adore the true God, under the name and figure of Baalim, Hoſ. ii. 16, 17. The Grecians, who were accuſtomed to take the eaſtern divinities for their own, called this Bel ſometimes Jupiter, ſometimes Mars; but the truth is, that the Babylonians underſtood by it either the ſtars and hoſt of heaven, or ſuch kings and heroes, whoſe memory they had conſecrated to poſterity, by a religious worſhip. The Phœnicians adored the ſun, under the names of Baal and Moloch. It is thought, this idol was the firſt invented by ſuperſtition, and the original worſhip of idolatry. *Selden de Diis Syris.*

BAALGA'D, Bagad, or Begad, an idol of the Syrians, which they accounted the goddeſs of fortune. *Kercher.*

BAA'RAS, Baharas, or Bacharas, a miraculous kind of root, ſaid to grow on Mount Lebanon, in a valley called Baaras, whence the name, near the city Macheron.

Joſephus repreſents it as of a flame colour, and emitting rays of light in the night-time, like a ſtar, but diſappearing in the day; on which footing, it ſhould make a vegetable phoſphorus. This property it may be ſuppoſed to derive from the ſoil, which abounds in bitumen; not unlike the plains of Puzzuoli; which, being replete with ſulphur, will flaſh under the horſes feet. But what the hiſtorian adds, concerning the difficulty and danger of pulling up this root, its ſhunning the hand, and retiring under-ground, with the extraordinary means uſed to ſtop it, and the expedient to pull it up, are ſo much on the marvellous, that we dare not relate them. The root, it ſeems, was highly prized for its virtue in curing epilepſies, &c.

BABYLO'NICS, *Babylonica*, in literary hiſtory, a fragment of the antient hiſtory of the world, ending at 267 years before Chriſt; and compoſed by Beroſus, or Beroſſus, a prieſt of Babylon, about the time of Alexander.

Babylonics are ſometimes alſo cited in ancient writers, by the title of Chaldaics.

The Babylonics conſiſted of three books, including the hiſtory of the ancient Babylonians, Medes, &c. but only a few imperfect extracts are now remaining of the work, preſerved chiefly by Joſephus and Syncellus, where all the paſſages of citations of ancient authors, out of Beroſus, are collected with great exactneſs. Annius of Viterbo kindly offered his aſſiſtance to ſupply the loſs, and forged a complete Beroſus out of his own head. The world has not thanked him for his impoſture. *Fabric. Bibl. Græc.*

BAC, or Back, in brewing, a large flat kind of tub, or veſſel, wherein the wort is put to ſtand and cool before boiling. *Savar. Dict. de Com.*

The ingredients of beer paſs through three kinds of veſſels. They are maſhed in one, worked in another, and cooled in a third, called Bacs or coolers.

To gauge a brewer's Bac.—Moſt Bacs have their ſides ſtraight; and, in caſe the ſides be not ſtraight, but make either an obtuſe, or acute angle, with the bottom, you muſt then be careful to take the true length and breadth in the middle of every inch in depth; from whence the area may be found upon every tenth.

For finding the area of the Bac, obſerve this rule: multiply the length by the breadth, and divide by 282: this gives the contents in ale gallons.

To find the true dip of a Bac.—Becauſe Bacs are not placed level, but ſloping, for conveniency of drawing off the wort; therefore, if you ſhould dip in too deep a place, you would wrong the ſubject, and, if in too ſhallow a place, you would wrong the king; to remedy which, take as many dips as you think convenient, and add them all together, and divide them by the number of dips, which will give a mean depth: when this is done, you muſt make trial in many places of the Bac, till you find a dip that anſwers your mean depth exactly; right againſt which, at the ſide of the Bac, make a mark, or notch, with a knife, and let that be your conſtant true dipping-place.

The bottoms of common brewers large Bacs generally warp, after they have been a little time uſed, and become more and more uneven, as they grow older, eſpecially ſuch as are not every-where well and equally ſupported: many of them are ſo large and uneven, that it is hardly poſſible to find a true medium of the depth of the wort, without taking a very great number of depths; beſides, ſome are ſo ſituate, that it is difficult to take depths in every part, where it may be neceſſary; and therefore it is a common practice to take one depth at a place in the back (cloſe to the ſide) which may be always moſt conveniently come at; then ſee all the wort let down into a tun, in which it may be exactly gauged, and (if the dip taken in the Bac doth not happen to be a mean one) mark, on the ſide of the Bac, ſuch addition or abatement as will make the gauge of the wort in the Bac equal to the gauge of the wort in the tun, which is called ſetting a Bac, by ſeeing the wort come down; and this is frequently done, becauſe moſt large Bacs are continually ſetting more one way than another. Beſides, the dimenſions of large Bacs, for want of proper inſtruments, are generally taken with inched tapes, which are ſeldom very exactly divided, and the alteration of the weather affects them in their lengths, and a very ſmall error, in the dimenſions of ſuch a large veſſel, cauſes a very conſiderable one in the area: but, by ſetting the Bac as above, there will be a compenſation in the depth, for any error that may happen in taking the other dimenſions.

Bac, in the diſtillery, is a veſſel in which the liquor to be fermented is put.

To gauge and tabulate a diſtiller's Bac.—*Plate* VI. *fig.* 1. repreſents a Bac, whoſe baſes are elliptical and unequal, but alike ſituated.

Find the center of the Bac, and in that center ſtrike a nail, as at *w*. Then, with a line and a bit of chalk, deſcribe a circle; this done, take a line and find the tranſverſe diameter, by holding the line from L to M, over the center *w*, and, at L and M, make a mark. Then find the conjugate diameter as Y Z, and mark it with chalk. Then take the depth in that place, where the officer propoſes to take his gauge, which ſuppoſe at *m*, and the depth from *m* to *w* is = to 36 inches; at which place make a notch. Then draw ſtraight lines with chalk, from M to B, from L to A, from Y to N, and from Z to O; the Bac being thus quartered, proceed to take the diameters thus: on the ſtraight lines make a mark in the middle of every ſix inches (with your chalk) as at A B, C D, EF, G H, I K, L M, which are the ſix tranſverſe diameters (as the depth of the bac is thirty-ſix inches) and, for the ſix conjugate diameters, make the like marks at N O, PQ, R S, TV, WX, Y Z; then take the ſeveral lengths and breadths in inches, and enter them on a piece of paper, as under:

Depth in inches.	Length, or tranſverſe diameters.	Breadth, or conjugate diameters.
6	A B = 62	N O = 32
6	C D = 65	P Q = 33
6	E F = 69	R S = 35
6	G H = 72	T V = 36
6	I K = 75	W X = 37
6	L M = 79	Y Z = 39

Then, to find the drip of the Bac, take a regular veſſel, and fill it with water, and continue pouring in water, till you have juſt covered the bottom of the Bac; then, with your rule, dip it, to know how much it wets; which ſuppoſe to be 1.5 inch, and that the quantity of water, poured in to cover the bottom, is juſt fifteen gallons.

Now, to find the areas of the ſeveral diameters, multiply the diameters ſixty-two by thirty-two, and that product divided by 294 (the cubical inches in a wine gallon) the quotient will be the area = to 6.74 gallons, which multiply by ſix, that product will be 40.44 gallons = to the content of the firſt ſix inches. By this method, the other five areas are found: but you muſt obſerve, as the drip of the Bac is found to be 1.5 inches inch, it muſt be ſubtracted from the whole depth thirty-ſix inches, and the remainder will be 34.5 inches. See the whole work, as under.

Inches.	Longeſt diameter. Inches.	Shorteſt diameter. Inches.	Mean area in wine gallons.		Inches.		Content of the ſeveral depths in wine galls.
6 —	62 —	32 —	6.74	×	6	is	40.44
6 —	65 —	33 —	7.29	×	6	is	43.74
6 —	69 —	35 —	8.21	×	6	is	49.26
6 —	72 —	36 —	8.81	×	6	is	52.86
6 —	75 —	37 —	9.43	×	6	is	56.58
4.5 —	79 —	39 —	10.47	×	4.5	is	47.11
1.4 The drip	—	—	—		—	is	16.00
36 The whole depth.						The content is	305.99

By this work it appears, that the Bac contains 305.99 gallons, and that the laſt mean area 10.47 gallons is multiplied by 4.5, becauſe the depth of the drip is ſubtracted from the laſt ſix inches.

To tabulate the Bac, ſet down the content 305.99 gallons, and ſubtract the ſeveral mean areas, as often as you multiplied them, and the ſeveral remainders will give you the contents of the Bac at any dry inch, from top to bottom; but, to prove the truth of the work, ſubtract the ſeveral contents of the ſeveral depths from the content of the Bac, and it veriſies your work at every ſix inches, and likewiſe at the laſt 4.5 inches, with the content of the drip.

BAC-MAKER is one who makes liquor-bacs, under-bacs, coolers, maſh-tuns, and working tuns, for the brewers. The workmanſhip is partly carpentry, in a particular manner; for it muſt be high enough to hold liquor; and partly cooperage, viz. the maſh-tun, or vat, which is hooped. See COOPERAGE.

There are not many of this trade, and it requires chiefly ſtrength, with a little art. A ſmall ſtock of ſtuff, beſides tools, will ſet a man up tolerably well; but, with 200 *l.* or 300 *l.* he will make a good figure in buſineſs.

BACCHANA'LIA (*Dict.*)—The Bacchanalia are ſometimes alſo called orgia, from the Greek ὀργὴ, fury, tranſport; by reaſon of the madneſs and enthuſiaſm wherewith the people appeared to be poſſeſſed at the time of their celebration.

They were held in autumn, and took their riſe from Egypt; whence, according to Diodorus, they were brought into Greece by Melampus.

The form and diſpoſition of the ſolemnity depended, at Athens, on the archon, and was at firſt exceedingly ſimple, but, by degrees, became incumbered with a number of ridiculous ceremonies, and attended with a world of diſſoluteneſs and debauchery; inſomuch that the Romans, who grew aſhamed of them, ſuppreſſed them, by a ſenatus-conſultum, throughout all Italy.

The women had a great ſhare in the ſolemnity, which is ſaid to have been inſtituted on their account; for a great number of them attended Bacchus to the conqueſt of the Indies, and carried in their hands the thyrſus, i. e. a little lance, covered with ivy and vine-leaves, ſinging his victories and triumphs where-ever they went: the ceremony was kept up, after Bacchus's deification, under the title of Bacchanalia; and the women were inſtalled prieſteſſes thereof, under that of bacchæ or bacchantes.

Theſe prieſteſſes, at the time of the feaſt, ran through the ſtreets, and over the mountains, covered with tygers ſkins, their hair diſhevelled, their thyrſus in one hand, and torches in the other, howling and ſhrieking.

Men and women met promiſcuouſly at the feaſt, all perfectly naked, except for the vine-leaves and cluſters of grapes which bound their heads and hips: here they danced and jumped tumultuouſly, and, with ſtrange geſticulations, ſung hymns to Bacchus, till, weary and giddy, they tumbled down diſtracted.

BACCHA'NTES, the name of ſuch women as followed Bacchus in the conqueſt of the Eaſt-Indies. It was afterwards given to the female prieſts of that falſe god, who celebrated his feaſt covered with ſkins of tygers or panthers, and running all the night, ſome with their hair looſe, with torches and links in their hands; others crowned with vine and ivy-leaves, carrying a thyrſus or ſtick covered with the like leaves. They had along with them cymbal-players, drummers, and others with hunting-horns; and they themſelves made a terrible noiſe, ſhouting and bawling, as they went along. The men were apparelled like ſatyrs, ſome riding upon aſſes, and others led he-goats to ſacrifice them. *Tertul. St. Auſtin.*

BACCHA'RACH *Wine*, a name of a particular kind of wine by ſome eſteemed a kind of Rheniſh; but Portzius, who has written expreſly on the ſubject, obſerves, that it differs from all the common Rheniſh wines, in colour, odour, taſte, and virtue. When the wine is firſt made, it is of a yellowiſh colour; but they take off this, by means of ichthyocolla, cut and ſteeped in fair water for ten or twelve hours, and then torn to pieces, and mixed with the wine, but only in a ſmall quantity. They add only ſo much of the wine, as they ſuppoſe capable of diſſolving it; and then, letting it ſtand ſix or ſeven days, they put it into a ſieve; and, pouring ſome more wine on it, they waſh it through; and, thus percolated, they pour it out of one veſſel into another, till it froths; they then pour the whole into a proper quantity of wine, to clarify it and take away its colour. Some add, at the ſame time, a quantity of ſand, or of powdered white glaſs, which being heavy, and entangling themſelves in the foul matter of wine, carry it to the bottom with them. When they pour this ſolution into the veſſel, they uſe a little ſtick with a piece of thin board perforated at the end of it, with which they beat the wine in the veſſel, to mix the ſolution of iſinglaſs every-where with it. Four or five days ſtanding quiet, after this, ſeparates all the fæces, and the wine is then drawn out into other veſſels, pure and colourleſs. *Portzius de Vin. Rhen.*

BACCHUS in the antient mythology, a god of the heathens. There were two eminent gods of this name; the Ægyptian Bacchus, ſon of Ammon, the ſame as Oſiris; and the Theban Bacchus, ſon of Jupiter and Semele.

The Ægyptian Bacchus was bred at Niſa, a city of Arabia Felix, and conquer'd the Indies. Orpheus carried his worſhip into Greece, and, out of flattery, attributed the wonders related of him to a prince of the race of Cadmus.

The Theban Bacchus, on the death of his mother Semele, which was effected by the arts of jealous Juno, in the ſeventh month of her pregnancy, was taken out of her womb by Jupiter, and ſewed up in his thigh, where he completed the time of ripening him for birth. Euripides, in his Bacchantes, ſays, that Jupiter hid the child in a cloud, to conceal him from his wife. Euſtathius tells us, he was bred on mount Meros (μηρὸς) which ſignifies thigh, and from hence it is probable the fable had its origin.

Bacchus went to the conqueſt of the Indies, at the head of a number of men and women, armed with thyrſi and drums. The people, terrified at the multitude and noiſe, received him as a god; and why ſhould they oppoſe him? He did not come to load them with chains, but to teach them the culture of the vine. He is ſaid to have performed wonders in the war of the giants.

Painters repreſent him by the figure of a young man, beardleſs, full-cheeked, crowned with ivy or vine leaves, a thyrſus in one hand, and bunch of grapes, or cup, in the other.

BACCI'FEROUS *Plants*, are ſuch as bear berries, i. e. fruit covered with a thin membrane, wherein is contained a pulp, which grows ſoft and moiſt, when ripe, and incloſes the ſeed within its ſubſtance.

Bacciferous trees Mr. Ray divides into four kinds. 1. Such as bear a caliculate, or naked berry; the flower and calix both falling off together, and leaving the berry bare; as the ſaſſafras trees, &c.

2. Such as have a naked monopyreneous fruit, that is, containing in it only one ſeed; as the arbutus, terebinthus, lentiſcus, &c.

3. Such as have a naked but polypyreneous fruit, that is, containing two or more kernels or ſeeds within it; as the jaſminum, liguſtrum, &c.

4. Such as have their fruit compoſed of many acini, or round ſoft balls, ſet cloſe together like a bunch of grapes; as the uva marina, rubus vulgaris, rubus Idæus, and the rubus minor fructu cæruleo.

BACK *of a chimney*, the hind part between the jaumbs and the hearth, uſually formed of brick, ſometimes tiles.

Iron BACK, is a large plate of caſt-iron, frequently adorned with figures in low relievo, ſerving not only to preſerve the ſtone-work of a chimney-back, but alſo to reflect the heat of the fire forwards. For the method of caſt-iron Backs; See IRON and FOUNDERY.

BACK *of a hip*, among builders, denotes the two planes on the outſide of a hip, lying parallel with the adjoining ſide and end of the roof. *Neve, Build. Dict.*

BACK-PAINTING, the method of painting metzo-tincto prints, paſted on glaſs, with oil-colours.

The art conſiſts chiefly in laying the print upon a piece of crown-glaſs, of ſuch a ſize as fits the print.

In order to do this, take your print and lay it in clean water for two days and two nights, if the print be on very ſtrong, cloſe, and hard gummed paper; but, if upon an open, ſoft, ſpungy paper, two hours will ſometimes ſuffice, or more, according as the paper is.

The paper or picture having been ſufficiently ſoaked, take it out and lay it upon two ſheets of paper, and cover it with two more, and let it lie there a little to ſuck out the moiſture.

In the mean time, take the glaſs the picture is to be put upon, and ſet it near the fire to warm; take Straſburg turpentine, warm it over the fire, till it is grown fluid; then with a hogs hair bruſh, ſpread the turpentine very ſmoothly and evenly on the glaſs.

When this has been done, take the metzo-tincto print from between the papers, and lay upon the glaſs; beginning firſt at one end, rubbing it down gently as you go on, till it lie cloſe, and there be no wind bladders between.

Then, with your finger or fingers, rub or roll off the paper from the backſide of the print, till it looks black, i. e. till you can ſee nothing but the print like a thin film left upon the glaſs, and ſet it by to dry.

When it is dry, varniſh it over with ſome white tranſparent varniſh,

varnish, that the print may be seen through it, and then it is fit for painting.

Note, You must be very careful in rubbing or rolling the paper off the print, so as not to tear it.

You may, instead of soaking your prints two days and two nights, roll them up and boil them for about two hours, more or less, according to the quality of the paper, in water, and that will render it as fit for rubbing, rolling or peeling, as the other way.

This being done, and your oil colours prepared, ground very fine, and tempered up very stiff, lay, on the backside of the transparent prints, such colours as each particular part requires; letting the master lines of the print still guide your pencil, and so each particular colour will lie fair to the eye on the other side of the glass, and look almost as well as a painted piece, if it be done neatly.

The shadows of the print are generally sufficient for the shadow of every colour, but, if you have a mind to give a shadow by your pencil, then let the shadows be laid on first, and the other colours afterward.

In laying on colours in this kind of backside-painting, you need not be curious as to the laying them on smooth. This is not at all requisite here, where the chief aim is only to have the colours appear well on the foreside of the print; and therefore the only care to be used in this work, is to lay the colours on thick enough, that its body may strike the colour of it plainly through the glass.

BA'CON's *Philosophy*.—Lord Bacon, baron of Verulam, and viscount of St. Albans, was born in the year 1560. He gave marks in his youth of what his manhood would produce. Queen Elizabeth was an admirer of his remarkable sagacity. He studied the Aristotelian philosophy at Cambridge, and, before he was sixteen years of age, discovered the absurdity of that jargon in vogue at that time. He afterwards applied himself to the study of the law; and his merit raised him to the dignity of lord chancellor, under king James I. He was accused of bribery, and, the king refusing him protection, was fined by the house of lords, stripped of his chancellorship, and cast into prison. He was soon after reinstated in his honours and fortune, but what he had undergone gave him a dislike to business, and increased his passion for study. At last he died aged 66 years, poor, and in very mean circumstances.

No man has contributed more to the advancement of learning than lord chancellor Bacon: he saw the imperfection of the philosophy of the schools, and taught the only way to amend it. This great man, indeed, did not know nature, but he knew and pointed out all the ways that lead to her. He entertained an early contempt for what the universities called philosophy, and did every thing in his power, to prevent societies, instituted for the improvement of human reason, from continuing to spoil it by a heap of impertinent terms, substantial forms, &c. which not only had made ignorance to be reverenced, but was, by a ridiculous mixture with religion, rendered sacred.

He composed two works with a design to improve the sciences, and carry them to perfection. In the first, intitled de Augmentis Scientiarum, he shews the state of learning, and points out a method of carrying it to greater perfection; but adds, that we must never hope to carry our discoveries to any great length, unless other methods were pursued, than those then in use. He shews that the logic, then taught in the schools, was fitter for wrangling, than to direct the mind in its search after truth. Aristotle, says he, from whom we have this art, has proceeded on wrong principles; he has made his physics conformable to his logic, instead of making his logic conformable to his physics; and, thus everturning the order of nature, has subjected the end to the means.

To correct the faults in the common logic, Bacon composed a second work, intitled Organum Scientiarum, wherein he has taught a new logic, the principal end of which is to shew how to make a good induction, as the end of Aristotle is how to make a good syllogism. Bacon looked on this as his master-piece, and spent eighteen years in composing it.

Nor was the cause of our errors hid from this great man; he saw that our ideas were operations of the mind; and that, in order to discover truth, they must be directed in a new method. This advice he frequently repeats in the work just mentioned. But who, in an age so prejudiced in favour of the jargon of schools, and the notion of innate ideas, listened to his doctrine? Who did not look on his new method of improving the human understanding, as a chimerical project? The method Bacon proposed was too perfect to be accepted at once: errors of long standing maintain their post with some obstinacy, and the Cartesian philosophy was embraced, because it admitted some of the former errors. Besides, lord Bacon's employments took up much of his time, and prevented him from carrying into execution himself the advice he gave to others; whereas Descartes gave himself up entirely to philosophy, and, being a man of a very lively and fruitful imagination, has substituted, in the room of the errors of the schools, others of a more seducing nature.

Lord Bacon's attention to the sciences in general did not hinder him from applying himself to some in particular; and, as he thought natural philosophy the basis of all the other sciences, he principally applied himself to bring that to some degree of perfection. But in this he acted like some great architects, who, scorning to work after others, begin with pulling every thing down, and raise their building on a plan entirely new. He, like these, never thought once about embellishing or repairing what had been already begun by others; but proposed to establish a new system of physics, without making any use of what had been left us by the antients, whose principles he suspected. To accomplish this great design, he resolved to publish a physical treatise every month, and began with one upon the winds; he afterwards published one on heat, another on motion, and, at last, one on life and death. But as it was impossible for a single man to give a complete system of physics in general, with equal exactness; after having given directions to serve as a rule for those who were desirous of proceeding on his principles, he contented himself with drawing the out-lines of four other treatises, and furnished materials for them, in a work intitled Sylva Sylvarum, wherein he has collected a vast number of experiments, to serve as a foundation for his new physics. In short, before lord Bacon, no-body knew any thing of natural philosophy; and all the experiments, made since his time, seem to have been pointed out by this great genius.

His moral essays are much esteemed; but they are wrote rather to instruct than entertain: an easy genius, a sound judgment, the sensible philosopher, and man of reflection, shine in these essays by turns. This was one of the fruits of the retreat of a man who had quitted the world, after having long supported a great share in its prosperity and adversity. There are also some very fine things in his book concerning the wisdom of the antients, wherein he has moralized the fables which compose the mythology of the Greeks and Romans. He wrote, besides, the history of Henry VII. in which, notwithstanding there are some traces of the bad taste of his age, yet it abounds in judicious remarks, and shews he was a refined politician, as well as a great philosopher.

BA'DGER, *taxus*, in zoology, called, in some parts of England, the brock, the grey, and the pate.

Authors who have described this animal, have all made two kinds; the taxus canius and taxus porcinus, the dog and hog Badger. The last of these is our common kind; and it is indeed doubted whether there be any such animal as the authors describe under the other name.

The body of the Badger is short and thick, its neck very short, and its hairs long, and very rigid, and stiff like hog's bristles. Those of the back are of a pale yellow, near the root: brown in the middle, and at the extremities yellow again; so that the creature appears, upon the whole, of a mixt colour, or what we call grey, on the back. The sides and belly are covered with hairs, which are all over of a pale yellowish hue; and the legs and shoulders, as also the belly, are wholly black. It has a broad white line from the top of the head to the nose, and, on each side of this, a very regular pyramidal black mark reaching up to the ears; and below these the jaws are whitish, so that the creature's face looks very odly variegated. Its eyes are small, and its snout wholly like a dog's. The teeth are like those of a dog also, and the legs short; its fore feet have sharp claws, with which it digs itself burrows in the earth; its face, like that of the fox, being broad at the top of the forehead, and sharpening to a point at the nose, so as to appear triangular in shape; and its cheeks are tumid, and furnished with strong muscles, whence it bites very hard. It feeds on insects and small animals, and on the roots of vegetables. We have them in many parts of England, particularly in the counties of Essex, Sussex, and Warwickshire. *Ray's Syn. Quad.*

The Badger's skin is of some use in commerce. Their fat is sold by the druggists, as a remedy against disorders of the kidneys and the sciatica; and their hair for making pencils for painters and gilders. *Savar. Dict. de Comm.*

BADIA'GA, in the materia medica, the name of a sort of spungy plant, common in the shops of Moscow, and some other northern kingdoms.

The use of it is the taking away the livid marks from blows and bruises, which the powder of this plant is said to do in a night's time.

We owe the knowledge of this medicine, and its history, to the accurate Buxbaum. He observes, that the plant is always found under water, and is of a very singular and peculiar nature.

It somewhat resembles the alcyoniums, and somewhat the spunges; but differs greatly from both, in that it is full of small round granules, resembling seeds. It is of a loose, light, and spungy structure, and is made up of a number of fibres of an herbaceous matter, and is dry, rigid, and friable, between the fingers.

BADI'GEON, a mixture of plaister and free-stone, well ground together, and sifted; used by statuaries, to fill up the little holes, and repair the defects in stones, whereof they make their statues and other work. *Savar. Dict. de Com.*

Masons give the same name to a kind of mortar made of the dust or fragments of free-stone, wherewith they colour or ſmear over the common plaiſter, to give it a reſemblance of free-ſtone.

The ſame term is alſo uſed by the joiners, for ſaw-duſt mixt with ſtrong glue, wherewith they fill up the chaps, and other defects in wood, after it is wrought.

BAFFE'TAS, or Baftas, a cloth made intirely of coarſe white cotton-thread, which comes from the Eaſt-Indies. Thoſe of Surat are the beſt. They are from thirteen French ells and three quarters to fourteen long, and ſeven eighths broad. There are alſo ſome which meaſure but five ſixths of an ell, or even but half of an ell in breadth. Theſe narrow Baffetas are called orgagis, gaudivis, nerindes, and dabouis, according to the names of the places where manufactured.

There are alſo narrow-white Baffetas, which meaſure thirteen ells and an half in length, by half an ell in breadth.

Broad-white Baffetas, 14 ells by three quarters.

Broad-brown and narrow-brown Baffetas. Theſe two laſt ſorts are made of raw thread, that is, which was never wetted or blanched. The former are fourteen ells long, by half an ell broad; the latter are of the ſame length, and three quarters in breadth.

BAGAU'Z.—Thus they call, in the Antilles iſlands, the ſugar-canes, after they have paſſed through the mill; they keep them under cover in ſmall huts, in order to uſe them, when dry, for boiling the ſugar. Theſe huts are called the Bagauz huts.

As ſoon as theſe Bagauz are taken from between the firſt and third roller, two or three negro women bind them up in bundles, which they pile up under the covers. In caſe the Bagauz be not long enough to be made up into bundles, as being too much broken, they carry them in large baſkets to a corner of the mill, where the horſes, oxen, and hogs, come and eat them.

Sometimes when they are ſtreightened for fuel, they only dry them in the ſun for three or four hours, which is ſufficient to make them fit for burning. In ſome places, where they have plenty of wood, they ſerve only to burn under the firſt boilers; but, where wood is ſcarce, they keep them for the two laſt, and under the firſt they burn ſtraw, and the dry leaves of the canes.

BA'GGAGE, is particularly uſed in the military art, for the neceſſaries, utenſils, apparel, &c. of the officers and ſoldiers.

The Baggage includes alſo women, children, ſuttlers, &c.

The Baggage-waggons before a march are appointed a rendezvous, where they are marſhalled by the waggon-maſter-general, according to the rank the ſeveral regiments bear in the army. On a march, they are ſometimes ordered to follow the reſpective columns of the army, ſometimes to follow the march of the artillery, and ſometimes to make a column of themſelves. The general's Baggage is commonly firſt. If the army march from the right, the Baggage of that wing has the van; if from the left, the Baggage of the left has the van. Each waggon has a diſtinguiſhing flag, to ſhew to what regiment it belongs. *Guillet.*

BA'HAR, or Barr, a weight uſed at Ternate, Mocha, in the Moluccas, Achem, and divers other parts of the Eaſt-Indies.

There are two kinds, the great, wherewith ſpice is weighed, equivalent to 200 catis, at 26 taels to the cati, amounting to 481 pounds 4 ounces, Paris meaſure.

The little Bahar ſerves for the weighing quick-ſilver, vermilion, ivory, ſilk, muſk, and other precious wares, containing likewiſe 200 catis, but at 22 taels to the cati, amounting to about 401 pounds ſeven ounces, Paris meaſure. The Chineſe Bahar is 300 catis, but each cati only equal to 16 taels.

BAIO'CCO, a money in modern Rome, equivalent to the tenth part of a julio, or hundredth part of the ducat.

BAIT.— Baits make a capital article in angling; on the choice whereof, much of the ſport depends; different ſeaſons, and different game, having their appropriated Baits. The red, or earth worm, is good for the ſmall fry moſt of the year round; and ſmall fiſh are good Baits for pikes at all times; ſheep's blood and cheeſe are good Baits in April; the bobs, dried waſps, and bees, for May; brown flies for June; maggots, hornets, waſps, and bees, for July; ſnails in Auguſt; graſhoppers in September; corn, bramble-berries, and ſeeds, at the fall of the leaf; artificial paſtes are for May, June, and July; and frogs, for March. *Sport. Dict.*

Natural Baits, include all kinds of worms, as the red-worm, maggot, and the like; alſo frogs, graſhoppers, hornets, bees, brown-flies, ſnails, roaches, bleak, gudgeon, and loaches.

Artificial Baits, are flies of all kinds and ſhapes, made of ſilk, feathers, and the like. The variety of which is very great; there being not only different ones for every ſeaſon and month of the year, but almoſt for every fiſh.

There are ſeveral artificial Baits, for intoxicating of fowl, and yet, without tainting or hurting the fleſh, as to make it unfit to eat.

Dead Baits, are paſtes of divers ſorts, made of corn, cheeſe, fruit, waſps dried or undried, ſheep's blood, boiled beans, and the like.

Ledger Bait, is that which remains fixed in one certain place, while the angler may be abſent; uſed eſpecially in fiſhing for pike.

Walking Bait, is that which the angler attends, while he keeps moving from place to place, in queſt of the fiſh.

Live Baits, are to be kept each ſort ſeparate, and fed with thoſe things which they like beſt.

The red-worm is to be kept in rich black mould, with a little fennel chopped among it; a little ox or cow-dung, newly made, is alſo a very acceptable thing to them. They may be kept in a box, with ſmall holes in it, or in a bag. Red-worms, and all other ſorts, ſcour quickly, and grow very tough and bright, on putting them into a thin rag, greaſed with freſh butter, or greaſe, before they are put into moſs.

This is the beſt of all things to keep them in; but the moſs muſt be firſt very well waſhed, and the water ſqueezed dry out again. As to food, a ſpoonful of cream, dropped into the moſs once in three or four days, is better than any thing elſe. The moſs is to be changed every week, and kept in a cool place.

White large maggots are an excellent Bait for many ſorts of fiſh, and they are to be kept on ſheep's-ſuet and liver, chopped ſmall. They will thrive extremely on this ſort of food.

Frogs and graſhoppers are to be kept in wet moſs and long graſs; and, on moiſtening this afreſh every evening, it will keep a long time. They are to have their legs and wings cut off, when they are uſed.

Live flies muſt be uſed as they are caught; but waſps, bees, hornets, and humble-bees, may be preſerved dry.

The beſt method of drying them, is putting them in an oven after the bread is drawn: care muſt be taken that they are not ſcorched; and, when they are taken out, they are to have their heads dipped in ſheep's blood. This is to be ſuffered to dry on, and then they are to be preſerved in a box. They will keep very well for three or four months.

BA'KERS.— This is a very ancient as well as uſeful trade; and the moſt general and extenſive branch of it is that of making, as well as baking, houſhold or family bread; though there are ſeveral others, as,

Biſcuit-baking, which is chiefly to prepare, in a particular manner for long-keeping, what is called ſea-biſcuit, or bread. See BISCUIT.

Of French bread, ſo called for its peculiar delicacy; who alſo makes various ſorts of the nicer ſweet, as well as inſipid, biſcuits, &c.

Of ginger-bread, or ſweet-ſpiced bread, and cakes of ſeveral kinds.

Of theſe three laſt there are but few of each, there not being ſuch a general call for their produce, as for the common bread; the Bakers of which, indeed, are many in number, yet not ſo numerous, but that moſt of them get a decent maintenance, if careful, and ſome acquire handſome eſtates. The principal expence they are at, when they ſet up, is that of building their ovens, one of which will coſt 20 pounds and upwards, according to the ſize; next to this, is their ſtock of flour and faggots: ſo that 2 or 300 pounds will ſerve very well to begin with.

BA'KING *of Porcelain.* The determining the due degree of heat for the Baking the China-ware, and the finding out the proper time it ſhould remain in that heat, are two very eſſential points in the manufactory of this elegant ware. Perhaps, our Engliſh attempts to imitate it would be brought nearer the perfection we are aiming at, by a juſt regard to theſe particulars, than by many other leſs material articles, about which we ſeem more ſollicitous.

It is generally ſaid, that the Chineſe judge of the proper degree of Baking for their ware, by obſerving when the gold and colours appear moſt perfect and brilliant, and then taking the thing out of the fire. But this is an idle opinion; for the colours are not ſeen at all, while the veſſel is red-hot in the fire, but only appear gradually, as it cools. The way they judge of the Baking being enough, is by looking down into the furnace; when they can diſtinguiſh the whole range of the veſſels equally red-hot, and ſee one from another to the very bottom of the furnace, they know that the fire is ſtrong enough, and ought not to be increaſed any farther. From this time they diligently watch the things; and, when they perceive the inequalities on the ſurface of the coloured parts diſappear, and theſe coloured parts blend themſelves ſo with the reſt, as to make one even ſurface, they then know that the whole is done, and have nothing farther to do, but to let them cool as gradually as poſſible, to prevent their cracking.

This method of judging ſerves them very exactly for their ſmall furnaces; but, when they are employed about the larger, they are forced to judge by other ſort of ſigns. When the flame that comes out of the furnace is not ſo red as at firſt, but becomes whitiſh, and the veſſels, as far as can be ſeen, appear thoroughly red, and when the whole furnace

furnace is so perfectly heated, that, on looking in at the top, the floor is seen bright and shining; these are the tokens of the things being almost done, and what remains is to be performed by trial. The usual way is to take out the pieces singly, at different times, and observing when the colours and the varnishing are as bright and perfect as they should be. The fire is then to be put out by degrees, and the furnace gradually cooled. *Observat. sur les Coutumes de l'Asie.*

BA'LANCE *(Dict.)*— If a weight of a known magnitude be hung at one end of a Balance, we may find the fixed point about which the Balance and weight will be in equilibrio, in the following manner:

Having suspended the given weight D (see *Plate* IX. *fig.* 28. of the Dictionary) equal to four pounds (for example) at the end A of the Balance A B, which weighs also four pounds; since the weight of the Balance is considered in this operation, we must suppose the whole weight of the Balance reduced into its center of gravity, as if the weight E of four pounds hung at C the center of gravity of the Balance, which is at its middle division 6: then we shall have a new Balance (viz. A C) without weight, at whose ends hang the weights D and E, whose fixed point will (by a known prop.) be easily found; or more generally by this analogy:

As D + E (or the weight of the body and the weight of the Balance):

Is to E (the weight of the Balance)::

So is C A (half the length of the Balance):

To A 3 (the distance of the fixed point from the given heavy body.)

Let the steel-yard P W (See *Plate* IX. *fig.* 27, in the Dictionary) be taken off of its hook K, and let its center of gravity C be placed upon a fulcrum or triangular prism D E; and, instead of the weight 1 hanging at P to keep in equilibrio the weight W of 4 pounds, let an animate power, as the hand, be applied at P: the statera or steel-yard will then be turned into a lever, whose fulcrum or fixed point is between the ends as at C, in which case the power may be four times less in intensity than the weight; but equal to it, if C or the fulcrum was removed to M (the middle point of P W) and four times greater, if C was removed to 3. See LEVER, in the Dictionary.

Assay BALANCE, a very nice Balance, used in docimastical operations, to determine exactly the weight of minute bodies.

This Balance should be made of the best steel: for it may be constructed much better of this metal, which must be of the hardest kind, though sufficiently tractable, than of any other matter. Besides, steel is not so easily spoiled with rust, as iron; and it is more apt than other metals to take a perfect polish, which at the same time prevents the rust.

The structure of the assayer's scale is little different from that of common scales, otherwise than by its nicety and smallness. The longer the beam of it *(Plate* VI. *fig.* 2.) is, the more exact may the weight of a body be found: however, ten or twelve inches are a sufficient length. Let the thickness of it be so very small, that two drachms may hardly be hung at either of its extremities, *a*, *b*, without its bending. For the largest weight put upon it seldom exceeds one drachm. The whole surface of this beam must be altogether without ornaments, which only increase the weight, and gather dust, &c. The beam is suspended in a fork, *fig.* 3. the two legs of which are steel-springs joined at top, but kept together below with a brass, pliant clasp, *fig.* 4. parallel, and two lines and an half distant from each other. This clasp being taken off, and the legs of the fork being stretched out, the axis of the beam may be put into two holes *a a* made for that purpose at the ends of the legs, or be taken away from them. Let a very sharp needle *c* be fixed in the head of the fork, standing perpendicularly downwards, if the fork is suspended, and so long, as that it may almost touch the top of the tongue of the beam *(plate* VI. *fig.* 2. *c)* put into the fork, when in equilibrio. This needle is the mark of the equilibrium; and, that the artists may be able to observe this, the legs of the fork must be broader in that place, and have an opening two or three lines wide. However, this fork may be adorned at pleasure, provided the motion of the Balance is not hindered by such ornaments. Then take two scales (A A *fig.* 5.) made of a thin plate of silver, one inch and a half in diameter, hanging on three small silk-strings, almost as long as the beam, tied together at top with a silver hook, in form of an *S*, and hang them to the extremities of the beam. A smaller silver-dish, somewhat less than one inch in diameter, belongs to each of these scales, as B, or, if made of steel blued over charcoal, they are less apt to wear. You first put into these dishes, with a pair of pincers, the bodies to be weighed, or with a spoon or a small shovel, when they are pounded, and then you put them into the scales: therefore, the small dishes must be perfectly equal in weight. We use them, that bodies may be more conveniently put into and taken out of the scales, and that these, which are vastly thin, may not be bent or soiled, and so be rendered false by wiping.

This Balance is suspended on a moveable brass or copper-support, which consists of a pedestal, *fig.* 6. *a*, and of a column set upon it *b* about twenty inches high, at the top of which comes out at right-angles an arm *c* one inch long. At the extremity of this arm, put a small pulley *d* three lines in diameter: put another at the top of the column *e*, and a third near the bottom of it *f*: all which pullies must turn very easily on their axes. At the distance of one inch and a half below the upper arm, let another arm *g* one inch and a half long come out of the column at right-angles, having a hole through it *h* two lines long, a quarter of a line broad, and placed perpendicularly below the pulley of the upper arm *f*, to receive a small plate *i*, one inch and a half long; and of such breadth and thickness, as that it may freely move up and down, and yet not have too much play within the hole. This plate must also have a small hook at each extremity.

And as such a Balance will hardly stand still in the open air, and becomes false, when spoiled with dust: it must be put together with its support into a small case, *fig.* 7. having glasses *a*, *a*, *a*, at top and all round it, that you may see what is within.

Manner of using the Assay BALANCE.— Pass a silk string over the three pullies of the support, *fig.* 6. *e f d*, and tie it at its upper extremity to the small hook of the plate *i*, which is then introduced into the hole of the inferior arm *h*. Then put the support in the middle of the small case, and pass the other extremity of the silk-string below, through a hole bored in the middle of the lower border of the frame, containing the window in the fore-part of the case, and fasten it to a weight of a few ounces *k*, reduced into a cubic form. Suspend the fork of the Balance, *fig.* 3, on the inferior hook of the plate *i*, *fig.* 6. By this means, if you move backwards and forwards, the weight fastened to the string *k*, placed upon the top of the draw, that juts out beyond the fore-part of the case, the Balance within is either lifted up, or let down. But you must put the bodies to be weighed, and the weights themselves, in the small silver-dishes, *fig.* 5, and these, when loaded, into the scales, through the side-windows, which must be opened for that purpose. When any thing is to be added to, or taken out of them, you do it with the small pincers, or, if it is powder, with the small shovel or spoon. However, you must let the Balance down, every time any thing is to be added, or taken away; that the scales may rest upon the bottom of the case: but then you must shut the windows, before the Balance is lifted up again, especially if the air is not perfectly calm.

BALANCE, in merchants accounts, is, when the debtor and creditor sides of any distinct account are equal. When that is the case, such account is said to be balanced.

Balance of a merchant's or trader's books. This is a branch of the art of accountantship. In the method of keeping the books of traders, according to that admirable art of charge and discharge, by double entry, such books, if kept as they ought to be, will be always fit for a general Balance. For such is the excellency of that method, that the books of themselves must be necessarily upon a Balance upon the whole, though not in every distinct account throughout the ledger.

BALANCE *of Trade (Dict.)*— It is necessary that this Balance be kept in trading nations; and, if it cannot be made in commodities, it must in specie.

Hereby it is that we know whether a nation gains, or loses, by foreign trade, or any branch thereof; and consequently, whether that nation grows richer or poorer.

There are divers methods of arriving at this knowledge.

1. That most received is, by taking a strict survey of what proportion the value of the commodities exported bears to those imported. If the exports exceed the imports, it is concluded that nation is in a gaining way, it being supposed that the overplus is imported in bullion, and so increases the treasure of the nation.— But this method is uncertain, by reason of the difficulty of obtaining a true account either of the exports or imports. 1. Custom-house books are no rule in this case; by reason of the running of goods, especially many fine commodities of small bulk but great value: as point, lace, ribbands, silks, jewels, fine linens, &c. also wines, brandies, teas, and the like. 2. To which add various accidents which affect the value of the stock either sent out or brought in; as losses at sea, markets, bankrupts, seizures, &c. 3. Then, as to particular trades, there are divers countries to which the manufactures we send out are inconsiderable, yet the goods we import are necessary to the carrying on our trade in general; as the trade to Norway, &c. for timber and naval stores. Also the East-India company, whose imports much exceed their exports, yet is their trade highly advantageous to the nation: as we sell much of these imports to foreigners, and wear others, *e. gr.* callico's and silks in lieu of linens, and silks, from other countries, which would cost us dearer.

2. The second method is by observing the course of exchange, which if generally above the intrinsic value or par of the coins of foreign countries, we not only lose by such exchanges, but the same is a proof that we lose by the general course of our trade.— But this method is imperfect; since we

trade

trade to many countries with which there is no ſettled courſe of exchange.

3. The third method (which is Sir Joſ. Child's) is made from the increaſe or diminution of our trade, and ſhipping in general: for, if theſe diminiſh, whatever profit particular men may make, the nation loſes: and vice verſa. He lays it down as an infallible rule, that in all parts of the world wherever trade is great, and continues ſo, and grows daily greater, and the ſhipping increaſes for a ſucceſſion of ages; that trade muſt be nationally profitable. Even in the caſe of a merchant, who by driving a great trade ruins himſelf; though he loſe, what a multitude are gainers by him? as the king, and cuſtom-houſe officers; beſides ſhip-wrights, butchers, brewers, bakers, ropemakers, porters, carmen, manufacturers, mariners, &c.

4. A fourth way is, by obſerving the increaſe and diminution of our coin and bullion.—But this is the leaſt obvious and palpable of any; for the money ſeems to vulgar eyes moſt plentiful, when there is leaſt occaſion for it; and more ſcarce, as the occaſions for employing it are more numerous and advantageous: by which means we ſeem to have moſt money when we have leaſt trade. Thus *e. gr.* when the Eaſt-India company have a great ſale to make, money is generally found to be ſcarce in London; becauſe the occaſion engages people to employ quantities which they had provided for that purpoſe. So a high rate of intereſt will make money ſeem ſcarce, becauſe every man, as ſoon as he can make up a ſmall ſum, ſends it to the goldſmith to be employed. *Child's Diſc. on Trade, c.* 9.

BALE *Goods*, in the Eaſt-India trade, the bulky goods, as ſalt-petre, pepper, red-earth, tea, &c.

BALES *of Camelet*, at Smyrna, are called tables, on account of their flat ſquare figure.

BALE *of Paper*, denotes a certain number of reams packed together in a bundle.

There are Bales of more and fewer reams. Thoſe ſent from Marſeilles to Conſtantinople uſually contain twenty-four reams.

A Bale or ballon of crown paper, manufactured in ſome parts of Provence, conſiſts of 14 reams, and is ſold in the Levant for Venice paper.

BALE *of Dice*, denotes a little packet or paper containing ſome dozens of dice for playing with.

BALL, a ſpherical and round body, either naturally ſo, or turned into that form. There are Balls of common wood, of box, of iron, &c.

The word Ball is alſo uſed to ſignify ſome tools and inſtruments of ſeveral arts and trades, becauſe they bear ſome reſemblance to Balls. Thus,

A Ball, or ſphere, is an inſtrument uſed by the optic-glaſs-makers: it is a piece of copper, iron, or ſome compound metal, cut into the form of an hemiſphere, or half Ball, to which a handle is joined with maſtic; with this inſtrument, thoſe workmen make the concave-glaſſes, which ſerve for teleſcopes, or ſpying-glaſſes, microſcopes, and other inſtruments of that kind.

There are Balls or ſpheres of ſeveral ſizes, according to the radius of the focus which the glaſſes require. They uſe thoſe Balls for concave-glaſſes, by applying them hard, and turning them upon the plate of glaſs, which is laid flat upon the former; contrary to what is done with regard to convex-glaſſes, which are worked in a kind of baſon. This difference excepted, the ſame methods are uſed in forming, ſmoothing, and poliſhing both ſorts. Balls are alſo ſet upon a lath or turning-wheel, as are likewiſe baſons for the ſame purpoſe. See the article TURNING.

BALL, in the military and pyrotechnical arts, is a compoſition of divers ingredients, generally of the combuſtible kinds, ſerving to burn, ſmoak, give light, &c.

Fire BALLS, *globi incendiarii* are bags of canvas filled with gun-powder, ſulphur, ſalt-petre, pitch, &c. to be thrown by the ſoldiers, or out of mortars, in order to fire the houſes, incommoding trenches, advanced poſts, or the like.

The preparations of fire Balls, among the moderns, conſiſts of ſeveral operations, viz. making the bag, preparing the compoſition, tying, and laſtly dipping the Ball.

The Bags for this purpoſe are either oval or round. *V. Wolf. l. c. ſect.* 48.

The compoſition wherewith fire Balls are filled, is various, To ten pounds of meal-gunpowder, add two of ſalt-petre, one of ſulphur, and one of colophony: or, to ſix pounds of gunpowder, add four of ſalt-petre, four of ſulphur, one of powdered-glaſs, half a pound of antimony, as much camphor, an ounce of ſal-ammoniac, and four of common ſalt, all pulverized. Sometimes they even fill fire Balls with hand-granadoes.

For tying the fire Balls, they prepare two iron rings, one fitted around the aperture, where the Ball is to be lighted, the other near its baſe. A cord is tied to theſe rings, in ſuch a manner, as that the ſeveral turns repreſent ſemicircles of the ſphere, cutting the globe through the poles: over the cords, extended according to the length of the Ball, others are tied, cutting the former at right-angles, and parallel to each other, making a knot at each interſection. Laſtly, putting in a leaden bullet, the reſt of the ſpace is filled with tow or paper. Thus compleated, the fire Ball remains to be dipped in a compoſition of melted pitch four pounds, colophony two, and linſeed-oil, or oil of turpentine two; after dipping, they cover it round with tow, and dip again, till it be brought to the juſt diameter required.

Light BALLS, *Globi lucentes*, are ſuch as diffuſe an intenſe light around; or they are Balls which, being caſt out of a mortar, or the hand, burn for ſome time, and illuminate the adjacent parts.

Luminous or light Balls, for the hand, are made of ground powder, ſalt-petre, brimſtone, camphor, and borax, all ſprinkled with oil, and mouldered into a maſs with ſuet and common and Greek pitch, to the ſize of an ordinary granado: this is wrapped up in tow, with a ſheet of ſtrong paper over it. To fire it, they make a hole into it with a bodkin, into which they put ſome priming, that will burn ſlow. Its uſe is to be caſt into any works they would diſcover in the night-time. *Millit. Dict.*

For the larger light Balls, or thoſe to be thrown to a greater diſtance, they melt equal quantities of ſulphur, turpentine, and pitch; and herein dip an earthen, or ſtone Ball, of a diameter much leſs than that of the mortar out of which the fire Ball is to be caſt: then rolling it in gunpowder, and covering it round with gauſe, they dip it again, and repeat the reſt till it come to fit the cavity of the mortar: laſtly, they ſprinkle it around with gunpowder. This, being once kindled, will ſtrongly illuminate all round the place where it is thrown, and give opportunity to examine the ſtate and condition thereof.

Smoak or Dark BALLS, thoſe which fill the air with ſmoak, and thus darken a place, to prevent diſcoveries. To prepare a darkening Ball, make an oval or ſpherical bag, melt roſin over the coals, and add an equal part of ſalt-petre not purified, alſo of ſulphur, and a fifth part of charcoal. The whole being well incorporated, put in tow firſt ſhred, and fill the bags with this compoſition, and dip it after the ſame manner as a fire Ball.

Stink BALLS, *globi fœtentes*, thoſe which yield a great ſtench, where fired to annoy the enemy.

Their preparation is thus; melt ten pounds of pitch, ſix of roſin, twenty of ſalt-petre, eight of gunpowder, and four of colophony; to theſe add two of charcoal, ſix of horſe-hoofs cut ſmall, three of aſſafœtida, one of ſtinking ſaracen, and any other offenſive ingredients. The reſt as in the former.

Sky BALLS, *globi aerii*, thoſe caſt on high out of mortars, and which, when arrived at their height, burſting like rockets, afford a ſpectacle of decoration. Sky Balls are made of a wooden ſhell, filled with various compoſitions, particularly that of the ſtars of rockets.

Theſe are ſometimes intermixed with crackers, and other combuſtibles, making rains of fire, &c.

Water BALLS, *globi aquatici*, thoſe which ſwim, and burn a conſiderable time in the water, and at length burſt therein.

Theſe are made in a wooden ſhell, the cavity of which is filled with refined ſalt-petre, ſulphur, ſaw-duſt boiled in water of ſalt-petre, and dried; to which ſometimes other ingredients are added, as iron-filings, Greek pitch, amber-duſt, glaſs powdered, and camphor. The ingredients are to be ground, mixed up, and moiſtened with linſeed-oil, nut-oil, olive-oil, hempſeed-oil, or petrol. At the bottom is placed an iron coffin, filled with whole gunpowder, that the Ball may at laſt burſt with a greater noiſe; and, laſtly, the Ball is, by the addition of lead, or otherwiſe, made of the ſame ſpecific gravity with water.

BALL *of a Pendulum*, the weight at the bottom. In ſhorter pendulums, this is called the bob.

BALL, among the Corniſh miners, ſignifies a tin-mine.

BALL, among printers, a kind of wooden tunnel ſtuffed with wool, contained in a leather cover, which is nailed to the wood; with which the ink is applied on the forms to be wrought off.

The preſs-man, holding one of theſe Balls with either hand, firſt daubs them on the ink-block, and afterwards on the forms, which retain the ink neceſſary to make an impreſſion.

Horſe BALLS, among farriers, a kind of cordial medicine, adminiſtered in the form of Balls, ſuppoſed of great virtue for feeding and ſtrengthening ſound, as well as healing and raiſing unſound horſes.

Markham's horſe Balls, are a preparation of aniſeeds, carthamus, elicampane, and other ingredients, wrought into a ſtiff paſte, and thence formed into Balls. They are cleanſing and emollient, efficacious in colds, ſurfeits, and hard labour, and eſpecially uſeful where any of the chief viſcera are decayed: nothing raiſes a lean jade ſo ſoon, being partly food and partly phyſic. *Ruſt. Dict. Farr. Dict.*

Chewing BALLS, are thoſe which the horſe is to keep champing, or maſticating in his mouth, a conſiderable time, without ſwallowing. Theſe are chiefly uſed for a loſt appetite, a thing very incidental to horſes.

They are uſually made of aſſafœtida, liver of antimony, juniper, bay-wood, and pellitory of Spain, beaten and incorporated into a maſs with verjuice. The method of adminiſtration

ſtration is to wrap one of the Balls in a linen cloth, and, having a ſtring faſtened to it, make the horſe chew it three or four hours at a time. *Ruſt. Dict.*

BALL *Vein*, in minerology, a name given by the miners of Suſſex to a ſort of iron ore, common there, and wrought to conſiderable advantage. It yields not any great quantity of metal, but what it has runs freely in the fire; it is uſually found in looſe maſſes, not in the form of ſtrata, and is of ten covered with one or more cruſts. It generally contains ſome ſparkling particles, and is uſually of a circular form, in the perfect maſſes; thickeſt in the middle, and gradually thinner, as it approaches the ſides. The ores of Suſſex in general are poor, but they require very little trouble in the working; ſo that a conſiderable profit is made annually from them.

BA'LLANCERS, in natural hiſtory, two ſmall oblong bodies, placed under the wings of the two-winged flies, and in ſome meaſure ſupply the office of the two other wings, which thoſe of the four-winged claſs are poſſeſſed of.

BA'LLUSTER, or BALLISTER, in architecture, a kind of column or pillar, whereof balluſtrades are formed.

BA'LSAM *of Life*. See BALSAMUM *Vitæ*.

Odoriferous BALSAMS, are a fragrant kind of unguents, generally of a thick conſiſtence, compoſed of ſome fatty, denſe juice, joined with ſome diſtilled oils of divers kinds.

Boerhaave's method of preparing theſe Balſams, which is this: melt an ounce of fine pomatum, in a China veſſel, over a ſmall and perfectly clear fire; then gradually add a drachm of white wax, ſhaved into thin pieces. After theſe are perfectly blended together, remove the veſſel from the fire; and, when the matter begins to thicken in cooling, drop in, by ſlow degrees, a drachm of any of the fragrant eſſential oils; keep the whole continually ſtirring, all the time the oil is dropping in, that it may perfectly mix. After which, ſet the veſſel in cold water, that the whole matter, immediately condenſing by the cold, may keep in the oil and ſpirit. When the Balſam is thoroughly cold, put it immediately up in veſſels of lead or pewter; and, if theſe are cloſe covered, it will keep perfect a great many years.

Inſtead of pomatum and wax, the expreſſed oil of nutmeg may be uſed in this proceſs, after it has been waſhed in water, till perfectly inſipid, white, and inodorous.

If theſe Balſams are required to be of any colour, it may be eaſily given at pleaſure. A ſcruple of fine cochineal, in fine powder, will tinge the Balſam of a fine purple; or the ſame quantity of the inſpiſſated juice of buckthorn-berries, to a fine green; a little native cinnabar will turn it ſcarlet: turmeric yellow; and ſmalt, to a beautiful blue. Any of theſe may be uſed at pleaſure, provided that they have no ill ſmell, or hurtful properties.

Theſe Balſams are prepared as rich perfumes, to raiſe the languid ſpirit; and the nobleſt and richeſt of the eſſential oils ſhould therefore be uſed in them. The oils, principally directed by Boerhaave to this purpoſe, are thoſe of balm, calamus aromaticus, cinnamon, cedar, citron, cloves, jaſmin, lavender, white lillies, marjoram, mace, nutmegs, origanum, oranges, both thoſe of China and Seville; roſes, rhodium, and yellow ſaunders; to which may be added, the natural Balſams of Peru and Gilead; theſe two being ſpontaneouſly fragrant without diſtillation. *Vid. Boerh. Chem.*

BA'LSAMINA, *Balſamine*, in botany, the name of a genus of plants, whoſe characters are: the flower is of the polypetalous anomalous kind, and is, in ſome ſpecies, four-leaved, and, in others, ſix-leaved. In the four-leaved flowers, the upper leaf is arched, and the lower hollowed, and terminated by a tail, and the two ſide-leaves are large. In the ſix-leaved flowers of this genus, the flower-leaf has no tail.

In both the piſtil, which is furniſhed with two leaves, occupies the middle part of the flower, and, at laſt, becomes a fruit; ſometimes turbinated at one end, or both, and ſometimes emulating the ſhape of a pod, conſiſting of ſeveral muſcles, as it were, and endued with an elaſtic force, and flying open with great violence. The ſeeds it contains, are fixed to the axis or placenta. See it repreſented in *Plate* VI. *fig.* 8.

Mr. Miller has enumerated nine, and M. Tournefort nineteen ſpecies of Balſamina.

The common white, red, and purple kinds of this plant will come up in common ground, without any artificial heat; and even be the ſtronger, and flower better, than if raiſed on hot beds. All the other varieties are raiſed from ſeeds ſown on hot beds in the ſpring, and afterwards planted into pots and borders. But the fine double large kind, or immortal eagle-flower, as it is called, requires to be ſet on a freſh hot bed, after it has been raiſed on one, in order to bring it forward; otherwiſe it will not get into flower till late in the year, and will not ripen its ſeeds; there are two kinds of this beautiful ſpecies; one brought from the Weſt-Indies, and called the cock's-ſpur, which produces large and ſtrong plants, but flowers very late: the other is from China, and called the immortal eagle-flower, and is one of the fineſt annual plants we have, producing large double flowers, and continuing a long time in flower, if ſheltered from violent winds and rain. This produces ſeeds very well with us; but, after a few years, they are apt to degenerate into ſingle flowers.

When the young plants are raiſed in a hot bed, and are to be planted out into pots, ſuch are always to be preferred as have ſtalks finely ſpotted with red; for theſe always produce red and double flowers. *Miller's Gard. Dict.*

BALSA'MUM *Traumaticum*, vulnerary balſam, a form of medicine preſcribed in the London Diſpenſatory, intended to ſupply the place of the tincture, commonly called the Friars balſam, ſo famous for curing freſh wounds. It is made thus: take of benjamin three ounces, ſtrained ſtorax two ounces, balſam of Tolu one ounce, ſuccotrine aloes half an ounce, rectified ſpirit of wine a quart; digeſt them together, till as much as may be of the gums are diſſolved, and then ſtrain off the ſpirit. *Pemberton's Lond. Diſpenſ.*

BALSAMUM *Vitæ*, *balſam of life*, the name of a celebrated medicine, prepared by the learned Hoffman.

This preparation is found under the title of Balſamum Vitæ Hoffmani, in the Straſburg and Ratiſbon Diſpenſatories; and is taken, with a little variation, from the author's notes on Poterius; where the following inſtructions are given for its preparation:

Take of the freſh diſtilled oils of lavender, marjoram, cloves, cubebs, cardamoms, and citron, each one ſcruple; of the oil of cinnamon, twenty-four drops: of the oils of rue and white amber, each half a ſcruple: let theſe oils be mixed together, and ſtand for ſome weeks.

When therefore we want the extemporaneous balſam of life, let ten drops of theſe oils be poured into an ounce of highly rectified ſpirit of wine. And, if we intend it ſhould be rendered more grateful, half a ſcruple of ambergriſe may be previouſly diſſolved in the oils. But this medicine will ſtill be impregnated with higher balſamic qualities, if to one ounce of it we add half a drachm of Peruvian balſam, by which it is rendered good againſt apoplexies, and is of ſingular uſe both internally and externally. Internally, it may be given from ten to twenty drops in weakneſſes, cholic pains, faintings, and lowneſs of ſpirits; and, externally, in all weakneſſes of the head, as alſo in ſpaſmodic and lethargic diſorders; it may be applied to the noſe, the wriſts, the nape of the neck, and the crown of the head.

BA'MBOE, or BAMBOU, as they ſpell that word in the Indies, and not bamboue. It is a plant that multiplies very much by its root, from which ſprings a ramous or branchy tuft, after the manner of ſome gramina, or, to ſpeak more naturally, after the manner of the European reeds; for the Bamboe is of the kind of reeds, as well as the ſugar-cane. The Indian Bamboe is the largeſt kind of cane that is known. It is of an extraordinary heighth and bigneſs, when it bears its bloſſom; each ſhoot or cane is often, towards the bottom, of the bigneſs of a man's thigh, and decreaſes gradually to the top, where it bears a bloſſom or flower, like our reeds, in their proper ſeaſon. The Bamboe grows in all the maritime countries of the Eaſt-Indies. Monſieur Lemery calls it a tree, whoſe leaves reſemble thoſe of the olive-tree. But John Bohin, from whom he has extracted his deſcription, has miſled him: for it is not a tree, though it grows very high, even to 20 or 25 feet, and ſometimes to 30. Its leaves are like thoſe of the other canes or reeds, except that they are not ſo long, nor ſo broad at their baſe, as thoſe of the other kinds: they are but half a foot long, and their breadth, towards the middle, is an inch, or ſometimes more. With theſe canes of Bamboe, the Indians build their houſes. and make all ſorts of furniture, in a very ingenious manner. The wood of theſe canes is ſo hard and ſtrong, that they ſerve very well to make piles for ſupporting their little houſes, built over rivers, which have a gentle courſe, as it were over ſtanding waters. They alſo make, with this wood, all ſorts of utenſils for their kitchens and tables. The thickeſt Bamboes ſerve to make the ſticks or poles, with which the ſlaves or other perſons carry thoſe ſorts of litters, which are called palanquins, and are of ſo common an uſe, and ſo convenient in all the Eaſt. They alſo make of that wood a kind of pales, in which the water keeps extremely cool. The walking-canes which we ſee in Europe, are the firſt and ſmalleſt ſtocks of the Bamboes. The Malays and theſe Chineſe, who are diſperſed in the Molucca and Sunda iſlands, uſe the young ſmall ſhoots of the Bamboes, preſerved in vinegar, after their manner, with very ſtrong or peppered ingredients. This they call achior Bamboe. For they give the name of achior to all that is preſerved in vinegar, and, to diſtinguiſh it, they add, to the name of achior, that of the thing preſerved.

BANA'NA, a name uſed by many authors for the muſa, or plaintain-tree, of the common kind; but more frequently, with us, underſtood to mean another ſpecies of the ſame genus, which the Portugueſe call pacoeira, and we, particularly, the Banana-tree. *Piſo.*

The difference between the two is this; the muſa has a green ſtalk, and a long, crooked, angular, fruit, reſembling a crooked cucumber; the Banana, a ſpotted ſtalk, and a round fruit. *Dale Pharm.*

BANDALEER, or BANDALEER, a kind of belt worn over the body, from the left to the right. It is uſed by horſemen to carry their carbines and muſketoons, and was formerly

uſed

ufed by the foot, to faften to it thofe fmall leather cafes, which they call charges. The ordonnance, or regulation publifhed in France, in the year 1687, puts the Bandaliers among the contraband merchandizes, the exportation of which is prohibited.

BANDS *of iron*, a term ufed by blackfmiths and others, to fignify thofe long, narrow, and flat pieces of iron, which they forge, to faften, ftrengthen, or fupport, feveral works of timber or bricks.

Bands are alfo thofe iron plates which are faftened with large nails to the jaunts of the wheels of coaches, carts, and other carriages. In France and elfewhere, thefe Bands are made of feveral pieces, but, in Holland and Lombardy, the Band is but one large iron hoop, which covers all the jaunts. This method of ftrengthening wheels begins to be ufed at Paris, and is indeed the beft.

BANK, in natural hiftory, denotes an elevation of the ground, or bottom of the fea, fo as fometimes to furmount the furface of the water, or, at leaft, to leave the water fo fhallow, as ufually not to allow a veffel to remain a-float over it.

In this fenfe, Bank amounts to much the fame as flat, fhoal, &c. There are Banks of fand, and others of ftone, called alfo fhelves, or rocks. In the North-fea, they alfo fpeak of Banks of ice, which are large pieces of that matter floating. *Aubin. Dict. Marin.*

Banks are ufually diftinguifhed by a buoy, poft, or the like. On charts, fand Banks are ufually marked by little dots, and banks of ftone, by croffes. The colours of the buoys are alfo varied accordingly; fand Banks being denoted by light-coloured buoys, and rocks by black ones.

In large rivers, as the Elbe, &c. fand Banks, by high tides and inundations, are liable to change places; care is therefore taken to fhift the buoys from time to time, to fhew the true channel of the river.

An exact knowledge of the Banks, their extent, and the depth of water on them, makes the moft effential part of the fcience of a pilot, and a mafter of a fhip; if the veffel be large, and draw much water, great attention will be neceffary to keep clear of the Banks; on the contrary, if it be fmall, the fame Banks afford a fure afylum, where it may brave the largeft and ftouteft veffels, which dare not follow it here. By means of this barrier, many fmall craft have efcaped its enemy.

BA'NKER, in bricklaying, a piece of timber whereon they cut the bricks.

The Banker is fix feet long, or more, according to the number of men to work at it, and nine or ten inches fquare: it is to be laid on two piers of timber, three feet high from the floor they ftand on. *Moxon. Mech. Exerc.*

BA'NKING, the making of banks to oppofe the force of the fea, rivers, or the like, and fecure the land from being overflowed thereby.

With refpect to the water which is to be kept out, this is called Banking; with refpect to the land, which is thereby to be defended, imbanking.

BANKING, in a falt work, the raifing a fence againft the fea, whereby its waters may be kept out, excepting fo much as is neceffary for the preparation of the falt.

BA'NNER, properly denotes a fquare flag, faftened like a cornet to a lance. *Dict. de Trev.*

A Banner differed from a pennon, or guidon, which had a long tail, or train; the cutting of which, in the ceremony of creating a banneret, converted it into a Banner.

BA'NQUET, in the manage, denotes that fmall part of the branch of a bridle under the eye; which, being rounded like a fmall rod, gathers and joins the extremities of the bit to the branch, in fuch a manner, that the Banquet is not feen, but covered by the cap, or that part of the bit next the branch.

BA'NTAM-WORK, a kind of Indian painting, and carving on wood, refembling Japan work, only more gay, and decorated with a great variety of gaudy colours.

Bantam work is of lefs value among conoiffeurs, though fometimes preferred, by the unfkilful, to the true Japan work. Formerly it was in more ufe, and efteem, than at prefent, and the imitation of it much practifed by our Japanners.

There are two forts of Bantam, as well as of Japan work; as, in the latter, fome are flat, lying even with the black, and others high or emboffed; fo, in Bantam work, fome are flat, and others in-cut, or carved into the wood, as we find in many large fcreens; with this difference, that the Japan artifts work chiefly in gold and other metals, and the Bantam generally in colours, with a fmall fprinkling of gold here and there.

For the flat Bantam work, it is done in colours, mixed with gum-water, proper for the thing defigned to be imitated.

For the carved, or in-cut kind, the method of performing it is thus defcribed by an ingenius artift: 1. The wood is to be primed with whiting and fize, fo often, till the primer lie near a quarter of an inch thick; then it is to be water-plained, i. e. rubbed with a fine wet cloth, and, fome time after, rubed very fmooth, the blacks laid on, varnifhed up with a good body, and polifhed well, though with a gentle hand. This done, the defign is to be traced out with vermilion and gum-water, exactly in the manner wherein it is intended to be cut; the figures, trees, buildings, &c. in their due proportions. Then the graver is applied, with other tools of proper fhapes, differing according to the workman's fancy. With thefe he cuts deep or fhallow, as is found convenient, but never deeper than the whiting lies; the wood being never to feel the edge of the inftrument. Lines, or parts of the black, are ftill to be left, for the draperies, and other outlines, and for the diftinction of one thing from another; the rule being to cut where the white is, and leave the black untouched. The carving being finifhed, then take to the pencil, with which the coloursare laid into the cut work. After this, the gold is to be laid in thofe places which the defign requires; for which purpofe, a ftrong, thick gum arabic water is taken, and laid with a pencil on the work; and, while this remains wet, leaf gold is cut with a fharp fmooth-edged knife, in little pieces, fhaped to the bignefs and figure of the places where they are to be laid. Thefe being taken up with a little cotton, they dab them with the fame clofe to the gum water, which affords a rich luftre. The work thus finifhed, they clear up the black with oil, taking care not to touch the colours. The European workmen ordinarily ufe brafs duft, which is lefs bright and beautiful. *Park. Treat. of Japan, c.* 13. *p.* 37 *& feq.*

BA'RBERRY-*Tree*, *berberis*, is very eafily and plentifully propagated from the fuckers taken from the roots of the old plants, which may be planted either in October or February, and fucceed beft in a ftrong loamy foil. They may be either produced from feeds, or by laying down the branches; but the fuckers are commonly fo plentiful, as to make it unneceffary. *Miller's Gard. Dict.*

This medicinal fhrub is ufed, both in the berry and bark, though with oppofite intentions.

The berry is of an agreeable, cooling, aftringent tafte, ufed chiefly in conferve to quench thirft, and ftrengthen the ftomach: yet the bark is, by experience, found an aperient and detergent. That which grows neareft the tree is moft efteemed. It is rarely found in difpenfatory compofitions, but much in extemporaneous prefcription, againft the jaundice, and other diforders from foulnefs and obftructions of the vifcera. *Quinf. Difpenf.*

BA'RBUS, in zoology, the fifh called in Englifh the barbel, and, by fome writers in natural hiftory, muftus fluviatilis. It grows to a foot, or fomewhat more, in length: its back is of a dufky, brownifh, olive colour, but with a palenefs not common with other fifh: its belly is of a filver white: its back and fides are fpotted with black fpots: the figure of its body is long and rounded, and its back rifes into a prominence and fharp ridge; its fcales are of a moderate fize, and its fide lines dotted: its mouth is large, but toothlefs: and its upper jaw hangs out a great way beyond the lower: it has four beards, two at the angles of the mouth, and two near the edge of the jaws; and in the middle of thefe there runs a flender red vein: it has only one fin on the back, and its tail is forked. Its flefh is lax and foft, and there is an opinion that its fpawn is poifonous. It is caught in many of our rivers, and in thofe of other parts of the world. *Ray's Ichthyog. Gefner, de Pifc.*

The barbel is a fifh commonly known, and fo called, on account of the barb or beard under its nofe, or chaps. It is of the leather-mouthed kind.

This is but a moderately well tafted fifh. The male is efteemed better than the female; but neither of them is very much valued. The worft feafon for them is April. They ufually fwim together in great fhoals, and love to be among weeds, where there is a hard, gravelly bottom. In fummer they frequent the ftrongeft and fwifteft current of the water, as deep bridges, weirs, and the like places, and are apt to get in among the piles, weeds, and other fhelter; but, in winter, they retire into the deepeft and ftilleft waters.

The time for taking this fifh is very early in the morning, or late in the evening: the place fhould be baited with chopped worms fome time before; and no bait is fo good for the hook as the fpawn of the falmon, or fome other fifh: in defect of thefe, lob-worms will do; but they muft be very clean and nice, and the hook carefully covered, otherwife he will not touch them. Old cheefe fteeped in honey is alfo a very fine bait. The rod and line for fifhing for this fifh ought to be very ftrong: the line fhould have a running plummet, that is, a bullet with a hole through it; and a piece of lead muft be placed a foot or more above the hook, to keep the plummet from falling upon it; the worm, or other bait, will, by this means, always be at the bottom; and the plummet will lie, and not choak the fifh: the bending of the rod will fhew when he bites, but indeed it will be felt in the hand by the twitch he gives; but, if not carefully managed, he will often break the tackle, for he is a very ftrong fifh. The beft feafon for fifhing for this fifh is from May to Auguft.

BARDA'NA, *burdock*, in botany, the name of a genus of plants, the characters of which are thefe: the flower is of the flofculous kind, being compofed of feveral flofcules, jagged at the ends, placed upon the embryo feeds, and contained in one general cup, which is of a fquammofe ftructure; each of the hooks of the whole being fo bent back, as to lay hold of any thing which touches it. The embryo's finally ripen into feeds, winged with a fhort down.

The

The root of the common burdock is a very powerful diuretic and diaphoretic. It is given, with great ſucceſs, in decoction, in obſtructions of the ſpleen, and in dropſies. It is alſo recommended by ſome in all diſeaſes of the breaſt and lungs, in aſthmas, in the ſtone, and in the ſciatica. The ſeed of it is eſteemed by many to be one of the greateſt lithontriptics known; and, by the inſtances that have been produced of its doing ſervice in nephritic complaints, it ſeems to merit a fair trial. The freſh leaves are by ſome recommended as a dreſſing for old ulcers, and for burns and uxations. They are alſo applied, by the good women, to the ſoles of the feet, as a remedy in hyſteric complaints.

The ſection of a burdock-root, viewed with a microſcope, has the appearance repreſented in *plate* VI. *fig.* 10.

BARDE'LLE, in the manage, denotes a ſaddle made in form of a great ſaddle, but only of cloth ſtuffed with ſtraw, and tied tight down with packthread, without either leather, wood, or iron.

BA'RGAIN and *Sale*, in law, is properly a contract made of manors, lands, and other things, transferring the property thereof from the bagainer to the bargainee, for a conſideration in money.

It is a good contract for land, and the fee paſſes, though it be not ſaid in the deed, to have and to hold to him and his heirs; and though there be no livery and ſeiſin given by the vender, ſo it be by deed indented, ſealed, and inrolled, either in the county where the land lies, or in one of the king's courts of record at Weſtminſter, within ſix months after the date of the deed. *Blount.*

This manner of conveying lands was created and eſtabliſhed by the 27th of Henry VIII. cap. 10. which executes all uſes raiſed; and, as this introduced a more ſecret way of conveying than was known to the policy of the common law, therefore, the inrollment of the deed of Bargain and ſale was made neceſſary, by the ſixteenth chapter of the Statute. *New Abridgement of the Law.*

BA'RGHMOTE, or BARMOTE, a court which takes cognizance of cauſes and diſputes between miners. *Pett. Fodin. Regal. in fine.*

BARI'LLIA, in the glaſs-trade, a ſort of pot-aſhes, imported from Spain, inferior in goodneſs to that of the Levant; called pulverine, when looſe, ſmall, and in powder; and rochetta, when in hard, rocky lumps. *Neri's Art of Glaſs*, page 27.

BA'RKING of trees, is the peeling off, or ſtripping the bark from the wood.

The month of May is the ſeaſon for Barking of trees, becauſe then the ſap looſens the bark from the wood; which it is very hard to effect in any other time, unleſs the ſeaſon be very wet; heat and drineſs being always oppoſite thereto.

Maliciouſly Barking of apple-trees, or other fruit-trees, is made felony, by the 37th of Henry VIII. chap. 6.

BA'RLEY, *hordeum*, a gramineous frumentaceous plant, whoſe ſeeds are of the larger ſort, being covered with a huſk growing in a ſpike, and the grains bearded.

Cultivation of BARLEY.—Some people ſow Barley upon land where wheat grew the former year; but, when this is practiſed, the ground ſhould be plowed the beginning of October, in a dry time, laying it in ſmall ridges, that the froſt may mellow it the better; and this will improve the land greatly: then, in March, the ground is plowed again, and laid even, where it is not very wet; but in ſtrong wet lands the ground ſhould be laid round, and the furrows made deep, to receive the wet. When this is finiſhed, the ſeed ſhould be ſown with a broad caſt, at two ſowings; the firſt being harrowed in once, the ſecond ſhould be harrowed until the ſeed is buried: the common allowance of ſeed is four buſhels to an acre.

It is a very common fault with farmers to ſow too much grain of all ſorts on their land; not conſidering, that, if the roots of corn ſtand very cloſe together, there will not be room for them to put out many ſtems; ſo that, frequently, there is not more than two or three ſtalks to a root; whereas, if the roots were farther diſtant, there might be ten or twelve, and, on good land, many more. I have counted upward of ſeventy ſtalks of Barley from one root, which was tranſplanted in a garden, where the ground was light, but not rich: and I am ſatisfied, by ſeveral experiments, that, where Barley is ſown early upon light ground, it ſhould not be too thick; for, if it is rolled two or three times before it ſtalks, the roots, by being preſſed, will ſhoot out a greater number of ſtalks; and it will not be ſo liable to lodge with wet, as the Barley which is ſown thick; ſo muſt, conſequently, be drawn up much taller, and have weaker ſtalks.

When the Barley is ſown, the ground ſhould be rolled after the firſt ſhower of rain, to break the clods, and lay the earth ſmooth; which will render it better to mow, and alſo cauſe the earth to lie cloſer to the roots of the corn, which will be of great ſervice to it in dry weather.

Where Barley is ſown upon new broken up-land, the uſual method is, to plow up the land in March, and let it lie fallow until June; at which time it is plowed again, and ſown with turneps, which are eaten by ſheep in winter; by whoſe dung the land is greatly improved; and then in March following the ground is plowed again, and ſown with Barley as before.

There are many people who ſow clover with their Barley; and ſome have ſown the lucern with Barley; but neither of theſe methods is to be commended; for, where there is a good crop of Barley, the clover or lucern muſt be ſo weak, as not to pay for ſtanding; ſo that the better way is to ſow the Barley alone, without any other crop among it; and then the land will be at liberty for any other crop, when the Barley is taken off the ground: but this practice of ſowing clover, rye-graſs, and other graſs ſeeds, with corn, has been ſo long and univerſally eſtabliſhed among farmers, that there is little hope of prevailing with thoſe people to alter a cuſtom which has been handed down to them from their predeceſſors; although there ſhould be many examples produced, to ſhew the abſurdity of this practice.

The time for cutting of Barley is, when the red colour of the ears is off, and the ſtraw turns yellow, and the ears begin to hang down: in the north of England they always reap their Barley, and make it up in ſheaves, as is practiſed here for wheat; by which method, they do not loſe near ſo much corn, and it is alſo more handy to ſtack; but this method cannot ſo well be practiſed, where there are many weeds amongſt the corn; which is too frequently the caſe in the rich lands near London, eſpecially in moiſt ſeaſons; therefore, when this is the caſe, the Barley muſt lie on the ſwarth till all the weeds are dead: but, as it is apt to ſprout in wet weather, it muſt be ſhook up, and turned every fair day, after rain, to prevent it. When it is carried, it ſhould be thoroughly dry; otherwiſe, if it be ſtacked wet, it will turn muſty; or, if too green, it is ſubject to burn in the mow.

The common produce of Barley is two and an half, or three quarters, on an acre; but I have ſometimes known four quarters on an acre.

Pearl BARLEY, and French Barley, are both of the ſame kind, though differing ſomewhat in the whiteneſs and ſize of the grain; and are thoſe chiefly uſed in phyſic.

Barley-water is a decoction of either of theſe, reputed ſoft and lubricating, of frequent uſe in phyſic.

This well known decoction is a very uſeful drink in many diſorders; and is recommended, with nitre, by ſome authors of reputation, in ſlow fevers.

BA'RNACLES, in farriery, are alſo called horſe-twiſters, or brakes.

Barnacles differ from pinchers, as the latter have handles to hold them; whereas the former are faſtened to the noſe with a lace or cord.

There is another meaner ſort of Barnacles, uſed in defect of the former, called roller Barnacles, or wood twiſters, which are only two rollers of wood bound together, with the horſe's noſe between them. *Dict. Ruſt.*

BARO'METER (*Dict.*)—The principal uſe of the Barometer is to eſtimate the gravity of the air at different times, in order to foreſee the alterations of the weather, which are conſequent thereon. To this end, Dr. Halley, in the 181ſt number of the Philoſophical Tranſactions, has laid down the more remarkable phænomena, relating to the different heights of the mercury at different times, together with the ſolution of each; which are ſo juſt, and ſo agreeable to true philoſophy, that I doubt not but the reader will be glad to ſee the account in his own words.

1. In calm weather, when the air is inclined to rain, the mercury is commonly low.

2. In ſerene, good, and ſettled weather, the mercury is generally high.

3. Upon very great winds, though they be not accompanied with rain, the mercury ſinks loweſt of all, with relation to the point of the compaſs the wind blows upon.

4. Cæteris paribus, the greateſt heights of the mercury are found upon eaſterly and north-eaſterly winds.

5. In calm froſty weather, the mercury generally ſtands high.

6. After very great ſtorms of wind, when the mercury has been low, it generally riſes again very faſt.

7. The more northerly places have greater alterations of the Barometer, than the more ſoutherly.

8. Within the tropics, and near them, thoſe accounts we have had from others, and my own obſervations at St. Helena, make very little or no variation of the height of the mercury in all weathers.

Hence I conceive, that the principal cauſe of the riſe and fall of the mercury, is from the variable winds which are found in the temperate zone, and whoſe great unconſtancy, here in England, is moſt notorious.

A ſecond cauſe is the uncertain exhalation and precipitation of the vapours lodging in the air, whereby it comes to be, at one time, much more crouded than at another, and, conſequently, heavier; but this latter, in a great meaſure, depends upon the former. Now, from theſe principles, I ſhall endeavour to explicate the ſeveral phænomena of the Barometer, taking them in the ſame order I laid them down: thus,

1. The mercury's being low inclines it to rain, becauſe, the air being light, the vapours are no longer ſupported thereby,

being become specifically heavier than the medium wherein they floated; so that they descend towards the earth, and, in their fall, meeting with other aqueous particles, they incorporate together; and form little drops of rain; but the mercury's being at one time lower than at another, is the effect of two contrary winds blowing from the place where the Barometer stands; whereby the air of that place is carried both ways from it, and, consequently, the incumbent cylinder of the air is diminished, and, accordingly, the mercury sinks: as for instance, if in the German ocean it should blow a gale of westerly wind, and, at the same time, an easterly wind in the Irish sea; or if in France it should blow a northerly wind, and in Scotland a southerly; it must be granted, that that part of the atmosphere impendent over England, would thereby be exhausted and attenuated, and the mercury would subside, and the vapours, which before floated in those parts of the air of equal gravity with themselves, would sink to the earth.

2. The greater height of the Barometer is occasioned by two contrary winds blowing towards the place of observation, whereby the air of other places is brought thither, and accumulated; so that the incumbent cylinder of air, being increased both in height and weight, the mercury pressed thereby must needs stand high, as long as the winds continue so to blow; and then, the air, being specifically heavier, the vapours are better kept suspended; so that they have no inclination to precipitate and fall down in drops, which is the reason of the serene good weather which attends the greater heighths of the mercury.

3. The mercury sinks the lowest of all, by the very rapid motion of the air in storms of wind. For, the tract or region of the earth's surface, wherein the winds rage, not extending all round the globe, that stagnant air which is left behind, as likewise that on the sides, cannot come in so fast as to supply the evacuation made by so swift a current; so that the air must necessarily be attenuated, when and where the said winds continue to blow, and that more or less, according to their violence; add to which, that the horizontal motion of the air, being so quick as it is, may, in all probability, take off some part of the perpendicular pressure thereof; and the great agitation of its particles is the reason why the vapours are dissipated, and do not condense into drops, so as to form rain, otherwise the natural consequence of the air's rarefaction.

4. The mercury stands the highest upon the easterly and north-easterly wind, because, in the great Atlantic ocean, on this side the thirty-fifth degree of north latitude, the winds are almost always westerly or south-westerly; so that, whenever here the winds come up at east and north-east, it is sure to be checked by a contrary gale, as soon as it reaches the ocean; wherefore, according to what is made put in our second remark, the air must needs be heaped over this island, and, consequently, the mercury must stand high, as often as these winds blow. This holds true in this country, but is not a general rule for others, where the winds are under different circumstances; and I have sometimes seen the mercury here as low as at twenty-nine inches upon an easterly wind, but then it blew exceeding hard, and so comes to be accounted for, by what was observed upon the third remark.

5. In calm frosty weather the mercury generally stands high, because (as I conceive) it seldom freezes, but when the winds come out of the northern and north-eastern quarters; or, at least, unless those winds blow at no great distance off; for the north parts of Germany, Denmark, Sweden, Norway, and all that tract from whence north-easterly winds come, are subject to almost continual frost all the winter; and thereby the lower air is very much condensed, and in that state is brought hitherwards by those winds; and, being accumulated by the opposition of the westerly wind blowing in the ocean, the mercury must needs be pressed to a more than ordinary height; and, as a concurring cause, the shrinking of the lower parts of the air into lesser room by cold, must needs cause a descent of the upper parts of the atmosphere, to reduce the cavity made by this contraction to an æquilibrium.

6. After great storms, when the mercury has been very low, it generally rises again very fast: I once observed it to rise one inch and an half in less than six hours, after a long continued storm of south-west wind. The reason is, because, the air, being very much rarefied by the great evacuations which such continued storms make thereof, the neighbouring air runs in the more swiftly, to bring it to an æquilibrium; as we see water runs the faster for having a greater declivity.

7. The variations are greater in the more northerly places, as at Stockholm, greater than that at Paris (compared by M. Paschal) because the more northerly parts have usually greater storms of wind than the more southerly, whereby the mercury should sink lower in that extreme; and then the northerly winds bringing the more dense and ponderous air from the neighbourhood of the Pole; and that again being checked by a southerly wind at no great distance, and so heaped, must of necessity make the mercury, in such case, stand higher in the other extreme.

8. Lastly, this remark, that there is little or no variation near the equinoctial, does, above all others, confirm the hypothesis of the variable winds being the cause of these variations of the height of the mercury; for, in the places above-named, there is always an easy gale of wind blowing nearly upon the same point, viz. east-north-east, at Barbadoes; and east-south-east, at St. Helena; so that, there being no contrary currents of air to exhaust or accumulate it, the atmosphere continues much in the same state: however, upon hurricanes (the most violent of storms) the mercury has been observed very low; but this is but once in two or three years, and it soon recovers its settled state about 29½ inches.

M. Leibnitz accounted for the descent of the mercury before rain, upon another principle, viz. as a body specifically lighter than a fluid, while it is suspended by it, adds more weight to that fluid, than when, by being reduced in its bulk, it becomes specifically heavier, and descends; so the vapours, after it is reduced into the form of clouds, and descends, adds less weight to the air, than before; and therefore the mercury falls. To which it is answered; 1. That, when a body descends in a fluid, its motion, in a very little time, becomes uniform (or nearly so) a farther acceleration of it being prevented by the resistance of the fluid; and then, by the third law of nature, it presses the fluid downwards, with a force equal to that whereby it tends to be farther accelerated; that is, with a force equal to its whole weight. 2. The mercury, by its descent, foretels rain a much longer time before it comes, than the vapour, after it is condensed into clouds, can be supposed to take up in falling. 3. Supposing, that as many vapours, as fall in rain, during the space of a whole year, were at once to be condensed into clouds, and even quite cease to gravitate upon the air, its gravity would scarce be diminished thereby, so much as is equivalent to the descent of two inches of mercury in the Barometer. Farther, in many places between the tropics, the rains fall at certain seasons, in very great quantities; and yet the Barometer shews there were little or no alterations in the weight of the air.

The following are Mr. Patrick's observations on the rising and falling of the mercury: they are very just, and are to be accounted for on the same principles with those of Doctor Halley.

1. The rising of the mercury presages, in general, fair weather; and its falling, foul weather; as rain, snow, high winds and storms.

2. In very hot weather, the falling of the mercury foreshews thunder.

3. In winter, the rising presages frost; and in frosty weather, if the mercury falls three or four divisions, there will certainly follow a thaw: but in a continued frost, if the mercury rises, it will certainly snow.

4. When foul weather happens, soon after the falling of the mercury, expect but little of it: and, on the contrary, expect but little fair weather, when it proves fair shortly after the mercury has risen.

5. In foul weather, when the mercury rises much and high, and so continues for two or three days before the foul weather is quite over, then expect a continuance of fair weather to follow.

6. In fair weather, when the mercury falls much and low, and thus continues for two or three days before the rain comes, then expect a great deal of wet, and, probably, high winds.

7. The unsettled motion of the mercury denotes uncertain and changeable weather.

8. You are not so strictly to observe the words engraved on the plates (though, for the most part, it will agree with them) as the mercury's rising and falling; for if it stands at Much Rain, and then rises up to Changeable, it presages fair weather, although not to continue so long, as it would have done, if the mercury were higher: and so, on the contrary, if the mercury stood at Fair, and falls to Changeable, it presages foul weather; though not so much of it, as if it had sunk down lower.

From these observations, it appears, that it is not so much the height of the mercury in the tube, that indicates the weather, as the motion of it up and down; wherefore, in order to pass a right judgment of what weather is to be expected, we ought to know, whether the mercury is exactly rising or falling; to which end, the following rules are of use.

1. If the surface of the mercury is convex, standing higher in the middle of the tube than at the sides, it is generally a sign that the mercury is then rising.

2. If the surface is concave, or hollow in the middle, it is sinking. And,

3. If it is plain, the mercury is stationary; or rather, if it is a little convex; for mercury being put into a glass tube, especially a small one, will naturally have its surface a little convex; because the particles of mercury attract each other more forcibly than they are attracted by glass. Further,

4. If the glass is small, shake the tube; and if the air is grown heavier, the mercury will rise about half the tenth of an inch higher, than it stood before; if it is growing lighter, it will sink as much. This proceeds from the mercury's sticking to the sides of the tube, which prevents the free motion of it, till it is disengaged by the shock: and therefore, when

when an obſervation is to be made with ſuch a tube, it ought always to be ſhaken firſt, for ſometimes the mercury will not vary of its own accord, till the weather, it ought to have indicated, is preſent.

Phoſphorus of the BAROMETER.—M. Picard firſt obſerved, in the year 1676, that, on ſhaking the mercury in the Barometer, in the dark, a light iſſued; but, on trying others, found few which exhibited the ſame phænomenon.

M. Bernouilli, having tried the experiment on his Barometer, found, that, though ſhaken very forcibly, in the dark, it emitted only a weak light. He obſerved, that, on ſhaking of the Barometer, ſo as to force the mercury above and below its æquilibrium by turns, this light never ſhewed itſelf but on the deſcent of the mercury, and always ſeemed to adhere to the upper ſurface; from whence he conjectured, that there might proceed, out of the mercury, a thin ſubtile matter, which was before locked up in the cloſe interſtices of this mineral, to ſupply the uncommon vacuum in the tube, which followed on a violent concuſſion; and that there might, poſſibly, on this occaſion, ſome particles, finer than air, pervade the glaſs tube, and, by meeting thoſe which proceeded from the quickſilver, produce the effect. But why is not this phænomenon common to all Barometers? M. Bernouilli imagined that the motion of the ſubtile matter, which proceeds from the mercury in its deſcent, might be weakened, deſtroyed, or interrupted, by ſome matter heterogeneous to the mercury; which might be collected on the upper ſurface, being forced thither by the mineral, which was heavier than it; that this pellicula always formed itſelf on quickſilver, unleſs very well purified; and even then it would ſoon contract it on the admiſſion of air; that this pellicula was formed by the impurities of the air; that this concuſſion made the quickſilver collect more impurities in an inſtant, than it would have done in many days in a ſtate of reſt; and that the certain method to have a luminous Barometer, was to take care, that, in the conſtruction of it, the mercury poured into the tube ſhould be well cleanſed, and free from any foulneſs of air.

Experiments have juſtified M. Bernouilli's reaſoning exactly, except, perhaps, what he advances about the pellicula formed on the ſurface of the quickſilver.

Nothing obſtructs this phænomenon more than moiſture; for if water gets in with the quickſilver, or even rectified ſpirit of wine, though in its nature apt to take fire; yet they have the ſame effect as the pellicula, to prevent the production of the phoſphorus. The tube muſt, therefore, be thoroughly dry and clean on the inſide.

Scale of the BAROMETER.—The ingenious Mr. Biſſet, of Newington-green, has favoured us with the following method, for graduating the ſcales of common or perpendicular Barometers, when the ciſterns or baſons are cylindrical.

Rule.—Deduct the ſquare of the external diameter of the tube, from the ſquare of the internal diameter of the ciſtern; to the remainder add the ſquare of the internal diameter of the tube, and compare the amount with the ſquare of the internal diameter of the tube; and, whatever part the ſaid ſquare appears to be of the ſaid amount, deduct or cut off a like part from the three inches, for the ſcale; divide the remainder into three equal parts; which parts treat as inches, by placing the numbers 28, 29, 30, and 31, and ſubdivide them into tenths, &c. as uſual.

This rule is founded on the twelfth book of Euclid's Elements, where we learn, that cylinders are to each other as the products of their heighths, multiplied by the area of their baſes; that their baſes (being circles) are to each other as the ſquare of their diameters; hence it would follow, that, when the mercury riſes in the tube, it, at the ſame time, falls in the ciſtern, and vice verſa, in an inverſe proportion of the ſquares of their internal diameters.—But, before a true compariſon can be made, we are to conſider the two following particulars, viz. 1. That, as the tube is immerſed in the mercury in the ciſtern, the ſquare of the external diameter thereof is to be deducted from the ſquare of the internal diameter of the ciſtern, to obtain the true ſuperficial contents of the mercury in the ciſtern. 2. That, whenever the mercury riſes in the tube, it, at the ſame time, falls in the ciſtern; and that theſe two ſpaces are to be added together, to expreſs the true riſe of the mercury; ſo, vice verſa, when the mercury falls in the tube, the riſe thereof in the ciſtern is to be deducted. Hence it is plain, that the mercury always riſes more, and falls leſs, than a ſcale with full inch diviſions can expreſs; and that, in the direct proportion, that the ſquare of the internal diameter of the ciſtern, leſs by the ſquare of the external diameter of the tube, bears to the ſquare of the internal diameter of the tube: ſo that, to obtain a ſcale that will expreſs the riſe and fall of the mercury, within the compaſs of three inches, we muſt proceed by the above rule; or ſay, as the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter, and plus the ſquare of the internal diameter of the tube, is to three inches; ſo is the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter of the tube, to the length of the ſcale; which proportion will, for the following example, ſtand in figures thus: $16 - 4 + 1 : 3$ inches $: : 16 - 4 : 2$ inches $7\frac{9}{13}$.

But, perhaps, this may be better underſtood by a figure. Let therefore A B (*plate* VI. *fig.* 9.) repreſent a tube immerſed in the ciſtern B C, with the mercury ſtanding in the former, at *b*, and in the latter at *c*. Now, let us ſuppoſe the mercury in the tube to riſe to *a* (three inches) and, at the ſame time, to fall in the ciſtern to *d*; it is certain the two ſurfaces of the mercury, viz. in the tube and in the ciſtern, have removed further from each other than they were before, by the ſpaces marked *a b* in the tube, and *c d* in the ciſtern, i. e. more than three inches by the ſpace *c d*.—Now, to aſcertain the diſtance of *c* from *d*, it is firſt to be conſidered, that the mercury that paſſed out of it exactly fills that part of the tube marked *a b*; conſequently, the ſolid contents of theſe two cylindrical ſpaces are equal: and as the internal diameter of the ciſtern, the external and internal diameters of the tube, and the diſtance from *a* to *b*, are given, the diſtance from *c* to *d* may be found, from the nature and effect of cylinders; by ſaying, as the ſquare of the internal diameter of the ciſtern, minus the ſquare of the external diameter of the tube (for, as the tube occupies part of the ciſtern, the ſquare thereof muſt be deducted from the ſquare of the ciſtern) is to the ſquare of the internal diameter of the tube; ſo is the diſtance *a b* to the diſtance *c d*; which, being thus obtained, muſt be added to *a b*, to expreſs the true riſe of the mercury. Hence it is plain, a ſcale, with full inch diviſions, cannot ſhew the true riſe of the mercury; and it will appear as plain, by carefully conſidering the figure, that it cannot ſhew the true fall thereof. In both caſes it is deficient; therefore the ſcale *a b*, which we have hitherto ſuppoſed to be three inches, ſhould exceed it, by the addition of a ſpace equal to *c d*; but as this cannot be done without marking fractional quantities on the ſcale (which would puzzle common obſervers) the beſt method is to let the ſcale expreſs only three inches, by making it proportionably ſhort thereof; by ſaying, as $ab + cd$: three inches : : three inches to the length required; which, when found, muſt be divided into three equal parts, and numbered as inches, as above directed.

Example.—Suppoſe the diameter of the bore of the tube to be $\frac{1}{4}$ inch, the external diameter thereof $\frac{2}{4}$ or $\frac{1}{2}$ inch, and the internal diameter of the ciſtern to be only * $\frac{4}{4}$ or one inch; and let us ſuppoſe the ſquare of the diameter of the bore of the tube to be the integer, then will the ſquare of the internal diameter of the ciſtern be (in ſuch parts) ſixteen; from which deducting the ſquare of the external diameter of the tube, viz. four, there will remain twelve; to this remainder, add the ſquare of the diameter of the bore, viz. 1, the amount will be 13; i. e. $\frac{1}{13}$ part of three inches (equal to $2\frac{4}{13}$ tenths of an inch) is to be deducted from the common ſcale of three inches; or, in other words, the ſcale ſhould, for this example, be only two inches $\frac{7}{10}$ and $\frac{9}{13}$ of a tenth long. Now, ſuch a ſcale, being divided as above, will, in every point thereof, ſhew, in inches and tenths, the true height of the mercury in the tube, from the ſurface of that in the ciſtern; which is the diſtance that ſhould be expreſſed: whereas the beſt Barometers, with the preſent ſcale (of full three inches) will ſhew the true diſtance at one point only, viz. that where the mercury ſtood when the ſcale was fixed; but, whenever the mercury riſes above, or falls below, that point, the expreſſion is erroneous.

* I chuſe to give an example, by a ciſtern of a ſmall diameter, as ſuch an one will ſave much mercury, and, at the ſame time, be equally true with one of a larger diameter.

BA'RRACKS, in military affairs, buildings to lodge ſoldiers in fortified towns, or others. Thus we ſay the Barracks of the Savoy, of Dublin, &c.

Barracks, when damp, are greatly prejudicial to the health of the ſoldiers lodged in them; occaſioning dyſenteries, intermitting fevers, coughs, rheumatic pains, &c. For which reaſon quarter-maſters ought to be very careful in examining every Barrack, offered by the magiſtrates of a place; rejecting all ground-floors in houſes that have either been uninhabited, or have any ſigns of moiſture. *Vid. Pringle, Obſerv. on the Diſeaſes of the Army.*

BA'RREL *of a pump*, is the wooden tube, which makes the body of the engine, and wherein the piſton moves. *Ozan. Dict. Math.*

BARREL *of a muſket, firelock, piſtol, or the like*, is that part wherein the charge or load is put.

BARREL *of a clock*, is a cylindrical part, about which the ſtring is wound, anſwering to what in watches is properly called the fuſy. *Derham's Artif. Clock-maker.*

BARREL *of a jack*, is the cylindrical part whereon the line is wound. *Moxon's Mech. Exer.*

BA'RRING *a vein*, an operation performed by farriers on the veins of horſes legs, and of other parts, in order to ſtop the courſe, and leſſen the quantity of the malignant humours which prevail there.

It is done by opening the ſkin above the part, and, after diſengaging it, and tying it both above and below, ſtriking between the two ligatures.

When

When horſes have got traverſe mules, or kibed heels, and rat-tails, or arreſts in the hinder legs, it is common to bar a vein. *Farr. Dict.*

BA'RRY-*Pily*, in heraldry, is when a coat is divided as repreſented in *Plate* VI. *fig.* 11. which is blazoned, Barry-pily, of eight pieces.

BARS *of iron*, are made of the metal of the ſows and pigs, as they come from the furnaces.

Theſe paſs through two forges, called the finery and the chaufery, where, undergoing five ſeveral heats, they are formed into Bars. See IRON *Works*.

BA'SKET *Salt*. This is a brine ſalt, made from the water of our ſalt ſprings in Cheſhire and elſewhere, differing from the common brine ſalt in the fineneſs of the grain, and in its whiteneſs and purity. See SALT.

BA'SON, *pelvis*, in anatomy, a round cavity in the form of a tunnel, ſituate between the anterior ventricles of the brain, deſcending from its baſe, and ending in a point at the glandula pituitaria.

It is formed of the pia mater, and receives the pituita which comes from the brain and paſſes through the pituitary gland, and from thence into the veins.

That capacity alſo is called pelvis, or baſon, which is formed by the oſſa ilia and ſacrum, and contains the bladder of urine, the matrix, and the inteſtines.

BASONS *of a balance*, two pieces of braſs, or other matter, faſtened to the extremities of the ſtrings; the one to hold the weight, the other the thing to be weighed.

BASON, or *diſh*, among glaſs-grinders. Theſe artificers uſe various kinds of Baſons, of copper, iron, &c. and of various forms, ſome deeper, other ſhallower, according to the focus of the glaſſes to be ground. In theſe Baſons it is, that convex-glaſſes are formed, as concave ones are formed on ſpheres or bowls.

Glaſſes are worked in baſons two ways. In the firſt, the Baſon is fitted to the arbor or tree of a lath, and the glaſs (fixed with cement to a handle of wood) preſented and held faſt in the right hand within the Baſon, while the proper motion is given by the foot of the Baſon. In the other, the Baſon is fixed to a ſtand or block, and the glaſs with its wooden handle moved.

The moveable Baſons are very ſmall, ſeldom exceeding five or ſix inches in diameter, the others are larger; ſometimes above ten feet diameter.

After the glaſs has been ground in the Baſon, it is brought ſmoother with greaſe and emery; and poliſhed firſt with tripoli, and finiſhed with paper cemented to the bottom of the Baſon.

BASON, among hatters, is a large round ſhell, or caſe, ordinarily of iron, placed over a furnace; wherein the matter of the hat is moulded into form.

The hatters have alſo Baſons for the brims of hats, uſually of lead, having an aperture in the middle, of a diameter ſufficient for the largeſt block to go through.

BASON, is alſo uſed on various occaſions for a ſmall reſervatory of water: as the Baſon of a jet d'eau, or fountain, the Baſon of a port, of a bath, &c. which laſt Vitruvius calls labrum.

BASON *of a port*, denotes the place where the ſhips lie.

The word is alſo uſed for a ſmall private port contrived in a large one, for the refitting of veſſels, more frequently called a dock. See DOCK.

BASONS *or Fountains*, among gardeners, are reſervoirs for holding water either for the ornament or uſe of the garden.

They are made in divers forms, ſome round, ſome oblong or oval, others ſquare, octangular, &c. but their moſt common form is circular; and, if the ground will permit, the larger they are, the better: and, when they exceed in ſize, they are called pieces of water, canals, fiſh-ponds, pools, &c.

In making theſe, care ought to be taken to avoid both extremes, and not to make them too big or too little; that a water-work may not take up the beſt part of a ſmall piece of ground; nor to make too little a Baſon in a large ſpot. This muſt depend intirely on the judgment of the deſigner of the garden.

Some would have the ſize of a Baſon to be proportioned to the jet d'eau, that the water, thrown up in the air, may not, by being blown by the air, be carried beyond the edge of the Baſon, but all fall down without wetting the walk.

As to the depth of Baſons, it uſually from two to three feet; this depth being ſufficient to ſecure the bottom of the Baſons from froſt, and to dip watering-pots.

But if they are to ſerve as reſervoirs, or to keep fiſh in, then they may be made four or five feet deep, which will both hold water enough, and be deep enough for the fiſh to breed in, and alſo to bear a boat.

Deeper than this they ſhould not be; for, if they were deeper, they would be dangerous as to the drowning of perſons, who might chance to fall in.

In making Baſons, great care ought to be taken of making them at firſt; for the water always naturally endeavouring to run away, and, by its weight and preſſure in a Baſon, making its way out at the leaſt cranny, it will grow conſtantly bigger and bigger; ſo that, if it be not well made at firſt, it will be very difficult to repair it.

Baſons are made either with clay, cement, or lead; they are moſt uſually made of clay: in making ſuch, at the marking out the dimenſions, the diameter ought to be four feet bigger on each ſide; yet the Baſon will not be the wider, for it will be taken up with the walls on each ſide; and the clay-work, which is to fill the ſpace between the Baſon, muſt alſo be dug two feet deeper than the depth of the water is deſigned to be, becauſe it is to be laid over eighteen inches thick with clay, and ſix inches with gravel and paving.

The clay ought to be well wrought with the hands and water; and, when it is ſpread, ſhould be trodden in with the naked feet, that the water of the Baſon may not dilute through it, and the roots of any trees that may grow near, may not penetrate into the outward wall; which may be made of ſhards, rubble, or flints, with mortar made of the natural earth, and is called the ground-wall, becauſe it is only made to reſiſt the preſſure of the ground about it. The inward wall ought to be made with good rubble-ſtones, that will not ſcale and come off in flaſhes in the water; or elſe of flints and ſtones from the hills, which will make durable works, but will not look ſo neat as the pointed rubble; and there ought to be laid here and there ſtones, the thickneſs of the wall, to render it the more ſubſtantial.

The method of making Baſons of cement is as follows: after you have marked out the dimenſions of the Baſon, as before, if you inlarge it one foot nine inches, it will be ſufficient; and the ſame depth deeper at the bottom will be enough.

This being done, you muſt begin to back up and raiſe againſt the ground: cut perpendicularly a wall of maſonry a foot thick, which muſt go to the bottom, and ſhould be built with ſhards and rubble-ſtones laid in a mortar of lime and ſand. When the wall is finiſhed round the circumference, then the bottom is to be wrought a foot thick with the ſame materials; and the ſolid work or lining of cement is to be backed up againſt the walls nine inches thick, including the plaiſtering and inward ſurface.

This ſolid ought to be made of ſmall flints, laid in beds of mortar made of lime and cement.

When this ſolid is eight inches thick, it ought to be plaiſtered over the whole ſurface of the bottom with cement well ſifted before it be tempered with lime; and with this it ſhould be wrought over ſmooth with the trowel.

The proportion of this cement ſhould be two-thirds of cement or powdered tile to one-third of lime.

This cement has the property ſo to harden under-water, that it will be as hard as ſtone or marble, and the body will be ſo ſolid as never to decay.

After the finiſhing of the Baſon, the plaiſtering ſhould be for four or five days ſucceſſively anointed over with oil, or bullocks blood, to prevent it from cracking or flawing: this being done, the water ſhould be let into the Baſon as ſoon as may be.

Thoſe Baſons which are made of lead, are to be thus wrought: the out-lines ought to be inlarged one foot of a ſide, and digged half a foot deeper than the Baſon is to be. The wall muſt be made a foot thick, that it may be able to bear up againſt the earth lying againſt it; but the bottom will not require to be more than half a foot thick.

Theſe walls muſt be built with rubble laid in mortar all of plaiſter, becauſe the lime will corrode the lead; and then the lead muſt be laid on the walls and bottom, and be ſeamed with ſolder.

But Baſons of lead are not much in uſe, becauſe of their great charge in making, and the danger of the lead being ſtolen.

Great care ought to be taken to keep the upper edge and ſuperficies of a Baſon upon a level, that the water may cover all the wall equally.

As for the waſte pipes of Baſons, whether at the bottom or ſuperficies, they ought not to be made too ſmall, leſt they ſhould be choaked, notwithſtanding the cauls that are drawn before them.

When this waſte water is only to be loſt in ſinks and common-ſewers, it is carried away in drains, or earthen-pipes; but, when it ſerves to play the Baſons that lie below it, it muſt paſs through leaden-pipes.

Theſe Baſons are now pretty generally rejected by perſons of good taſte, as being no-ways ornamental: therefore, where there is a neceſſity to make reſervoirs for water for the uſe of gardens, they are commonly dug in the loweſt part of gardens, or where the ſpot is moſt convenient for receiving the water which may run from the adjacent grounds in hard rains. Theſe ponds ſhould have their ſides made very eaſy; for, if they are too upright, the earth frequently breaks down, by the water waſhing and making it hollow below: the ſides and bottom of theſe ponds ſhould be laid nine or ten inches thick with well wrought clay; and, as the clay is finiſhed, it ſhould be well covered to prevent the ſun and wind from cracking it before the water is let in: the figures of of these ponds should not be regular; for the shape of the hollow, where they are made, should be followed, which will save expence and have a better appearance.

BA'SIL, among joiners, denotes the angle to which the edge of an iron tool is ground.

To work on soft wood they usually make their Basil twelve degrees, for hard wood eighteen; it being observed, that, the more acute or thin the Basil is, the better and smoother it cuts; and, the more obtuse, the stronger and fitter for service.

BA'SSETING, in the coal-mines, denotes the rise of the vein of coal towards the surface of the earth, till it come within two or three feet of the surface itself.

This is also called by the workmen croping, and stands opposed to dipping, which is the descent of the vein to such a depth, that it is rarely, if ever, followed to the end.

BA'STION (*Dict.*)— To construct the plan of a Bastion.

1. Draw a capital line B K (*Plate* VI. *fig.* 12.) and make the angles M B K, F B K, each equal to half the flanked angle.

2. Take the lines B F, B M, each of the length of the face.

3. At the points F, M, make the angles of the shoulder B F H, B M N.

4. Make the lines F H, M N, each the length of the flank.

5. At the points H, N, make the angles F H G, M N *a*, equal to the angle of the curtin, and draw the pieces of the curtin H G, N *a*.

This problem may be found useful on many occasions; particularly when the drawings of works in a Bastion are to be represented with that Bastion only, on a large scale; therefore it was here introduced, more especially for beginners, who are for the most part apt to be somewhat puzzled about constructing part of a work, independent on the whole.

BAT, in physiology, a mongrel or amphibious sort of animal, partaking both of the mouse and the bird, and flying, but without feathers.

The Bat, called also by us lapwing, and flittermouse, by the Latins, vespertilio, seems a medium between the quadruped and the feathered kinds; but it partakes more of the former tribe, agreeing only with the birds in the sternum, and the position of its liver; and with the quadrupeds in the kidneys, bladder, teeth, penis, testicles, diaphragm, and lungs. In reality, it only appears to be a bird by its flying. They lay themselves up in the winter in the driest apartments of caves; where planting their talons to the roof, they cover their bodies with their wings, and so hanging perpendicularly in great numbers, but so as not to touch each other, they sleep for some months.

BAT-*Fowling*, a method of catching birds in the night, by lighting some straw or torches near the place where they roost: for, upon beating them up, they fly to the flames, where, being amazed they are easily caught in nets, or beat down with bushes fixed to the ends of poles, &c.

BA'TEMENT, a term in carpentry, signifying an abatement or waste of a piece of stuff, by forming it to a designed purpose or use: thus, instead of asking how much was cut off from such a board or piece of stuff, they say what abatement had that piece of stuff.

BATH *Metal*, a preparation of copper with zink, which gives a more beautiful colour than the calamine used in the preparation of the common brass. See PRINCE'S *Metal*.

BA'TISTE, in commerce, a fine white kind of linen cloth, manufactured in divers parts of the Spanish Netherlands. There are three kinds of Batiste; the first very thin; the second less thin; and the third much thicker, called holland. The chief use of Batiste is for neck-cloths, head-cloaths, surplices, &c. *Savar. Dict. Comm.*

BA'TMAN, a weight in Turkey consisting of six okes. Forty of these Batman's make a camel's load, and amount to about seven hundred and twenty pounds English weight. *Pocock's Egypt.*

BATRACHOMYOMA'CHIA *, battle of the frogs and the mice; the title of a fine burlesque poem, usually ascribed to Homer.

* The word comes from the Greek βάτραχος, frog, μῦς mouse, and μάχη, battle.

The subject of the war is the death of Psycharpax, a mouse, son of Toxartes, who, being mounted on the back of Physignates, a frog, on a voyage to her palace, to which she had invited him, was seized with fear when he saw himself in the middle of the pond, so that he tumbled off and was drowned. Physignates being suspected to have shook him off with design, the mice demanded satisfaction, and unanimously declared war against the frogs.

Stephens, Nunnesius, and other modern authors, take the poem not to be Homer's; but several of the ancients seem of another opinion; and Statius, who wrote under Domitian, makes no doubt of it.

BA'TTEN (*Dict.*)— This term is chiefly used in speaking of doors, and windows of shops, &c. which are not framed of whole deal, or one quarter inch-oak, with stiles, rails, and pannels, as wainscot is framed; and yet they are made to appear as if they were, by means of these pieces or Battens, bradded on upon the plain boards which are joined together for the door, or window, all round, and sometimes cross them, and up and down, &c. according to the number of the pannels, the workman designs the door, or window, shall appear to have.

These pieces, which are thus bradded on, to represent stiles, rails, and montans, and are of different breadths according to the design of the workman, as from two to six or seven inches; and there is usually some moulding struck, as a bead, an ogee, or the like, on one edge of those that represent the stiles, and the upper and lower rails, and on both the edges of those which are designed to appear like montans and middle rails.

BATTEN *Doors*, are such as seem to be wainscot ones, but are not; for, in wainscot ones, the pannels are grooved into the framing; but, in these, they first joint and glue the boards, which are cut to the full length and breadth of the door-case; which gluing being dry, they traverse them over with a long plane; and, being smoothed, the Battens are fitted on, on the front-side. And these are called single Batten-doors; for there are others, called double Batten-doors, viz. such as are battened on both; though this is but rarely done.

But there are battened doors, which are called double doors, such as front or outer-doors; which are usually made of whole deal, and afterwards battened on the outside, and pieces, four or five inches broad, mitred round the edges on the inside of the door; and then it is lined cross the door betwixt these pieces, with thin slit-deal, which renders it level with the mitred pieces.

Some doors have been lined with pieces laid bevelling, and not at right-angles, but near mitre to the sides of the door; and, when all has been plained off level, it has been divided into rhombus's, and struck with a pencil, and round-headed nails driven in at the angles of the rhombus's, which added something of beauty to the work.

This way of lining upon the doors, viz. pointing from the lower corner behind, towards the upper corner before, seems to be a good way to prevent a door from sagging or sinking at the fore-corner, whenever the joints shall happen to unglue. *Builder's Dict.*

BA'TTER, a term used by bricklayers, carpenters, &c. to signify that a wall, piece of timber, &c. doth not stand upright, but leans from you, when you stand before it.

BA'TTERY (*Dict.*)— All field Batteries consist of four chief parts, namely, the ditch, the parapet, the platform, and the magazine.

The Ditch is usually dug in the front and sides, and sometimes quite round; and serves not only to furnish the earth necessary for the parapet, but it also prevents the enemy from entering the Battery so readily as he might otherwise do.

The ditch in front is commonly eighteen or twenty feet broad, and the depth about seven or eight feet; the sides sloping towards the bottom, which is about six feet wide: but the ditches on the sides are about ten feet wide, and six feet deep. These are the dimensions usually given; but the general practice seems to be, only to get earth sufficient for the work, and not mind the regularity of the ditch: for, as these works in attacks are usually done by night, the keeping strictly to the assigned dimensions is hardly practicable.

The parapet is generally raised about three or four feet distant from the brink of the ditch, the space left between, called the berm or foreland, serving to lodge the rubbish beat down by the enemies shot, that it may not fall into the ditch.

The thickness of the parapet should be about eighteen or twenty feet, in order to be cannon-proof, and about seven or eight feet high, when the enemy has no command above the Battery: but, if they have a command over this height, the parapet should be raised high enough to cover the men when they load the guns.

The length of the parapet depends on the number of guns to be employed in the Battery.

Thus, for one gun allow eight yards in length. And six yards more for every other gun. So two guns have fourteen yards, three guns twenty yards, four guns twenty-six yards, &c.

There should be great care taken that the Battery be not enfiladed or raked by the enemies cannon: neglects of this kind are often fatal to the officers and gunners, as was well known at the siege of Carthagena, anno 1741. But this is easily prevented by raising at one, or both ends of the parapet, a bank across the Battery called an epaulment, of the same thickness and height with the parapet, and about fifteen or eighteen feet long.

The parapet consists of two parts, namely, the wall and the merlons.

The wall is that part of the parapet, which is contained in one piece from end to end, and is about two and a half of three feet high.

The merlons are detached pieces of the parapet, leaving openings called embrasures, through which the cannon deliver their shot.

The embrasures should, as much as is possible, be cut perpendicular to the parapet; therefore the Battery should be parallel, or nearly so, to the object to be battered: for the direct shots have most force; and oblique embrasures weaken the merlons, or parts of the parapet standing between the embrasures.

The embrasures are usually about two or two and a half feet wide on the inside, and about nine or ten feet on the outside: whereby the cannon may be traversed from the right to the left, so as to command a pretty large extent in front.

The distance from the middle of one embrasure to the middle of the next should be about eighteen feet, in order to leave sufficient room for the working of the guns, and the stowage of the shot and other necessaries.

Platforms are generally laid sloping towards the parapet nine or ten inches; this carries off the rain, prevents the gun from recoiling so much when fired as it would do if laid level; and, when loaded, it is more easily brought to the embrasure.

In temporary Batteries, the platforms are made of planks laid across some ground timbers or sleepers: there is usually a platform made to each gun; it is about eighteen feet long, eight feet broad next the parapet, and about fourteen feet broad at the tail, the intermediate spaces between the platforms serving for the shot and other necessaries.

When a platform is to be laid on marshy ground, first lay a floor or two of fascines; cover these with hurdles of twelve or fifteen feet long, and six or seven broad; on these lay a floor of three or four inches of earth, and therein lay the sleepers, and over these the planks.

When a Battery is built of stone or brick, the platform is generally a flat-stone pavement ranging the whole length of the Battery: this, on account of its resisting the injuries of the weather for a long time, is to be preferred to planks; but, in case of a bombardment, such a platform is to be avoided, because the shells will not only break the pavement, but also, by driving about the broken stones, do the troops much mischief.

The magazine to a field Battery is usually made about fifty or sixty yards behind the platform: it is a cavity dug in the ground, about four feet deep; the earth whereof is thrown between the pit and the platform; the sides of the pit are sometimes planked round to keep it dry, and prevent the earth from crumbling in; and the powder barrels placed herein are covered with hurdles and earth, or tanned hides, to preserve the powder from wet and fire.

The communication to the magazine is by a sloping trench beginning to descend about five or six yards behind the platform; and the earth thrown on that side where it will most conveniently cover the persons who remove the barrels of powder from the great magazine to the Battery, or small magazine.

When there are many cannon in Battery, and the service is quick, it is customary to have to every two pieces a small magazine to hold twenty or thirty barrels of powder: this is placed about fifteen or twenty yards behind the platform, and against the merlon between the cannon; and, as these barrels are used, they are replaced by others from the great magazine.

At each magazine a centinel is placed to prevent accidents.

And, to prevent persons coming into the Battery and magazines who have no business there, a trench is sometimes dug behind the magazine, and carried into the trenches which communicate between the magazine and Battery.

To construct a Fascine BATTERY.— For one gun provide fascines, of 9 feet, 600; of 6 feet, 100; of 3 feet, 120.

And, for every other piece of 9 feet, 400; of 6 feet, 100; of 3 feet, 100; each fascine being about nine inches thick; and let there be three or four pickets for every fascine, for many will break in driving.

Trace the limits of the parapet in two parallel lines about eighteen feet distant, allowing eight yards in length for one gun, and six yards for every other gun; and along these line cut a trench about half a spade deep.

Lay a row of nine feet fascines along one trench, observing that their ends be well jammed one into the other, and let each be pegged down with two pickets, drove into the ground till the head is sunk into the fascine.

Close to this row lay another, letting the two end ones be of six feet, and the rest nine feet, whereby the joinings in this row will not fall against the joinings in the first row: let these be also staked down as before. Close to the second row lay a third all of nine feet. Close to the third lay a fourth, the two end ones being six feet, and the rest nine feet. In this manner lay the rows of fascines within the limits staked out, which will be covered with twenty-four rows; then over this floor of fascines sprinkle earth to fill up the hollows, and let the whole be trod or rammed down.

On the first floor lay a second, observing, that as in the first floor every second row ended with six feet fascines; so in the second floor let every odd row end with six feet ones, whereby the joinings of no two fascines in this floor will fall over the joining of the fascines below them. Let the outside rows in the second floor be so placed over those of the lower, that there be a little sloping preserved, the work narrowing upwards. The pickets which stake down this floor are to be drove up to the head, and the channels or hollows in the floor are to be filled up with earth. In this manner lay four floors, which will raise the work to about two and a half or three feet; and that part of the breast-work called the wall will be compleated.

Measure from each end of the wall twelve feet, there stick a stake; and plant other stakes at every intermediate eighteen feet: this being done on the inside of the wall, let other stakes be planted on the outside, either directly opposite the former, or in the line towards the place where the gun is more particularly intended to deliver its shot. Plant other stakes on the inside, one a foot distant on each side the former, and this will leave spaces of two feet each for the inner opening of the embrasures: Then, on the outside, plant other stakes at five or six feet distance from the former ones, one on each side, and spaces of ten or twelve feet will be marked out for the outside openings of the embrasures.

In the direction of the pickets which limit the inner and outer openings of the embrasures, let single rows of fascines be staked down across the wall, and these will be the sides of the embrasures: fill the intermediate spaces or merlons with rows of fascines laid lengthwise to the wall, and this will be the first floor of the merlon, which is to be picketed down, and the hollows filled with earth as before directed. Let other floors be raised in like manner, until the merlons are carried up to about five or six feet, or more, if necessary; and on the top of each let a bed or floor of earth be laid of about 8 or 12 inches thick.

Across the top of the inner opening of the embrasure, either lay a bundle of 10 or 12 fascines bound together, or as many stuffed into a kind of basket open at both ends, and the bundle well staked to the merlons.

Provide a blind made of planks three or four inches thick, to fit the inner opening of the embrasure, which is to be put up, while the gunners are loading the piece, to preserve them from the fire of the musketry.

The cheeks or sides of the embrasures are to slope so, as to have the top wider than the bottom; which not only leaves a greater opening for the blast of the gun, but these slopes in works of this kind give a greater degree of strength to support themselves against the thrust of the upper parts.

Against each embrasure lay on the ground five pieces of timber called sleepers, of about eighteen feet long and six or eight inches square; let the ends next the embrasure be placed at such a distance from one another, that the distance from out to out be about six feet, the other ends spreading about twelve or fourteen feet from out to out; drive two stakes of about three inches square into the ground on both sides of each end of every sleeper, whereby they will be kept steady in their places, and let the earth be well rammed and beat up close to them: but observe to let the tails of the sleepers be raised about six or eight inches higher than the ends next the wall, to prevent the cannon from recoiling too much, when fired.

Cover the sleepers with planks of about two inches thick laid crosswise; that next the embrasures being about eight feet long, the rest gradually increasing, so that the plank at the tail be about fourteen feet long; and let the planks be nailed to the sleepers.

On this floor fix a piece of timber of about six or eight inches square next the embrasure, to serve as a spur for the carriage wheels to knock against (and is therefore usually called the knocker) when the gun is run up to the wall; observing that the spur be laid parallel to the object to be battered.

The whole platform should be of oak, if it can be had.

If there is any danger of the Batteries being raked by the enemies cannon, let an epaulment or screen be raised at one or both ends of the parapet, joining to it, and constructed by floors of fascines, as before shewn: then, all the straggling twigs of the fascines being cut off, the Battery is constructed.

A Battery thus made will do in case of haste, and where earth enough is not easily had: but, as it is subject to be fired when the wood is dry, it is not so much in use as another sort called a coffer Battery, especially where wood is scarce and earth plenty.

A Coffer BATTERY, is that where the sides of the wall and merlons only are formed of fascines, and all the cavities or included spaces filled with earth.

The place of the Battery being determined, make out, with a line of some kind, the limits of the parapet of about eighteen or twenty feet thick; and, three or four feet before the parapet, mark out with lines, or stakes, the limits of the ditch of about ten or twelve feet broad, or more, if earth is wanted; allowing eight yards in length for one gun, and six yards more for every other gun.

On the outlines of the parapet, cut a trench of about five or

six

six inches wide and deep, and therein lay a row of fascines, the ends being jammed one into the other; let these be staked down: lay on them another row, so that the joinings of these be not directly over the joinings of the lower one, and the knots of all the bands turned inwards; stake these down, and on them lay, in like manner, a third and a fourth row, &c. until the height be about three feet. The same kind of work being done at the ends, and for the epaulment, if wanted, the coffer for the wall will be made.

Then let the men be disposed along the place intended for the ditch, and, with the proper tools, break the ground, and throw it into the coffer; where another set of men are, as the earth is thrown in, to spread it and stamp it down with rammers; and this work is to be continued until the coffer is filled.

When the wall is finished, let the embrasures be staked out as before, and a coffer formed in like manner, as for the wall, for each merlon, which is also to be filled with earth, and rammed down.

The other articles in the preceding Battery are to be followed in this, the only difference being in the making of the parapet.

When a proper place for a temporary Battery is destitute both of dry earth and wood, then materials must be carried to the place; these usually are gabions and earth-sacks.

To make a gabion BATTERY.—Along the line, pitched out for the Battery, let the gabions be planted in the places where the merlons are to be: the gabions used are of five, six, and seven feet diameter, and eight feet high. Each merlon must have seven; that is, three within, of six feet diameter, next, two of seven feet diameter, and, on the outside, two of five feet diameter; observing to leave proper openings for the embrasures, of about two feet on the inside, and nine or ten on the outside.

Or thus: let the merlons be made of gabions five feet diameter; then put four within, three in the middle, and two on the outside; this construction being rather stronger than the former.

The ends and epaulments are also formed by three rows of gabions.

The floors or bottoms of the embrasures are to be filled with gabions of about three feet high, and of a proper diameter, to fill up the spaces between the merlons.

The gabions being placed, they are to be filled with earth brought from the nearest places that will afford it, in the earth-sacks; or else they may be filled with dung, mingled with sand; and, in cases of necessity, they may be filled with large faggots, or billet-wood, observing that the voids between the gabions are also filled.

Batteries of this construction are usually made on marshy or rocky ground. *Robertson's Elem. Nav.*

BATTERY is sometimes used in speaking of the fabric of metalline utensils.

In this sense, Battery-works include pots, saucepans, kettles, and the like vessels, which, though cast at first, are to be afterwards hammered or beaten into form.

A society for the mineral and Battery-work of England was incorporated by queen Elizabeth, to whom she granted all mines, minerals, and subterraneous treasures, except copperas and alum, in all parts of England, not mentioned in the patent of the society of the mines royal. This society has a governor, court of assistants, and other officers, who are the same as those for the mines royal, with whom they are now associated.

BAY, among carpenters, part of the capacity of a barn.—Thus, if a barn consists of a floor and two heads, where they lay the corn, they call it a barn of two Bays.

BAY-*window*, in architecture, one that is composed of an arch of a circle, and stands without the stress of the building.

BAYS *(Dict.)*—This stuff is without wheal, and is wrought on a loom, with two treddles, like flannel. It is chiefly manufactured at Colchester and Bockin in Essex, in England, where there is a hall, called the Dutch Bay-hall, or Raw-hall. By the statute, 12 Car. II. cap. 22, no person shall weave at Colchester any Bay, known by the name of four and fifties, sixty-eights, eighties, or hundred Bays, but, within two days after weaving any such, shall carry it to the Dutch Bay-hall, to be viewed and examined, that it may appear whether it be well and substantially wrought, before it be carried to be scoured and thickened. No scourer or thickener shall receive any such Bay, before it has been marked or stamped at the said hall. This manufacture, which is very considerable, was first introduced into England with that of says, serges, &c. by the Flemings, who, being persecuted by the duke of Alva, for the sake of their religion, fled hither, about the sixth year of queen Elizabeth's reign.

The exportation of Bays was formerly much more considerable than it is as present, the English then furnishing the French and Italians with those stuffs; but, of late years, the French have attempted to imitate them, and have admirably well succeeded, particularly at Beauvais, Castres, Montpelier, and Nismes. They also manufacture vast quantities of Bays in Flanders, and especially at Tournay, Lisle, and Neuf-Eglises. The people of that country call them baigues: however, the export of English Bays is still very considerable to Spain and Portugal, where they are called baetas; and even Italy. Their chief use is for dressing the monks and nuns, and for linings, especially in the army. The looking-glass-makers also use them behind their glasses, to preserve the tin, or quicksilver; and the case-makers, to line their cases.

The breadth of Bays is commonly a yard and an half, a yard and three quarters, or two yards, by forty-two and forty-eight in length. Those of a yard and three quarters are most proper for the Spanish trade.

BA'ZAC, or BAZA, spun cotton, very beautiful and very fine, which comes from Jerusalem, whence it is called Jerusalem cotton. The half Bazac, and the middling Bazac, come from the same place, but are of a much inferior quality.

BAZGE'NDGES, in natural history, the name of a substance used by the Turks, and other eastern nations, in their scarlet dying: they mix it for this purpose with cochineal and tartar, the proportions being two ounces of the Bazgendges to one ounce of cochineal.

The Bazgendges seem to be no other than the horns of the turpentine-tree in the eastern parts of the world: and it is not only in Syria that they are found, but China also affords them. Many things of this kind were sent over to Mr. Geoffroy at Paris, from China, as the substances used in the scarlet dying of that country; and they all proved wholly the same with the Syrian and Turkish Bazgendges, and with the common turpentine horns. The lentisk or mastic-tree is also frequently found producing many horns of a like kind with these, and of the same origin, all being owing to the pucerons, which make their way into the leaves, to breed their young there. *Reaumur, Hist. Insect.*

BEACH-*Tree, fagus*, a large and beautiful tree, whose leaves somewhat resemble those of the horn-beam: the male flowers grow together in a round bunch, and are produced at remote distances from the fruit on the same tree: the fruit consists of two or three triangular nuts, which are inclosed in a rough hairy rind, divided into four parts.

There is but one species of this tree at present known (except the two varieties with striped leaves, which are accidental) though the planters would distinguish two or three sorts; one of which they call the mountain Beach; and, as they say, affords a much whiter timber than the other, which they call the wild Beach: but as those have never been distinguished by the botanists, nor can I perceive any real difference amongst all the trees of this kind I have yet seen, I rather think the difference in the colour of the wood is occasioned by the place of their growth; which is often observed to be the case with most other sorts of timber.

This tree is propagated by sowing the mast; the season for which is any time from October to February; only observing to secure the seeds from vermin, when early sowed; which, if carefully done, the sooner they are sown, the better, after they are fully ripe: a small spot of ground will be sufficient to raise a great number of those trees from the seeds; but you must be very careful to keep them clear from weeds; and, if the plants come up very thick, you should not fail to draw out the strongest of them the autumn following, that those left may have room to grow: so that, if you husband a seed-bed carefully, it will afford a three years draught of young plants, which should be planted in a nursery; and, if designed for timber-trees, at three feet distance, row from row; and eighteen inches asunder in the rows.

But if they are designed for hedges (to which the tree is very well adapted) the distance need not be so great; two feet, row from row, and one foot in the rows will be sufficient. In this nursery they may remain two or three years, observing to clear them from weeds, as also to dig up the ground between their roots, at least once a year, that their tender roots may the better extend themselves each way; but be careful not to cut or bruise their roots, which is injurious to all young trees; and never dig the ground in summer, when the earth is hot and dry; which, by letting in the rays of the sun to the roots, is often the destruction of the young trees.

This tree will grow to a considerable stature, though the soil be stony and barren; as also upon the declivities of hills and chalky mountains, where they will resist the winds better than most other trees; but then the nurseries for the young plants ought to be upon the same soil; for, if they are raised in a good soil, and a warm exposure, and afterwards transplanted into a weak barren situation, they seldom thrive, which holds true in most other trees; therefore I would advise the nursery to be made upon the same soil where the plantation is intended: but of this we shall say more under the article NURSERY.

The tree is very proper to form large hedges, to surround plantations, or large wilderness-quarters; and may be kept in a regular figure, if sheared twice a year, especially if they shoot strong; in which case, if they are neglected but a season or two, it will be difficult to reduce them again. The shade of this tree is very injurious to most sorts of plants which grow near it, but is generally believed to be very salubrious to human bodies.

The timber is of great use to turners, for making trenchers; dishes,

dishes, trays, buckets; and likewise to the joiners for stools, bedsteads, coffers, &c. The mast is very good to fat swine and deer; it also affords a sweet oil, and hath, in some families, supported men with bread.

This tree delights in a chalky or stony ground, where it generally grows very fast; and the bark of the trees, in such land, is clear and smooth; and, although the timber is not so valuable, as that of many other trees, yet, as it will thrive on such soils, and such situations, where few better trees will grow, the planting of them should be encouraged; especially as the trees afford an agreeable shade, and the leaves make a fine appearance in summer, and continue green as long in autumn as any of the deciduous trees; therefore, in parks, and other plantations for pleasure, this tree deserves to be cultivated among those of the first class; especially where the soil is adapted to it.

The two sorts with variegated leaves may be propagated by budding or grafting them upon the common Beach, observing not to plant them in a good earth; which will cause the buds or cyons to shoot vigorously, whereby the leaves will become plain; which often happens to most variegated plants.

This tree affords us two articles for trade, namely, its timber, and its fruit, or seed. The wood of the Beach is whitish, hard, dry, and crackles in the fire. In France it is commonly sold in the forests, cut into boards, stakes, and shingles, to be afterwards used in making houshold furniture, and other joiners work. The boards ought to be from eleven to twelve inches broad, thirteen lines thick, and six, nine, or twelve feet long.

The Beach-timber is also sold in laths, which are small thin boards, designed for the drawer and trunk-makers.

They likewise make of this wood staves, saddle-bows, &c.

It is very useful for making the keel and inside of ships.

Beach-wood is also used for making shovels, spoons, wooden-shoes, and other such small-wares.

Of the largest trunks of Beach-trees are made forms, and kitchen-tables, which are four, five, six, and seven inches thick, and of different breadths and lengths, according as the trunks are more or less thick and long.

Beach-wood also makes good fuel; for which reason, there is a great deal of it sold in faggots, in cords of wood, in logs, &c.

The fruit or seed of the Beach-tree, which is a kind of nut, or acorn, called mast, contains a kind of white and oily marrow, or pulp, of a sweet taste, and agreeable to eat; of which they make oil, very much esteemed for frying, and for sallads. This oil, which is very common in Picardy, and those places where there are many Beach-trees, is extracted cold by expression, after the shell of the mast has been taken off, and the pith broke or bruised. There are some countries where hogs are fattened with Beach-masts, as they are with acorns in other places.

The common people in France use that oil instead of butter; but most of those who use a great deal of it, complain of pains and heaviness in the stomach. M. Danty d'Isnard has prescribed a method to prevent those inconveniencies. We must pour the oil of masts, newly expressed, into stone pitchers, very closely shut; put them into the ground, and leave them there a year; after which time the oil will have lost all its bad qualities.

BEAD-PROOF, a term used by our distillers, to express that sort of proof of the standard strength of spirituous liquors, which consists in their having, when shaken in a phial, or poured from on high into a glass, a crown of bubbles, which stand on the surface some time after. This is esteemed a proof that the spirit consists of equal parts of rectified spirits and phlegm.

BEAM, or ROLLER, used by weavers, is a long and thick wooden cylinder, placed lengthways on the back part of the loom of those who work with the shuttle. The threads of the warp of linen or woollen cloth, serges, and other woollen stuffs, are rolled upon the Beam, and enroll, as the work goes on. That cylinder, on which the stuff is rolled, as it is weaved, is also called the Beam or roller, and is placed on the fore-part of the loom.

BEAM *of a plough*, a name given by our farmers to the great timber of the plough, into which all the other parts of the plough-tail are infixed.

This is usually made of ash, and is straight, and eight feet long in the common plough; but, in the four-coultered plough, it is ten feet long, and its upper part arched. The head of this Beam lies on the pillow of the plough, and is raised higher, or sunk lower, as that pillow is elevated or depressed, by being slipped along the crow-staves. Near the middle, it has an iron collar, which receives the tow-chain from the box; and the bridle-chain from the stake or gallows of the plough is fixed into it a little below the collar. Some inches below this, there is an hole, which lets through the coulter; and below that there are two other small ones, through which the heads of the retches pass. These are the irons which support the sheat, and with it the share. Farther backward still is a large perforation, through which the body of the sheat passes; and behind that, very near the extremity, is another hole, through which the piece called the hinder-sheat passes. *Tull's Husb.* See PLOUGH.

BEAM, in building (*Dict.*)—The proportions of Beams near London are fixed by statute, as follows; a Beam, fifteen feet long, must be seven inches on one side its square, and five on the other; if it be sixteen feet long, one side must be eight inches, the other six; if seventeen feet long, one side must be ten inches, the other six: in the country they usually make them stronger. Sir H. Wotton advises these to be of the strongest and most durable timber.

Herrera tells us, that, in Fer. Cortez's palace, in Mexico, there were 7000 Beams of cedar; but he must certainly use the word Beam in a greater latitude than we do. In effect, the French, under poutre, Beam, take in not only the pieces which support the rafters, but also those which sustain the joists of the cielings.

Some of their best authors have considered the force or strength of Beams, and brought their resistance to a precise calculation; particularly M. Varignon and M. Parent; the system of the latter is as follows:

When, in a Beam breaking parallel to its base, which is supposed to be a parallelogram, two plans of fibres, which were before contiguous, are separated, there is nothing to be considered in those fibres, but their number, bigness, tension before they broke, and the lever by which they act; all these together making the strength or resistance of the Beam to be broke.

Suppose then another Beam of the same wood, where the base is likewise a parallelogram, and of any bigness, with regard to the other, at pleasure; the height or thickness of each of these, when laid horizontal, being divided into an indefinite number of equal parts, and their breadth into the same number, in each of their bases will be found an equal number of quadrangular cells, proportionable to the bases whereof they are parts. These then will represent little bases, or, which is the same thing, the thicknesses of the fibres to be separated for the fracture of each Beam: and, since the number of cells is equal in each, the ratio of the bases of both Beams will be that of the resistance of their fibres, both with regard to number and thickness.

Now, the two Beams being supposed of the same wood, the fibres most remote from the points of support, which are those which break the first, must be equally stretched when they break. Thus the fibres, *v. gr.* of the tenth division, are equally stretched in each case, when the first breaks; and, in whatever proportion the tension be supposed, it will be still the same in both cases; so that the doctrine is intirely free, and unembarrassed with any physical system.

Lastly, it is evident, the levers whereby the fibres of the two Beams act, are represented by the heighth or depth of their bases; and, of consequence, the whole resistance of each Beam is the product of its base, by its height; or, which is the same thing, it is the square of the height, multiplied by the breadth; which holds, not only in case of parallelogramatic, but also of elliptic bases.

Hence, if the bases of two Beams be equal, though both their heighths and breadths be unequal, their resistance will be as their heighths alone; and, by consequence, one and the same Beam, laid on the smallest side of its base, will resist more than when laid flat, in proportion as the first situation gives it a greater height than the second; and thus an elliptic base will resist more, when laid on its greatest axis, than when on its smallest.

Since, in Beams equally long, it is the bases that determine the proportion of their weights or solidities; and since, their bases being equal, their heighths may be different; two Beams of the same weight may have resistances differing to infinity; thus, if, in the one, the height of the base be conceived infinitely great, and the breadth infinitely small, while in the other the dimensions of the base are infinite; the resistance of the first will be infinitely greater than that of the second, though their solidity and weight be the same. If, therefore, all required in architecture were to have Beams capable of supporting vast loads, and, at the same time, be of the least weight possible, it is plain they must be cut thin as laths, and laid edge-wise.

If the base of two Beams be supposed unequal, but the sum of the sides of the two bases equal, *v. gr.* if they be either twelve and twelve, or eleven and thirteen, or ten and fourteen, &c. so that they always make twenty-four; and further, if they be supposed to be laid edge-wise, pursuing the series, it will appear, that, in the Beam of twelve and twelve, the resistance will be 1728; and the solidity or weight 144; and that in the last, or one and twenty-three, the resistance will be 529, and the weight twenty-three; the first, therefore, which is square, will have less than half the strength of the last, with regard to its weight.

Hence M. Parent remarks, that the common practice of cutting Beams out of trees as square as possible is ill husbandry: he hence takes occasion to determine, geometrically, what dimensions the base of a Beam, to be cut off any tree proposed, shall have, in order to its being of the greatest possible strength; or, which is the same thing, a circular base being given,

given, he determines the rectangle of the greatest resistance that can be inscribed; and finds, that the sides must be nearly as seven to five, which agrees with observation.

Hitherto the length of the Beams has been supposed equal; if it be unequal, the bases will resist so much the less, as the Beams are longer.

To this it may be added, that a Beam sustained at each end, breaking by a weight suspended from its middle, does not only break at the middle, but also at each extreme; or, if it does not actually break there, at least immediately before the moment of the fracture, which is that of the equilibrium, between the resistance and the weight, its fibres are as much stretched at the extremes, as in the middle. So that, of the weight sustained by the middle, there is but one third part which acts at the middle, to make the fracture; the other two only acting to induce a fracture in the two extremes.

A Beam may either be supposed laden only with its own weight, or with other foreign weights applied at any distance, or else only with those foreign weights. Since, according to M. Parent, the weight of a Beam is not ordinarily above $\frac{1}{70}$ part of the load given it to sustain, it is evident, that, in considering several weights, they must all be reduced, by the common rules, to one common center of gravity.

M. Parent has calculated tables of the weights that will be sustained by the middle, in Beams of various bases and lengths, fitted at each end into walls, on a supposition, that a piece of oak an inch square, and a foot long, retained horizontally by the two extremes, will sustain 315 *lb.* in its middle before it breaks, which it is found by experience it will. *See Mem. Acad. R. Scienc. An.* 1708.

BEAN, *faba*, in botany, the name of a genus of plants; whose characters are: the flower is of the papilionaceous kind, and from its cup there arises a pistil, which finally becomes a large pod, containing large, flatted, and, in some degree, kidney-shaped seeds. To this it is to be added, that the stalks are firm and erect, and the leaves stand by pairs, on a middle rib, which is terminated by an odd one.

Mr. Tournefort has enumerated eight species of this plant, But we have only the four following sorts, commonly sowed in our Gardens. 1. The small Lisbon. 2. The Spanish. 3. The Sandwich. And, 4. The Windsor Beans.

The first and second sorts are to be planted in October and November, under warm walls and hedges, where if they stand through the winter, they produce Beans early in the spring. They may also be raised very close in beds, and covered with hoops and matts in the winter, and in the spring planted out; but there is some hazard in the transplanting, and they will be a fortnight, or more, later than those which have stood the winter abroad.

The Lisbon Bean is preferred to the Spanish; and the curious ought to have fresh seed every two years from abroad, for they are apt to degenerate, though not in goodness, yet in their earliness.

The Spanish and Windsor Beans are not to be planted till Christmas, but especially the Windsor, which are subject, more than any other kind, to be hurt by the cold. These Beans should have an open ground, and be planted at the distance of two feet and a half, row from row, and four inches from one another in the rows; but, if the place is closely surrounded with hedges or walls, the distance must be greater, else the stalks will run high, but they will bear very little fruit.

The Sandwich Beans are hardier than the Windsor, and may be planted to come in between the early crops and them, and, though not much regarded at present, they are a very good Bean.

The first plantation of Windsor Beans should be made in the middle of January; and, after that, a new plantation should be made every three weeks, till the middle of May, that there may be a succession of crops. *Miller's Gard. Dict.*

Beans, with a proper management, make one of the finest of all baits for fish. The method of preparing of them for this purpose is this: take a new earthen pot, glazed on the inside, boil some Beans in it, suppose a quarter of a peck: they must be boiled in river water, and should be beforehand steeped in some warm water, for six or seven hours. When they are about half boiled, put in three or four ounces of honey, and two or three grains of musk: let them boil a little on, then take them off the fire, and use them in this manner: seek out a clean place, where there are no weeds, that the fish may see and take the Beans at the bottom of the water. Throw in some Beans at five or six in the morning, and in the evening, for some days. This will draw them together, and they may be taken in a casting-net, vast numbers together.

BEAR, in zoology, denotes a well known quadruped of the cat kind, of some use in medicine, but more in commerce and sport. See *Plate* VI. *fig.* 34.

Some distinguish two kinds of Bears, terrestrial and marine; the former of which keep to the mountains; whereas the latter come out on the ice, as far as the middle of the North sea. Some of this kind are found in Nova Zembla, of an incredible size.

Bear-skins are a sort of furs, very much esteemed, and there is a very large trade of them, whether they be skins of young Bears, or of old ones. The latter are commonly used to make housings, or horse-cloaths, or, in the more northern climes, for bags to keep the feet-warm, in the sharpest cold of the winter. The skins of young Bears serve to make muffs, and other such things for warmth or ornament.

Besides the great quantity of Bears-skins which the fellmongers sell, the druggists sell also Bear's-fat, or grease, which they commonly get from Switzerland, Savoy, and Canada.

That grease is a powerful remedy for the cure of the king's evil, and the rheumatism. It is also used with success for curing the gout, and it is also employed in several Galenic compositions. Bear's-grease, in order to be of a good quality, must be chosen newly melted, greyish, clammy, of a strong and pretty bad smell, and of a middling consistence or thickness. That which is too white is adulterated, and mixed with common tallow.

BEA'RINGS, in heraldry, a term used to express a coat of arms, or the figures of armories, by which the nobility and gentry are distinguished from the vulgar, and from one another.

BEAST *of burden*, a name given to all four-footed animals, which serve to carry burdens and merchandizes on their backs. Those that are most commonly used, are elephants, dromedaries, camels, horses, mules, asses, the sheep of Mexico and Peru, and the vicnua. There are also some places on the coast of Africa, where they use oxen; nay, even large dogs are sometimes employed for that purpose, as may be seen in Flanders, and in some other countries.

Gold-BEA'TING.—First a quantity of pure gold is melted, and formed into an ingot; this, by forging, is reduced to a plate about the thickness of a sheet of paper, which plate is afterwards cut into little pieces, about an inch square, and laid in the first and smallest mould, to begin to stretch them.

These moulds are made of vellum, consisting of forty or fifty leaves, and, after they have hammered a while thus with the smallest hammer, they cut each of them into four, and put them into the second mould of vellum, which consists of two leaves, to be extended farther.

Then they are taken out again, and cut into four, and put into the third mould, which is made of bullock's gut, well scoured and prepared, and consisting of five hundred leaves, and beaten; then they are taken out and divided into four again, and laid in the last and finishing mould, which is also of bullock's gut, and containing five hundred leaves; and there they are beaten to the degree of thinness required.

The leaves, being thus finished, are taken out of the mould, and disposed in little paper books prepared with red bole, for the gold not to stick to; each book usually containing twenty-five leaves. These books are of two sizes, twenty-five leaves of the smallest of which weigh but five or six grains: and twenty-five of the largest, nine or ten grains.

Gold is beaten more or less, according to the quality or kind of work it is designed for; that which is for the use of gold wire-drawers, to gild their ingots withal, is left much thicker than that for gilding picture frames, &c.

The gold-beaters use three hammers of different sizes, of well polished iron, something in the form of mallets. The first, which weighs three or four pounds, serves to chase or drive; the second, eleven or twelve pounds, which is to close; and the third, which weighs fourteen or fifteen pounds, to stretch and finish.

BEATING *flax*, or *hemp*, is an operation in the dressing of these matters, contrived to render them more soft and pliant. *Hought. Collect.*

When hemp has been swingled a second time, and the hurds laid by, they take the strikes, and dividing them into dozens, and half dozens, make them up into large thick rolls, which, being broached on long sticks, are set in the chimney corner to dry; after which they lay them in a round trough made for the purpose, and there with beetles beat them soundly, till that they handle, both without and within, as pliant as possible, without any hardness or roughness to be felt: that done, they take them from the trough, open and divide the strikes as before, and, if any be found not sufficiently beaten, they roll them up, and beat them over as before. *Dict. Rust.*

BEATING, in the paper works, signifies the Beating of paper on a stone, with a heavy hammer with a large, smooth head, and short handle, in order to render it more smooth and uniform, and fit for writing. *Savar. Dict. Comm.*

BEAVER, *(Dict.)*—This creature is about four feet in length, and twelve or fifteen inches broad. His skin, in the northern regions, is generally black, but it brightens into a reddish tincture, in the temperate climates. He is covered with two sorts of hair, one long, and the other a soft down; the latter, which is an inch in length, is extremely fine and compact, and accommodates the animal with a necessary warmth. The long hair preserves the down from dirt and humidity. *See Plate* VI. *fig.* 35.

The Beaver, whether male or female, has four bags under his intestines, impregnated with a resinous and liquid substance, which, when it is ejected, settles into a thick consistence.

tence. See the article CASTOREUM in the Dictionary.

His teeth are ſtrong, and deeply riveted into his jaws, with a long and crooked root; with theſe he cuts as well the wood with which he builds, as that which furniſhes him with food. His fore feet reſemble thoſe of ſuch animals as hold what they eat with their paws, as apes, for inſtance, and rats, and ſquirrels; with theſe feet he digs, ſoftens, and works the clay, which is extremely ſerviceable to him. His hind feet are accommodated with membranes, or large ſkins, extending between his toes, like thoſe of ducks, and all other water-fowl: this makes it evident that the author of nature intended the creature ſhould be amphibious. His tail is long, a little flat, entirely covered with ſcales, ſupplied with muſcles, and perpetually lubricated with oil or fat: this animal, who is an architect from his nativity, uſes his tail inſtead of a hod, for the conveyance of his clay or mortar, and a trowel to ſpread and form it into an incruſtation; the ſcales prevent theſe materials from penetrating the tail with their coldneſs and humidity. But the ſcales, as well as the tail, would be injured by the air and water, were it not for the prevention of an oil, which he diſtributes all over them with his ſnout; the bags we have already mentioned, are undoubtedly the magazines of this fluid.

The Beavers inhabit the ſame manſion in great numbers, unleſs violent heats, or inundations, the purſuits of hunters, ſcarcity of proviſions, or the extraordinary increaſe of their offſpring, obliges them to ſeparate. In order to raiſe themſelves a convenient abode, they chuſe a ſituation that abounds with ſuſtenance, and is waſhed by a rivulet, and where they may form a convenient reſervoir of water for their habitation. They begin with building a mole or cauſey, in which the water may riſe to a level with the firſt ſtory.

This cauſey, at the foundation, may contain ten or a dozen feet in thickneſs; it deſcends in a ſlope on the ſide next the water, which, in proportion to its elevation, gravitates upon the work, and preſſes it with a ſtrong tendency towards the earth. The oppoſite ſide is raiſed perpendicularly, like our walls; and the ſlope which at its baſis is twelve feet broad, diminiſhes towards the top, whoſe breadth does not exceed two feet: the materials of this work are wood and clay. The Beavers, with an admirable facility, cut the pieces of wood, ſome as thick as a man's arm, and others as large as the thigh, and from two to four, five, or ſix feet in length, and ſometimes more, in proportion to the aſcent of the ſlope. They drive the extremity of theſe, very near each other, into the earth, and take care to interlace them with other ſtakes, more ſlender and ſupple. But as the water, without ſome other prevention, would glide through the cavities, and leave the reſervoir dry, they have recourſe to a clay, which they perfectly know how to procure, and with which they cloſe up all the interſtices, both within and without, and this entirely prevents all evacuation. They continue to raiſe the dike proportionably to the water's elevation and plenty. They are likewiſe very ſenſible, that their materials are not ſo eaſily tranſported by land as by water, and therefore take the opportunity of it's increaſe to ſwim, with mortar placed on their tail, and ſtakes of wood between their teeth, to every place where they have occaſion for theſe materials. If the violence of the water, or the footſteps of hunters, who paſs over their work, damage it in any degree, they immediately repair the fracture, viſit all the edifice, and, with indefatigable application, refit and adjuſt whatever happens to be diſconcerted. But, when they are too frequently perſecuted by the hunters, they only work in the night, or entirely diſcontinue their labours.

When the cauſey, or dike, is compleated, they begin to form their cells, which are round, or oval apartments, divided into three partitions, raiſed one above another. The firſt is ſunk below the level of the dike, and generally full of water; the other two are formed above it. They raiſe this ſtructure, in a very ſolid manner, on the edge of their cauſey, and always in ſtories, that, in caſe the water ſhould aſcend, they may dwell in an higher ſituation. If they find any little iſland near the reſervoir, they fix their dwelling there, which is then more ſolid, and they are leſs incommoded with the water, in which they are capable of continuing but a ſhort time: but, if they are not favoured with this advantage, they drive ſtakes into the earth with their teeth, to fortify the building againſt the winds and water. At the bottom they ſtrike the two openings to the ſtream; one conducts them to the place where they bathe, and which they always keep very decent; the other is a paſſage to that quarter, where they carry out every thing that would ſoil or rot the upper apartments. There is a third aperture much higher, calculated to prevent their being ſhut up, when the ice hath cloſed the openings into the lower lodgments. They ſometimes build their houſes entirely on dry land, and ſink ditches, five or ſix feet deep, in order to deſcend to the water. They employ the ſame materials and induſtry in the ſtructure of their dwellings, as they uſe for the cauſey. The walls of the building are perpendicular, and two feet thick. As their teeth are more ſerviceable than ſaws, they cut off all the projections from the wood, that ſhoot out beyond the perpendicular of the wall; after which they work up a mixture of clay and dry graſs, into a kind of mortar, with which, by the aid of their tails, they rough-caſt the out and inſides of the work.

The edifice is vaulted within, and generally riſes in an oval figure. The dimenſions are proportioned to the number of the intended inhabitants. Twelve feet in length, and ten in breadth, are ſufficient for eight or ten Beavers. If the number increaſes, they enlarge the place accordingly. It has been aſſerted for a truth, that there have been found above an hundred of theſe creatures, in different lodgments, communicating with one another. But theſe populous ſocieties are very rare, becauſe they are too unmanageable and tumultuous, and the Beavers are generally better acquainted with their own intereſt. They aſſociate to the number of ten or twelve, and ſometimes a few more.

There are ſome Beavers, called terriers, who make their abode in caverns, dug in a riſing ground, either on the ſhore, or at ſome diſtance from the water, to which they ſcoop out ſubterraneous trenches from their caverns, which deſcend from ten to an hundred feet in depth. Theſe trenches furniſh them with retreats, ſituated at unequal heights, and wherein they enjoy a ſhelter from the water, when it riſes.

All theſe works, eſpecially in the cold regions, are compleated in Auguſt, or September, after which period, they furniſh themſelves with proviſions. During the ſummer ſeaſon, they regale themſelves with all the fruits and plants the country produces. In the winter, they eat the wood of the aſh, the plane, and other trees, which they ſteep in water, in quantities proportionable to their neceſſary conſumption; and they are ſupplied with a double ſtomach, to facilitate the digeſtion of ſuch a ſolid food, at two operations. They cut twigs from three to ſix feet in length; the large ones are conveyed by ſeveral Beavers to the magazine, and the ſmaller by a ſingle animal, but they take different ways; each individual hath his walk aſſigned him, to prevent the labourers from being interrupted by their mutual occaſions. The dimenſions of their pile of timber are regulated in proportion to the number of the inhabitants; and it has been obſerved, that the proviſion of wood for ten Beavers comprehended thirty feet in a ſquare ſurface, and ten in thickneſs. Theſe parcels of wood are not piled up in one continued heap, but laid acroſs one another, with interſtices between them, that they may the better draw out what quantity they want, and always take the parcel at the bottom, which lies in the water. They cut this wood into ſmall pieces, and convey it to their cell, where the whole family comes to receive their particular ſhare.

Merchants diſtinguiſh three ſorts of Beavers, though they are all the ſkins of the ſame animal: the new Beaver, the dry Beaver, and the fat Beaver.

The new Beaver, which is alſo called white Beaver, or Muſcovy Beaver, becauſe it is commonly kept to be ſent into Muſcovy, is that which the ſavages catch in their winter hunting. It is the beſt, and the moſt proper for making fine furs, becauſe it has loſt none of its hair by ſhedding.

The dry Beaver, which is ſometimes called lean Beaver, comes from the ſummer hunting, which is the time when theſe animals loſe part of their hair.

Though this ſort of Beaver be much inferior to the former, yet it may alſo be employed in furs; but it is chiefly uſed in the manufacture of hats. The French call it ſummer caſtor, or Beaver.

The fat Beaver is that which has contracted a certain groſs and oily humour, from the ſweat which exhales from the bodies of the ſavages, who wear it for ſome time. Though this ſort be better than the dry Beaver, yet is uſed only in the making of hats.

Beſides hats and furs, in which the Beaver's hair is commonly uſed, they attempted in France, in the year 1699, to make other manufactures with it; and, accordingly, they made cloths, flannels, ſtockings, &c. partly of Beaver's hair, and partly of Segovia wool. This manufactory, which was ſet up at Paris, in St. Anthony's ſuburb, ſucceeded, at firſt, pretty well; and, according to the genius of the French, the novelty of the thing brought into ſome repute the ſtuffs, ſtockings, gloves, and cloth, made of Beaver's hair. But they went out of faſhion of a ſudden, becauſe it was found, by experience, that they were of a very bad wear, and, beſides, that the colours faded very much: when they had been wet, they became dry and hard, like felt, which occaſioned the miſcarriage of the manufactory for that time.

When the hair has been cut off from the Beaver's ſkin, to be uſed in the manufactory of hats, thoſe ſkins are ſtill employed by ſeveral workmen; namely, by the trunk-makers, to cover trunks and boxes; by the ſhoe-makers, to put into ſlippers; and by turners, to make ſieves for ſifting grain and ſeeds.

Hot-BEDS, in gardening, are enriched with extraordinary plenty of manure, and ſheltered from the cold air, by ſtraw coverings, frames, and the like, ſerving to help forward the growth of plants, and force a vegetation, where either the ſeaſon, or the climate of itſelf, is not warm enough.

To make a Hot-Bed in February, for the raiſing of colli-flowers, cucumbers, melons, radiſhes, or other tender plants or flowers, they provide a warm place, defended from all winds, by being incloſed with a pale or hedge, made of reed or ſtraw, and laid with freſh horſe-dung, ſix or eight days old, trodden down hard, and level on the top; over which they lay rich earth, three or four inches thick. When the extreme heat of the bed is over, which may be perceived by thruſting in the finger, then plant their ſeeds. This done, they ſet up forks, four or five inches above the bed, to ſupport a frame made of ſticks, and covered with ſtraw or baſs matt, to ſecure the ſeedlings from the weather. As the plants ſhoot in height, they earth them up; and, when able to bear the cold, tranſplant them into natural beds. *Bradley.*

BEE, *Dict.* — The ſting of the Bee is a very curious weapon, and, when examined by the microſcope, appears of a very ſurprizing ſtructure. It has a horny ſheath or ſcabbard, which includes two bearded darts. This ſheath ends in a ſharp point, near the extremity of which, a ſlit opens, through which, at the time of ſtinging, the two bearded darts are protruded beyond the end of the ſheath: one of theſe is a little longer than the other, and fixes its beard firſt, and, the other inſtantly following, they penetrate alternately deeper and deeper, taking hold of the fleſh with their beards, or hooks, till the whole ſting is buried in the fleſh; and then a venomous juice is injected through the ſame ſheath, from a little bag, at the root of the ſting, which occaſions an acute pain, and a ſwelling of the part, which ſometimes continues for ſeveral days. But this is beſt prevented, by enlarging the wound directly, to give it ſome diſcharge. Mr. Derham counted, on the ſting of a waſp, eight beards on the ſide of each dart, ſomewhat like the beards of fiſh-hooks; and the ſame number are to be counted on the darts of the Bee's ſting.

When theſe beards are ſtruck deep in the fleſh, if the wounded perſon ſtarts, or diſcompoſes the Bee, before it can diſengage them, the ſting is left behind ſticking in the wound; but, if he have patience to ſtand quiet, the creature brings the hooks down cloſe to the ſides of the darts, and withdraws the weapon; in which caſe, the wound is always much leſs painful. A waſp is not ſo liable to leave its ſting in the wound as a Bee, the beards of it being ſhorter, and the creature more vigorous and nimble in its motions.

To view the ſting of a Bee by the microſcope, the end of the tail is to be cut off, and then, touching it with a pin or needle, it will thruſt out the ſting and darts, which may be cut off with a nice pair of ſciſſars, and kept for obſervation: or, if a Bee be caught in a leather glove, its ſting will be left in the glove, the creature being unable to diſengage it from the leather. The bag, containing the poiſonous juice, may eaſily be found at the bottom of the ſting, and examined, it being commonly pulled out with it; and, if a living Bee be provoked to ſtrike with its ſting, againſt a plate of glaſs, enough of the liquor will be left on the glaſs, for examination; and the ſalts of it may be ſeen, forming themſelves into cryſtals. *Baker on the Microſcope.*

Mr. Dudley ſpeaks of a method of hunting, or finding of Bee's neſts, practiſed, of late years, in the woods of New England. It conſiſts in catching a Bee, then letting it fly, and obſerving the way it ſteers; this ſhews the hunter the courſe, or bearing of the neſt. To find the diſtance, he takes an off-ſet of an hundred perches, and lets fly another Bee; the angle, or point wherein theſe two courſes interſect, is the place of the neſt. *Phil. Tranſ.* N°. 367.

BEET, *beta*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the ſtaminous kind, conſiſting of ſtamina, ariſing from a five-leaved cup. Great numbers of theſe flowers are uſually collected into a ſort of head; and the cups finally become capſules, nearly of a globular figure, in which are contained the ſeeds.

Mr. Tournefort has enumerated two ſpecies of this plant.

All the ſpecies of this plant are propagated by ſowing their ſeeds in February, or March, in a looſe, deep ſoil, not over dunged. When they are come up, they muſt be hoed out, ſo as to leave them ten or twelve inches aſunder; for, if they have not room, the roots ſeldom grow large. It is a cuſtom, with the gardeners about London, to ſow carrots on the ſame ground with their Beets. The carrots are drawn off in the ſummer time, and the Beets have then ſufficient time to grow to their ſize. *Miller's Gard. Dict.*

BEE'TLE, in zoology. See the article SCARABÆUS.

Beetle, in a mechanical ſenſe, denotes a large wooden inſtrument, formed after the manner of the mallet, and uſed for driving piles, paliſades, wedges, and the like.

BE'ING, entity, or thing, ſomething which has an eſſence and exiſtence diſtinct from other things; it is conſidered as poſſible or actual: when poſſible, it is ſaid to have an eſſence or nature; ſuch were all things before their creation: when it is conſidered as actual, then it is ſaid to have exiſtence alſo; ſuch are all things which are created, and God himſelf the creator. Eſſence, therefore, is but the very nature of any Being, whether it be actually exiſting or no. A roſe in winter has an eſſence, in ſummer it has exiſtence alſo: it may not be improper to remark, that there is but one Being that includes exiſtence, in the very eſſence of it, and that is God, who therefore actually exiſts by natural and eternal neceſſity; but the actual exiſtence of any other Being is very diſtinct from its eſſence: for it may be, or may not be, as God pleaſes. Again, every Being is conſidered either as ſubſiſting in and by itſelf, and then it is called a ſubſtance; or ſubſiſts in and by another, and then it is called a mode, or manner of Being. Though few writers allow mode to be called a Being, in the ſame perfect ſenſe as the ſubſtance is; and ſome modes have evidently more of real entity or Being than others, See the article Mode. Mr. Locke ſays, there are but two ſorts of Beings that man knows and conceives. Firſt, ſuch as are purely material, without ſenſe, perception or thought, as the clipping of our beard, and paring or cutting our nails. Secondly, ſenſible, thinking, perceiving Beings. ſuch as we find ourſelves, which he calls cogitative; and cogitative exiſtence is a bleſſing to thoſe Beings only, which are endowed with perception, and is in a manner thrown away upon dead matter, any farther than as it is ſubſervient to Beings, which are conſcious of their own exiſtence. See the ſenſible ſcale of Beings, beautifully conſidered, by Mr. Addiſon, *Spect.* 219.

BELEMNITE, *or thunder-ſtone. Lapis Belemnites,* (*Dict.*)— The Belemnites is of the number of thoſe extraneous foſſils, which we have not yet been able to reduce to their kindred anomala: we only know that it is a petrifaction of an animal body, or part of an animal body; but, till we are much better acquainted with the creatures which inhabit the depths of the ſea, we are not to expect to find the mould in which every figured foſſil in the world has been caſt. See *Plate* VI. *fig.* 33.

The Belemnite is an oblong and ſlender body, ſomewhat pellucid, and of a browniſh or yellowiſh colour. It has ſeveral varieties in ſhape, which make ſo many ſpecies of it among the naturaliſts; but all agree in the main characters, and all are indifferently received as Belemnites in the ſhops.

The Belemnites are all compoſed of multitudes of thin coats, or cruſts, encircling one another, and are all of them of a tranſverſely ſtriated texture; they have always a hollow or cavity of a conic form, wide at the mouth, and tapering to a point at the bottom, placed at their large end; but this is uſually not exactly in the center, but on one ſide. In ſome, indeed, it grows ſo wide at the very extremity, as to take in the whole body of the Belemnite, and leave only a thin cruſt for its circumference. This cavity is frequently found empty, ſometimes it is filled up with earthy or ſtony matter, and ſometimes there is lodged in it a concamerated ſhell of a peculiar kind, which ſo exactly fits and fills it every way, that it is hard to doubt of its being the original inhabitant; though we know very well, that petrifactions of the ſame concamerated ſhell-fiſh are found in ſtone and earth, where there are no Belemnites. This is of the nature of thoſe foſſils, called orthoceratitæ, or ſtraight nautili, all which are, though common enough in their foſſil ſtate, as wholly unknown to us in their recent one, as the Belemnite itſelf. The inſide of the cavity in many of the Belemnites, in which it is found empty, is regularly marked with alternate ridges and furrows all the way round, ſuch as would exactly correſpond to the concamerated ſhell, found in the others, and plainly indicating that ſuch had once alſo been there.

The Belemnites have, in general, a ſingle crack or ſlit, running down the whole length of the body, or nearly ſo, in the form of a ſtraight line. Some we find, however, that have no mark of any fiſſure of this kind, and, on the other hand, ſome that have two or three of them inſtead of one; but the additional ones only begin at the apex, or end, and never run any great way up.

The uſual form of the Belemnites is that of a long and ſlender cone, tapering by degrees, from a not very large baſe, to an obtuſe point; and the general ſize is about the length and thickneſs of a finger, though there are vaſt numbers found much ſmaller, and ſome conſiderably larger. But, beſides theſe conic ones, there are ſome of a regularly cylindric form, and ſome others which are thickeſt near one of the ends, and grow gradually thinner and ſmaller, as they approach to both. Some are found of all the intermediate figures, between the cylindric and conic, and ſome are almoſt orbicular; theſe laſt are always very ſhort and ſmall: ſome of them taper off to a point very gradually, and others very abruptly, and ſome are, inſtead of being rounded, flatted on one ſide, and ſometimes on both; and we alſo ſometimes find them cruſhed and cracked by accidents, as the other petrifactions of animals frequently are. We find of them as far as to eight inches in length, and they ſometimes vary in colour from their uſual yellowiſh brown, and are found of a blackiſh or bluiſh grey, and ſometimes of a cheſnut colour, ſometimes of a darker or paler brown, with no admixture of yellow in it.

The Belemnites are found in almoſt all parts of the world, they are extremely common in Germany; we find them alſo in ſufficient plenty in England, and France and Italy abound with them. They are ſometimes brought to us from Syria, among the lapides Judaici, and very frequently among the coarſer ſtones from the Eaſt-Indies. Authors have called them, beſide their common name, by thoſe of dactyli idæi,

and

and lapides lyncis, or lyncurii; but this last name has been an occasion of error, and has occasioned the Belemnite to be confounded with the hyacinth, which gem the ancients called by that name.

BELL (*Dict.*)— There is a curious observation in a paper of Mr. Reaumur's, in the Memoirs of the Paris Academy, relating to the shape most proper for Bells, to give them the loudest and clearest sound. He observes, that as pots, and other vessels, more immediately necessary to the service of life, were doubtless made before Bells, it probably happened, that the observing these vessels to have a sound, when struck, gave occasion to making Bells, intended only for sound, in that form; but that it does not appear that this is the most eligible figure; for lead, a metal which is, in its common state, not at all sonorous, yet becomes greatly so on its being cast into a particular form, and that very different from the common shape of Bells. In melting lead for the common occasions of casting in small quantities, it is usually done in an iron ladle; and, as the whole is seldom poured out, the remainder, which falls to the bottom of the ladle, cools into a mass of the shape of that bottom. This is consequently a segment of a sphere, thickest in the middle, and thinner towards the edges: nor is the ladle any necessary part of the operation, since, if a mass of lead be cast in that form in a mould of earth or sand, in any of those cases it is found to be very sonorous. Now, if this shape alone can give sound to a metal which in other forms is perfectly mute, how much more must it necessarily give it to other metals naturally sonorous, in whatever form? It should seem, that Bells would much better perform their office in this than in any other form, and that it must particularly be a thing of great advantage to the small Bells of common house-clocks, which are required to have a shrill note, and yet are not allowed any great size. Mr. Reaumur very judiciously observes, that, had our forefathers had opportunities of being acquainted with the sound of metals in this shape, we should probably have had all our Bells at present of this form. *Vid. Mem. Acad. Par. An.* 1726.

BE'LLOWS (*Dict.*)— This instrument is composed of two flat boards, sometimes of an oval, and sometimes of a triangular figure. Two or more hoops, bent according to the figure of the boards, are placed between them: a piece of leather, broad in the middle, and narrow at both ends, is nailed on the edges of the boards, which it thus unites together, as also on the hoops, which separate the boards, that the leather may the easier open and fold again. A tube of iron or copper, and sometimes of silver, for chamber Bellows, is fastened to the undermost board, in which there are several holes; that tube is called the nose, or nozel; finally, there is a piece of leather within the machine, which serves as a valve, or sucker, and covers the holes in the under board, that the air, which comes in through those holes, when the upper board is raised, may be expelled with force through the nozel, when that board is moved down.

Smiths and founders Bellows, whether single or double, are wrought by means of a rocker, with a string or chain fastened thereto, which the workman pulls. The Bellows pipe is fitted into that of the tuvel. One of the boards is fixed, so as not to play at all. By drawing down the handle of the rocker, the moveable board rises, and, by means of a weight on the top of the upper board, sinks again. *Moxon, Mech. Exerc.*

The Bellows of forges, and furnaces of mines, usually receive their motion from the wheels of a water-mill. Others, as the Bellows of enamellers, are wrought by means of one or more steps or treddles under the workman's feet. *Hought. Collect.*

BELLA'TRIX, in astronomy, a ruddy, glittering star of the second magnitude, in the left shoulder of Orion. Its longitude, according to Hevelius, for the year 1700, was 16°. 47'. 20"; and its latitude southward 16°. 52'. 11".

BE'NDING. Divers methods have been contrived for Bending timber, in order to supply crooked planks, and pieces for building ships: M. Dalesme ingeniously enough proposed to have the young trees bent, while growing in the forest. The method of bending planks by a sand-heat, now used in the king's yard at Deptford, was invented by Captain Cumberland. See SHIP-BUILDING.

The Bending of boards, and other pieces of timber for curved works in joinery, is effected by holding them to the fire, then giving them the figure required, and keeping them in this figure by tools for the purpose.

BENE'NAIM, BENENATH, BENENASCH, or BENENAT, in astronomy, the outermost star of the second magnitude, in the tail of the great Bear.

Its longitude, according to Hevelius, for the year 1700, was 22°. 39'. 24", and its latitude 54°. 25'. 7". north.

BE'RAMS, a coarse cloth, all made with cotton thread, which comes from the East-Indies, and particularly from Surat. There are white plain Berams, and others striped with colours. The white are about eleven yards long, and about a yard wide; the red are fifteen yards long, and something less than a yard wide.

BE'RCHEROIT, or BERKEROITS, a weight used at Archangel, and in all the dominions of the czar of Muscovy, to weigh such merchandizes as are very heavy, or very bulky, such as pot-ashes, &c. The Bercheroit weighs 400 pounds of Muscovy, which amount to about 364 pounds English avoirdupoise weight.

BE'RGAMO, a coarse tapestry, which is manufactured with several sorts of spun thread, as flocks of silk, wool, cotton, hemp, ox, cow, or goats hair. It is properly a weft of all those sorts of thread, the warp of which is commonly of hemp. It is wove on a loom, almost like linen cloth. Some pretend it was called Bergamo, because the people of Bergamo in Italy were the first inventors of it.

French BE'RRY, *graine d'Avignon*, or *graine jaune*, is the fruit of a shrub called by the ancients lycium and pizacanta, frequent about Avignon, and in the south parts of France; of considerable use among dyers and illuminers for a yellow colour.

This shrub grows in a rough stony soil. Its branches are beset with prickles two or three inches long: its bark is blackish; its leaves small and thick, like that of box, but disposed like that of myrtle: its root yellow and woody: its Berry is green, bordering on yellow, of the size of a grain of wheat, bitter and astringent to the taste. *Savar. Dict. Comm.*

BE'SISTAN, or BERSTAN, a name given at Constantinople, Adrianople, and in some other towns within the grand seignior's dominions, to those places where the merchants have their shops, and expose their merchandize to sale. Each sort of merchant have their particular Besistan, which must also be understood of the workmen, all those of the same trade working in the same place. These Besistans are commonly large galleries, vaulted over, whose gates are shut every night. Sometimes the wardens and keepers of the Besistans will answer for the merchandizes, on paying them a very moderate perquisite for each shop.

BE'TEL, in botany, an Indian plant, in great use and esteem throughout the East, where it makes a considerable article of commerce.

The Betel bears some resemblance to the pepper-tree. Its leaves are like those of ivy, only softer, and full of a red juice, which, among the orientals, is reputed of wonderful virtue for preserving the teeth, and rendering the breath sweet. The Indians are continually chewing these leaves, which renders their lips so red, and teeth black, a colour by them vastly preferred to the whiteness affected by the Europeans.

The consumption of Betel leaves is incredible, no body, rich or poor, being without their box of Betel, which they present to each other by way of civility, as we do snuff. *Savar. Dict. Comm.*

BE'TILLES, muslins, or white cotton cloths, manufactured in the East-Indies, particularly at Pondicherry. There are three sorts of them.

The first, called only Betille, is somewhat coarse. The piece is from 16 to 20 ells long, and ⅞ of an ell wide, French measure.

The second sort, called Betille organdy, has a round grain, and is very fine. It measures 12 ells and ½, by ¾ and ⅝, French measure.

The third sort, which is called tarantane Betille, is very clear, and is from 12 ½ to 13 ells long, and ⅞ wide. See MUSLIN.

Betilles. These are also white cotton cloths, which used formerly to be imported into France, to be there dyed of several colours. Some are 16, and others 20 ells long, French measure. The red and white Betilles which come from Bengal, are pretty near of the same length and breadth.

B'ETONY, *Betonica*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the labiated kind: the upper lip is erect, imbricated, and bifid; and the lower is divided into three segments, the middle one being larger than the rest, and bifid: the pistil arises from the cup, and is fixed in the manner of a nail to the hinder part of the flower: this is surrounded by four embryo's, which afterwards become so many seeds, of an oblong form, to which the flower-cup serves as a capsule. The flowers of Betony usually grow verticillately in short spikes on the tops of the stalks.

The species of Betony, enumerated by Mr. Tournefort, are eight.

Betony is chiefly administered in the way of decoction, sometimes of smoak, sometimes as an ingredient of a cerat or plaister, hence called emplastrum de betonica. Some also give its juice boiled to the consistence of honey, mixed with a little balsam of Peru, as a pectoral healer.

BE'ZANS, cotton cloths, which come from Bengal. Some are white, and others striped with several colours.

BIA, a name given by the Siamese to those white shells which come from the Maldives, and which are called coris, or couries, almost throughout the East-Indies, where they serve for small coin, or money. We shall give under its proper article a full account of that small money of the Indies, which is current also in several parts of the African coast. See COURIES.

BI'DENS, in botany, the name of a genus of plants, the characters

racters of which are theſe: the flower is uſually of the regular floſculous kind, compoſed of a number of ſmall floſcules, divided into ſeveral ſegments at their ends, placed on the embryo's, and contained in one common ſcaly cup. Sometimes there are alſo a number of ſemi-floſcules in the flower; but this is leſs common. The embryo's finally ripen into ſeeds, terminating in ſeveral prickly points. See *Plate* VI. *fig.* 36.

BIGHT, in the ſea language, denotes any part of a rope, as it is taken compaſſing, coiled up. When they cannot, or would not, take the end in hand, becauſe of the cables being coiled up; they ſay, give me the Bight, or hold by the Bight, i. e. by one of the flakes, which lies rolled up one over the other. *Manw. Seam. Direct. p.* 8. *Butel. Seam. Dial.* 4. *p.* 194.

BI'LANDER, in navigation, a ſmall flat-bottomed veſſel uſed in northern countries, with one large maſt and ſail, having its deck raiſed from head to ſtern, half a foot above the platboard. *Ozan. Dict. Math.*

BI'LIOUS *Fever*. Dr. Pringle, in his Obſervations on the Diſeaſes of the Army, remarks, that the Bilious or putrid fever is epidemic in camps, eſpecially in low and marſhy countries, where the air, being full of moiſt and putrid effluvia, tends to relax the fibres and promote putrefaction. As to the ſymptoms of the Bilious fever, it always begins with chillneſs and laſſitude, pains of the head and bones, and a diſorder at the ſtomach. At night the fever runs high; the heat and thirſt are great; the tongue is parched; the head aches violently; the perſon gets no reſt, and often becomes delirious; but, generally in the morning, an imperfect ſweat brings on a remiſſion of all the ſymptoms. In the evening the paroxyſm returns, but without any cold fit, and is commonly worſe than the former: on the ſecond morning it remits as before. Theſe periods go on daily, until the fever changes inſenſibly, either into a confirmed or into an intermitting ſhape. Sometimes looſe ſtools carry off the fit, and ſupply the place of ſweats: however, though it reſembles an ague in many particulars, yet it is rare to meet with a real ague in the camp, unleſs the perſon has been ill of it before he took the field. The remiſſions uſually appear from the beginning, eſpecially if the patient has been plentifully blooded: but ſometimes there are no remiſſions for the laſt two or three days. Hæmorrhages of the noſe happen frequently in the height of the paroxyſm, and always bring on the remiſſion ſooner, and make it fuller. Vomiting or purging have the like effects. The fits are ſeldom preceded by ſhiverings, or any ſenſe of cold after the firſt attack; the pulſe is always full and quick during the paroxyſms, and in the remiſſions it ſtill indicates ſome degree of fever. The blood is florid, the craſſamentum is firm, in a large quantity, and ſinks in the ſerum. Whilſt the weather continues warm, the Bilious ſymptoms are moſt frequent, but, as winter approaches, the inflammatory ones prevail. See INFLAMMATORY *Fever*.

The doctor enumerates other ſymptoms, as crudeneſs of the urine, Bilious ſtools, coſtiveneſs, &c. and farther obſerves, that the infantry are more liable to it than the cavalry.

As to the cure of the camp-fever, before it becomes continued, it depends upon the proper uſe of evacuations, the neutral ſalts, and the bark. Bleeding he judges indiſpenſable; which he would have repeated once or oftener, according to the urgency of the ſymptoms. After bleeding it will be neceſſary to give an emetic, the beſt time for doing which is in the remiſſion of the fever, and rather ſooner after a paroxyſm than before one. He adds, however, that vomits do harm when the ſtomach is any wiſe inflamed; in which caſe they ought never to be given. Ipecacuanha is the ſafeſt and eaſieſt, but antimonials make the moſt efficacious vomit. If the body remains coſtive, it is neceſſary to open it with ſome lenient phyſic, and eſpecially if the bowels are affected with pains, or a teneſmus. He likewiſe recommends ſalt of wormwood, lemon-juice, ſpiritus mindereri, and the bark; which laſt ought not to be given till the urine breaks, and the intermiſſions take place. Bleeding and purging are alſo neceſſary before the bark ought to be given: it anſwers beſt in ſubſtance, adminiſtered in Rheniſh wine, after ſtanding a night in infuſion.

If, after remiſſion, or intermiſſions, the diſeaſe changes into a continued fever, bleeding becomes neceſſary, unleſs other ſymptoms forbid it; but whether there be room for bleeding or no, bliſters are not only uſeful, but the beſt remedy. To theſe may be joined neutral ſalts and diaphoretic powders. But, though a ſweat be the proper criſis, it ought never to be promoted by theriaca, or the like hot medicines; unleſs the pulſe ſhould ſink, and the petechiæ or other bad ſymptoms appear: in which caſe the warmer alexipharmics are neceſſary, as the diſeaſe has changed into a malignant fever. *Pringle's Obſerv. on the Diſeaſes of the Army.*

BILL, among mechanics, an iron inſtrument, flat and edged, in the form of a creſcent, and adapted to a handle. It is, beſides the ax, one of the chief inſtruments uſed by the wood-fellers. The gardeners uſe a bill to prune trees. Plumbers likewiſe have a ſort of Bills, to perform ſeveral parts of their work. Baſket-makers uſe alſo Bills to cut the largeſt pieces of cheſnut-trees, and other wood: for ſmaller pieces of other they employ only the working-knife.

BILL, in trade, both wholeſale and retail, as alſo among trades-people and workmen, ſignifies an account of merchandizes or goods delivered to a perſon, or of work done for one.

In thoſe Bills muſt be ſet down the ſums of money received on account, which ought to be deducted from the ſum total.

BILL *of Credit*, is a Bill which a merchant, or banker, gives to a perſon whom he can truſt, impowering him to receive money from the ſaid merchant or banker's correſpondents in foreign countries.

Though Bills of credit be different from Bills of exchange, yet they enjoy the ſame privileges, for the money paid in conſequence of them is recoverable by law.

A merchant, or banker, ought to be very well acquainted with the character of thoſe to whom he gives letters of credit, eſpecially if the ſum be not limited. It is adviſeable, therefore, as much as it is poſſible, to determine the ſum, that a perſon may exactly know what engagement he enters into.

There is another caution to be obſerved, which is, to acquaint the correſpondents who are to furniſh the money, with the departure of him who is to receive it, and to deſcribe his perſon as accurately as can be, or even to agree about ſome peculiar word or ſentence, by which the correſpondents may know that the perſon who applies to them for money, is really the identical perſon meant: for he may be killed, and his Bill of credit ſtolen, whereby another might perſonate him, and receive the money in his ſtead, which has frequently happened.

BILL *of Store*, is a licence granted at the cuſtom-houſe to merchants, whereby they have liberty to carry, cuſtom-free, all ſuch ſtores and proviſions, as they may have occaſion for during their voyage.

BINO'MIAL (*Dict.*)—Sir Iſaac Newton, in his Univerſal Arithmetic, has given us the two following theorems for reducing Binomials, conſiſting of rational and ſurd quantities, to more ſimple terms. 1. If A expreſſes the greater part of a quantity, and B the leſſer part: then will $\frac{A+\sqrt{AA-BB}}{2}$ be the ſquare of the greater part of the root; and $\frac{A-\sqrt{AA-BB}}{2}$ the ſquare of the leſſer part, to be added to the greater with the ſign of B. So that if the Binomial be $3+\sqrt{8}$; (A being $=3$, and $B=\sqrt{8}$) we ſhall have the ſquare root of $3+\sqrt{8}=1+\sqrt{2}$. In like manner $\sqrt{32}-\sqrt{24}=\sqrt{18}-\sqrt{2}$. Secondly, if $A\pm B$ be a Binomial, whoſe greater part is A, and the index of the root to be extracted c, and n be found to be the leaſt number, whoſe power n^c can be divided by $AA-BB$, without a remainder, and Q be the quotient: and if $\sqrt[c]{A+B\times\sqrt{Q}}$ be computed in the neareſt integral numbers, and the ſame be called r, and if $A\sqrt{Q}$ be divided by the greateſt rational diviſor, and the quotient be s, and if $\frac{r+\frac{n}{r}}{2s}$ in the neareſt integral numbers be t, then will $\frac{ts\pm\sqrt{ttss-n}}{\sqrt[2c]{Q}}$ be the root whoſe index is c, provided the root can be extracted. So that the cube root of $\sqrt{968}+25$ will from hence be $2\sqrt{2}+1$. $AA-BB$ being $=343$, its diviſors 7, 7, 7; $n=7$, and $Q=1$. alſo the root of the firſt part of $\overline{A+B}\times\sqrt{Q}$, or $\sqrt{968}+25$ being extracted, will be a little greater than 56; its cube root in the neareſt number 4; and ſo $r=4$. Moreover, by extracting all that is rational from $A\sqrt{Q}$ or $\sqrt{968}$, it will be $22\sqrt{2}$: therefore $\sqrt{2}$ the radical part of it will be s, $\frac{r+\frac{n}{r}}{2s}$, or $\frac{5}{2\sqrt{2}}$ in the neareſt integral numbers is 2; therefore $t=2$. Laſtly, ts is $2\sqrt{2}$. $\sqrt{ttss-n}$ is 1. and $\sqrt[2c]{Q}$ or $\sqrt[6]{1}$ is 1.

Sir Iſaac Newton has not thought fit to lay down a demonſtration of theſe two theorems, or rules, which are much more elegant and general than thoſe given us for extracting the roots of Binomials, in Van Schouten's Commentary upon Des Cartes's Geometry. But Mr. s'Graveſande, at the latter part of his Algebra, has been at the pains to give us a demonſtration of the latter of the ſaid theorems, judging, I ſuppoſe, the former to be ſo eaſy, as not to ſpend time about evincing its truth. In order to which, he premiſes eight lemma's, which are theſe:

1. If to any power whoſe index is c be raiſed the Binomial

mial $a + b$, and the terms of this power alternately taken (that is, the 1ſt, 3d, 5th, 7th, &c. and the 2d, 4th, 6th, 8th, &c.) be united into one ſum, and ſo the whole power be divided into two parts; the difference of the ſquares of the parts will be $\overline{aa - bb}|^{c}$.

2. If a and b repreſent numbers, whereof a is the greater, and the Binomial $\sqrt{a} + \sqrt{b}$ be raiſed to the power c, and this number be odd, this power will be a Binomial, one of whoſe members is multiplied by $\sqrt{a}$, and the other by $\sqrt{b}$; and theſe members will be the parts (lemma 1.) of which the greater is that which is multiplied by $\sqrt{a}$.

3. If, the ſame things being ſuppoſed, the number c be even, the power forms a Binomial, one of whoſe members is rational, and the other multiplied by $\sqrt{ab}$, the members will be alſo the parts mentioned in lem. 1.

4. Any power of a numerical Binomial $\sqrt{a} + \sqrt{b}$ has both its members poſitive; the power of a Binomial or apotome $\sqrt{a} - \sqrt{b}$ has one member negative; and the members themſelves do not differ, whether it be $+ \sqrt{b}$ or $- \sqrt{b}$.

5. If a Binomial $\sqrt{a} + \sqrt{b}$ be raiſed to a power whoſe index is c, the difference of the ſquares of the members of the power is $\overline{a - b}|^{c}$.

6. The root of a Binomial whoſe index is c, that is $\sqrt[c]{\ }$, cannot be extracted, unleſs the difference of the ſquares of the parts of the given Binomial has $\sqrt[c]{\ }$ rational.

7. If two continual decreaſing geometrical progreſſions have the middle term common, the difference between the firſt terms of the progreſſion will be greater than the difference between the laſt.

8. The $\sqrt[c]{\ }$ of a Binomial cannot be extracted, if c be an even number, unleſs the greater member of the given Binomial be rational.

BIRCH *Tree*, *betula*, in botany, a genus of trees, containing but one ſpecies. The leaves reſemble thoſe of the poplar; the ſhoots are very ſlender and weak; the juli or katkins are produced at remote diſtances from the fruits on the ſame tree; the fruit becomes a little ſquamous cone; the ſeeds are winged; and the tree caſts its bark every year.

This tree is propagated by ſuckers taken from the roots of old trees, which may be tranſplanted either in October or February; but October is to be preferred; for, if the ſpring ſhould prove dry, thoſe planted in February will many of them fail: it delights in a poor ſoil, and will grow in either moiſt ſpringy ſoils, or in ſtony or gravelly marſhes or bogs: when the young trees have been planted two years, you ſhould (if deſigned for underwood) cut them down within ſix inches of the ſurface, which will cauſe them to ſhoot out ſtrong and vigorous branches; but, if they are deſigned for large trees, it will be much better to let them ſtand three years, before you head them down; and, when you do it, cut them within three inches of the ground, that their ſtems may be ſtraight and handſome: but you muſt obſerve, when they begin to put out, whether they produce more than one ſhoot; which if they do, you muſt cut off all but the ſtrongeſt and moſt convenient ſhoot, which muſt be trained up for a ſtem.

The timber of this tree, though accounted the worſt of all others, yet it is not without its various uſes: the turners often uſe it, to make chairs, &c. and the huſbandmen, for making ox-yokes; it is alſo planted for hop-poles, hoops, &c. but, in places within twenty miles of London, it is kept often cut to make brooms, and turns to great account.

There are three or four other ſorts of this tree growing in the northern parts of Germany, Sweden, and Lapland, which are all of them rather ſhrubs than trees, the talleſt of them ſeldom riſing above ten feet high, the others about three or four feet; but, being of little uſe, I ſhall not enumerate them.

There is alſo a Birch-tree, which has been raiſed in the gardens lately, whoſe ſeeds came from America: the leaves of this ſort are larger than thoſe of the common Birch-tree; but this may be only from the plant's being young and vigorous; ſo cannot be pronounced different, by its preſent appearance.

The piercing and bleeding of Birch is performed thus: about the beginning of March, when the buds begin to be proud and turgid, and before they expand into leaves, with a chizel and a mallet cut a ſlit almoſt as deep as the pith, under ſome branch of a well ſpreading Birch; cut it oblique, and not long-ways, as a ſurgeon does a vein; and inſert a ſmall ſtone or chip, to keep the lips of the wound a little open; laſtly, to this orifice faſten a bottle, or other convenient veſſel, appendant, into which will diſtil a limpid and clear water, retaining an obſcure ſmack both of the taſte and odour of the tree. The miracle is, that, in the ſpace of twelve or fourteen days, as much juice may be gathered, as will outweigh the whole tree, body and roots.

The liquor or juice, thus procured, is uſed, in ſome northern countries, as a preſervative againſt the ſtone. Van Helmont extols a drink prepared with this juice, daucus-ſeeds, and brook-lime. Mr. Boyle, tells us, he has ſeen extraordinary medicinal effects of the juice itſelf, even when other remedies failed; ſo that he uſually provided a quantity of it every ſpring. He ſays, it may eaſily be preſerved, by pouring a little oil on the top of it; or by diſtillation; but that the beſt way is, to impregnate it with the fumes of ſulphur.

This juice is uſed both to make wine of, and to brew withal, being here employed in lieu of water; a barrel of malt will afford as much, and as good ale, as four with common water.

A great difference is found between the efficacy of that liquor which diſtils from the body, or parts of the tree nearer to the root, and that which weeps out from the more ſublime branches; the former being more crude and watery, the latter purer, and more refined.

Birch-wine is made by fermenting the vernal juice: formerly it was in great repute againſt all nephritic diſorders, but is left out in the modern London practice. *Quinc. Pharmac.*

BIRD *of Phœbus*, the raven, one of the ſouthern conſtellations, containing ſeven ſtars; five of the third magnitude, one of the fourth, and one of the fifth.

BIRDS, in heraldry, are figures frequently borne in arms.

Birds are eſteemed a more honourable bearing than fiſhes; and wild and ravenous Birds, than tame ones.

Birds, according to Leigh, are to be numbered as far as ten; according to Chaſſaneus to ſixteen; after which they are to be blazoned without number. When their bills and feet are of a different colour from the firſt, they are ſaid to be membered. Birds of prey are more properly ſaid to be armed.

Birds borne of their natural colour are to be blazoned by proper, without mention of the colour. In the blazoning of fowls much exerciſed in flight, if the wings be not diſplayed, they are ſaid to be borne cloſe, *e. gr.* he beareth an eagle, a hawk, or a ſwallow, cloſe. In the general, wherever a Bird is found in any action or poſture, to which nature does not ordinarily incline it, ſuch action or poſture is to be named, otherwiſe not. *Coat's Her. Dict.*

BIRD-LIME, among ſportſmen, a tenacious compoſition uſed in taking birds.

The common method of making it is to peel a good quantity of holly bark about midſummer; fill a veſſel with it, put ſpring water to it; boil it till the grey and white bark ariſe from the green, which will require twelve hours boiling; then take it off the fire, drain the water well from it, ſeparate the barks, lay the green bark on the ground in ſome cool cellar, covered with any green rank weeds, ſuch as dock thiſtles, hemlock, &c. to a good thickneſs; let it lie ſo fourteen days, by which time it will be a perfect mucilage; then pound it well in a ſtone mortar, till it becomes a tough paſte, and that none of the bark be diſcernable; next, after waſh it well in ſome running ſtream, as long as you perceive the leaſt motes in it: then put it into an earthen pot to ferment; ſcum it for four or five days, as often as any thing riſes, and, when no more comes, change it into a freſh earthen veſſel, and preſerve it for uſe in this manner: take what quantity you think fit, put it into an earthen pipkin, add a third part of capons or gooſe greaſe to it, well clarified, or oil of walnuts, which is better; incorporate them on a gentle fire, and ſtir it continually till it is cold, and thus it is finiſhed.

To prevent froſt; take a quarter of as much oil of petroleum as you do gooſe greaſe, and no cold will congeal it: the Italians make theirs of the berries of the miſletoe-tree treated after the ſame manner, and mix it with nut-oil, an ounce to a pound of lime, and, taking it from the fire, add half an ounce of turpentine, which qualifies it alſo for the water.

When the twigs, or cords, are to be put in places ſubject to wet, the common Bird-lime is apt to have its force ſoon taken away. It is neceſſary, therefore, to have recourſe to a particular ſort, which, from its property of bearing water unhurt, is called water Bird-lime; and is prepared thus:

Take a pound of ſtrong and good Bird-lime, waſh it thoroughly in ſpring water, till the hardneſs is all removed; and then beat it well, that the water may be clean ſeparated, ſo as not a drop remains; add to it as much capon's greaſe as will make it run. Then add two ſpoonfuls of ſtrong vinegar, one ſpoonful of oil, and a ſmall quantity of Venice turpentine. Let the whole boil for ſome minutes over a moderate fire, ſtirring it all the time. Then take it off; and, when there is occaſion to uſe it, warm it, and cover the ſticks well with it. This is the beſt ſort of Bird-lime for ſnipes, and other birds that love wet places.

The moſt ſucceſsful method of uſing the common Bird-lime is this: cut down the main branch or bough of any buſhy tree, whoſe twigs are thick, ſtraight, long, and ſmooth, and have neither knots nor prickles. The willow and the birch-tree afford the beſt of this kind. Let all the ſuperfluous ſhoots be trimmed off, and the twigs all made neat and clean;

clean; they muſt all be well covered with the Bird-lime, within four inches of the bottom; but the main bough, from which they grow, muſt not be touched with the lime. No part of the bark, where the lime ſhould come, muſt be left bare; but it is a nice matter to lay it on properly, for, if it be too thick, it will give the birds a diſtaſte, and they will not come near it; and, if there be too little of it, it will not hold them when they are there. When the buſh is thus prepared, it muſt be ſet up in ſome dead hedge, or among ſome growing buſhes near the outſkirts of a town, a farmer's back-yard, or the like, if it be in ſpring; for theſe places are the reſort of ſmall birds at that time. If it be uſed in ſummer, the buſh muſt be placed in the midſt of a quick-ſet-hedge, or in groves, buſhes, white-thorn trees, near fields of corn, hemp, flax, and the like; and, in the winter, the proper places are about ſtacks of corn, hovels, barns, and the like. When the lime buſh is thus planted, the ſportſman muſt ſtand as near it as he can, without being diſcovered; and with the mouth, or otherwiſe, make ſuch ſort of notes, as the birds do when they attack, or call to one another. There are bird-calls to be bought for this uſe; but the moſt expert method is to learn the notes of call of the ſeveral birds, and imitate them by a ſort of whiſtling. When one bird is thus enticed to the buſh, and hung faſt, the buſineſs of the ſportſman is not to run up to take it, but to be patient; for it will hang itſelf more faſt, by its ſtruggling to get away; and its fluttering will bring more to the buſh; ſo that ſeveral may be taken together. The time of the day of this ſport is from ſun-riſe to ten o'clock, and from one to ſun-ſet. Another very good method of bringing the birds together is by a ſtale; a bat makes a very good ſtale, but it muſt be faſtened, ſo as to be in ſight at a diſtance. An owl is a ſtill better ſtale, for this bird never goes abroad, but it is followed by all the ſmall birds in the neighbourhood. They will gather together in great numbers about it, and, having no convenient place to ſit on, but the lime buſh, will be taken in great numbers. If a living owl or bat is not to be had, the ſkin ſtuffed will ſerve the purpoſe, and will laſt twenty years. Some have uſed the image of an owl carved in wood, and painted in the natural colours, and it has been found to ſucceed very well.

A method of deſtroying ſmall birds in great numbers by lime twigs is this: take two or three hundred ſmall twigs, about as thick as ruſhes, and three or four inches long; ſtick theſe on the tops of ten or a dozen cocks of hemp, or other produce of the field, cut and cocked up. There are generally in theſe fields of hemp vaſt numbers of linnets, and other ſmall birds, feeding on the ſeeds; the whole field is to be beat over, after the twigs are planted, and the birds will naturally ſettle on the cocks, and many dozen of the ſeveral kinds will be taken at once.

Another method of taking great numbers in the winter ſeaſon is this: take a number of wheat ears, with the ſtraws about a foot long to them; melt ſome good Bird-lime gently over the fire, adding one fourth part of its weight of ſome light fat, ſuch as the greaſe of fowls, or the like. When this runs thin, cover the ſtraws with it for ſix inches below the ears. Then take into a field, where the ſmall birds reſort in flocks, as they do at this ſeaſon of the year, a quantity of theſe limed ſtraws, and a peck or two of chaff; ſpread the chaff over a large ſpace of ground, and among it place the limed ſtraws, ſticking them in the ground at the bottom, and letting the ears droop down. When the place is thus planted, the ſportſman muſt beat the neighbouring fields and hedges; and the birds being diſturbed will riſe, and they will naturally make their way to where they ſee the chaff. They will then ſoon be pecking at the ears of corn; and, as the limed ſtraws will ſoon begin to ſtick to them, they will mount up into the air with them; but, in their flight, the ſtraws ſoon get under their wings, and faſten them together; ſo that they can no longer fly, but fall ſtruggling to the ground.

As ſoon as they begin to fall, the ſportſman's buſineſs is to watch, not to run to take them up, for, in a little time, more will be entangled; and, with patience, ſometimes five or ſix dozen may be taken in this manner at a time. This method ſucceeds better, as the weather is more and more ſevere; and beſt of all, when the ground is covered with ſnow. The ſame place will ſerve for many repeated flights. The limed ſtraws are to be taken away, as ſoon as the firſt flight is taken, and the place new bated with chaff; the birds may then be left to feed with freedom; and the next morning, the limed ſtraws being ſet up again, they will be caught in greater numbers, than at the firſt attempt.

BIRD's-NESTS, in natural hiſtory, a kind of ſpice very much eſteemed in China, and throughout all the Eaſt-Indies; it is to be found in Tonquin and Cochinchina, but more particularly in the kingdom of Campa or Champa, which is ſituated between both. The birds which make thoſe neſts to lay their eggs, and hatch their young ones in, are pretty much like the ſwallows: in coupling time, there iſſues from their bills a clammy foam or glutinous matter, which is the only material they build their neſts with; they faſten them to the rocks, by applying to them that glutinous ſubſtance; by ſeveral layers the one over the other, the former becomes dry. Theſe neſts are of the form of a middle-ſized ſpoon, but the brims are higher.

There are ſo many of theſe kinds of neſts, that they gather every year ſeveral hundred weight of them, which are almoſt all carried into China, where they are ſold for five taels per hundred weight, which amounts to about a hundred Spaniſh ducats. They are thought to be good for the ſtomach and the head, and give a delicious taſte to the meat ſeaſoned with them.

BI'RMINGHAM *Hard-ware-men*, or dealers in the city of London, in Sheffield and Birmingham wares, are ſo called, becauſe they principally trade in, and moſtly wholeſale, all ſorts of tools, ſmaller utenſils, toys, buckles, buttons, in iron, ſteel, braſs, &c. made in London, and the great trading towns of Birmingham in Warwickſhire, and Sheffield in Yorkſhire, where many thouſands of artiſans, in different branches, are conſtantly employed, but for the moſt part in the ſmithery and cutlery ways.

There are but few of theſe in London; yet almoſt all of them carry on a moſt extenſive trade, and are reputed wealthy. It is not eaſy to conceive, much leſs to deſcribe, the numerous articles that paſs through their hands: therefore, a youth, deſirous to ſerve an apprenticeſhip to this buſineſs, ſhould be ready and acute, not want a good memory, write a plain hand, know arithmetic, and ſomewhat of book-keeping.

BI'SCUIT, or BISKIT, a general name for that bread which is made for voyages by ſea, eſpecially for long voyages.

Biſket, in order to be good, ſhould be made ſix months before it is put on board a ſhip; it muſt be of good wheat flour, thoroughly cleaned from bran.

Water and Biſket are the moſt neceſſary proviſions in the fitting out of ſhips, and, if either of theſe two be loſt or ſpoiled, the crew languiſh away, and often periſh moſt miſerably, eſpecially if they happen to be bound for a very long voyage.

Manner of making Sea BISCUITS.— The flour is firſt wet in the kneading-trough with a ſufficient quantity of water, and covered for ſome time with a cloth. It is then well kneaded, and the dough divided into pieces of about three ounces each. Theſe pieces are again kneaded ſingly, and laid in rows; and, after having ſome flour ſhaken over them, others are laid upon them, till the whole quantity to be baked at once is finiſhed. The pieces of dough are then flatted into cakes, pricked with an inſtrument for that purpoſe, and placed regularly in the oven; where they ſtand about half an hour, and are then drawn out of the oven, and carried into the ſtore-room.

The Manner of making Sea BISCUIT *in France.*— In order to make the leaven, which the French put in their Biſket, a piece of dough weighing about twenty pounds, from the leaven of the laſt oven full, ſhould be prepared, which is done, we will ſuppoſe, between eleven and twelve at noon. At four of the clock in the afternoon, the baker puts that dough into the kneading-trough, and pours over it about five gallons of very clean water, a little more than luke-warm, but hotter in winter than in ſummer; he dilutes afterwards with the quantity of flour neceſſary to conſume all that water, ſo as to make a dough neither too ſoft nor too hard. This new maſs of dough weighs commonly about ſixty pounds. In this condition the baker puts it in a corner of the kneading-trough, ſurrounding it on all ſides with flour to ſupport it. When it has been riſing five or ſix hours, the ſame operation is repeated, by adding water and flour to the dough, which increaſes it by about thirty pounds.

About one or two o'clock the next morning, which is the time when the baker would knead, he adds thirty pounds more to the paſte, which makes a maſs of 120 pounds; of this he takes half to ſerve as leaven for the next baking, and at the ſame time kneads the remaining ſixty pounds in the kneading-trough for the firſt oven full, and, for the other bakings, he is to make the reſt of the day, he increaſes the leaven at once with ſixty pounds, which he puts into a tub or bucket, in order to continue the ſame alternately, except that for the laſt oven full he adds but twenty pounds to the leaven, which is to ſerve for beginning the ſame operation the next day.

The kneader takes water out of the kettle or copper which he uſed for the leavens, and dilutes that which he would employ into a whitiſh and thick water; and, putting flour to it two or three times, he kneads it quickly and very ſtrongly with his fiſts, going from the right to the left, and beginning again from one end to the other, and from the left to the right, he reduces it to one ſingle maſs. After this, he flattens it with the palms of his hands, and divides it into four parts: then he flattens them again, and handles them and kneads them with all his might one after another; afterwards he puts them again one upon another, and, having cleaned his kneading-trough, he puts the whole into one maſs, turning and kneading it ſtill. After which he cuts it again into four parts, which having rejoined for the laſt time, he takes the dough out of the kneading-trough, and puts it upon a table, where another workman turns it ſeveral times during a quarter of an hour, till it be very firm and dry.

As

As ſoon as the dough is in the above-mentioned condition, it muſt immediately be made into cakes. Each cake muſt weigh fourteen ounces of dough, that, when baked, it may weigh eight, or at moſt nine ounces.

The dough is cut into pieces of that weight, which pieces are afterwards turned upon the table with the hands into balls, to make it harder ſtill: then it is flattened with a kind of rolling-pin, the middle of which is thicker than the two ends, obſerving, however, to make the cake ſomething hollow in the middle; as for the edges, they muſt be even, and be above one third part of an inch thick.

The cake being thus formed, they make the mark, a croſs, or ſome other figure, upon it, with an inſtrument for that purpoſe; after which they turn it on the other ſide, laying it upon the table, as near as poſſible to thoſe already made; finally, a little before they put it into the oven, they prick it four or five times with an iron inſtrument that has three points.

Before they prick the cakes and put them into the oven, they muſt let them reſt half an hour upon the table, or even more, if need be, that they may have time to riſe, which the baker ought to know and direct.

At Breſt, they put the cakes into the oven, as ſoon as they are pricked, without letting them reſt or riſe, becauſe they pretend they are ſufficiently furniſhed with leaven, and in that caſe they do not cover them.

For the firſt oven full, they muſt begin to heat the oven, as ſoon as they begin to work the dough with the rolling-pin; and they know that the oven is hot, when the roof of it is of a whitiſh aſh colour. But, for the other oven full, they do not warm the oven; but after they have rolled the dough, or a little ſooner or later, according as the baker thinks fit, or as the dough requires it, and the oven is not to be quite ſo white.

It muſt be obſerved, that for the firſt oven full they may heat the oven with green wood, becauſe it has time to dry and burn: but, for the others, the drieſt wood is beſt, becauſe the dough requires to be ſoon put into the oven, leſt it ſhould dry too much.

After the fire is taken out of the oven, and it has been well ſwept, the baker thruſts the cakes into the oven, the one after the other, on an iron or wooden ſhovel, obſerving to place them regularly, ſo that there may be no void ſpace between them. He afterwards ſhuts the oven very cloſe, and puts a few ſhovels full of live coals againſt the door; a quarter of an hour after he opens the oven, to ſee whether the Biſkets begin to colour: if he find them ſufficiently coloured, he leaves the oven open for half a quarter of an hour, during which he takes away the coals from before the door, which he ſhuts again. When the cakes have remained in the oven a full quarter of an hour longer, he takes out ſome of the cakes which were firſt put in, and breaks them to ſee whether they be baked. When they are ſo, the edges are reddiſh within; and the little which remains in the middle, is ſpongy but dry. They put their hand upon that crumb, and, if they obſerve any moiſture in it, it is a ſign that the cakes are not baked enough; and they muſt leave them in the oven, as long as they judge it neceſſary to dry up all the moiſture.

As ſoon as the Biſkets are taken out of the oven, they carry them out into the ſtore-room, which has been well cleaned and warmed, during four days. The ſtore-rooms, to be good, ſhould be built over the ovens, wainſcotted at top and bottom, and on all ſides, and the joints of the boards well caulked.

BISTORT, *Biſtorta*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the apetalous kind, conſiſting of a number of ſtamina, which ariſe from a cup, divided into ſeveral ſegments at the edge: the piſtil becomes afterwards a ſeed, uſually of a triangular figure, and contained in a capſule, which was before the cup of the flower. See *Plate* VI. *fig*. 37.

To this it is to be added, that the flowers are diſpoſed in ſpikes; and the roots are large and fleſhy, oddly twiſted or contorted, and furniſhed with a number of ſmall fibres, like hairs. There are alſo ſome ſpecies of Biſtort, in which, beſides the common flowers and ſeeds, there are certain tubercles, which have their roots, and rudiments of leaves.

The roots of the common Biſtort are a ſtanding medicine in the ſhops; they are given in decoction, and ſometimes in powder, as an aſtringent, and generally in conjunction with the tormentil root. They give a bright red colour to the common hartſhorn drink, and add conſiderably to its virtue. It is good in diarrhœas, and hæmorrhages of all kinds.

Some alſo commend it as an alexipharmic, and ſudorific.

BITTACLE, a ſea term, ſignifying a frame with two ſtories, placed in the ſteerage, before the place where the ſteerſman ſtands, by the miſſen-maſt; it is all made of boards faſtened together with wooden pegs, without any iron, to prevent the direction of the needle of the compaſs, which is incloſed in it, from being altered by the proximity of that metal. They alſo put a watch or clock in it, with a candle or lamp to light the ſteerſman.

In large ſhips, beſides this Bittacle, they have another for the pilot or mate.

BITTERN, in zoology, the name of a bird of the heron kind called by authors ardea ſtellaris: and by ſome taurus, botaurus, butorius, and ocnus.

In Engliſh, the butter-bump, and mire-drum. It is nearly of the ſize of a common heron; its head is ſmall and narrow; its crown is black; and there is alſo a black ſpot on each ſide, near the angle of the mouth. Its throat and ſides are reddiſh, variegated with black tranſverſe lines; the neck is covered with very long feathers, which make it appear much thicker and ſhorter than it really is; its belly is of a duſky white, with a caſt of browniſh red, and its back is variegated with a pale reddiſh brown and black. It makes a very remarkable noiſe, which it repeats either three or five times. It is heard only in the building-time, which begins in February. The common people, from the ſingularity of the noiſe, think the bird, in order to make it, ſticks its beak in a reed, or in the mud. It is commonly found in ſedgy and reedy places, near the waters, and ſometimes in hedges. Towards autumn, this bird flies very high in an evening after ſun-ſet, riſing with a ſpiral aſcent, till quite out of ſight; and, as they riſe, they make an odd noiſe, not at all like their uſual note. This they repeat alſo very often, as they are on the wing in the night; and hence they are called by ſome, though improperly, the night-raven. It builds on the ground, and lays five or ſix eggs, which are roundiſh, and of a greeniſh white. When wounded, and going to be taken, it ſtrikes at the perſon's eye, and ought carefully to be guarded againſt.

BITTS, are two perpendicular pieces of timber in the fore part of the ſhip, bolted to the gun-deck and orlop beams, their lower ends ſtepping in the foot waaling, the heads of which are braced with a croſs piece, and, when ſeveral turns of the cable are taken over them, is for ſecuring the ſhip at anchor; there are generally two pair of them; beſides, there are others upon the upper deck, which are fixed by the main and fore maſt, and called the top-ſail ſheet and jeer Bitts.

Currier's BLACK, ſignifies a teint or dye laid on tanned leather; of which there are uſually two, the firſt made of galls, ſour ale, and old iron; the ſecond of galls, copperas, and gum arabic.

BLACK-*Bird*, *merula*, in zoology. See the article MERULA.

BLACK *Land*, in agriculture, a term by which the huſbandmen denote a particular ſort of clayey ſoil, which, however, they know more by its other properties than by its colour, which is rarely any thing like a true Black, and often but a pale grey. This, however pale when dry, always blackens by means of rains; and, when ploughed up at thoſe ſeaſons, it ſticks to the plough-ſhares, and, the more it is wrought, the muddier and duſkier-coloured it appears. This ſort of ſoil always contains a large quantity of ſand, and uſually a great number of ſmall white ſtones.

BLACK *Flux*, in mineralogy, a flux uſed in the aſſaying of ores, and is made as follows: take one part of nitre, and two parts common tartar; reduce each to powder, mix them together, and deflagrate the whole in a crucible, by lighting the mixture a-top; which thus turns to a kind of alkaline coal, that is to be pulverized, and kept in a cloſe glaſs, to prevent its diſſolving, as it would do in a moiſt air.

This flux is of general uſe; and, to have it ready at hand, ſhortens the buſineſs of making aſſays in metallurgy; and renders the operation more exact, than when crude tartar and nitre are employed; becauſe the deflagration might thus carry off ſome part of the ore, and defraud the account. For the ſame reaſon, the mixture is here directed to be fired at top; otherwiſe a conſiderable part might be loſt in the deflagration, which would prove much more tumultuous and violent, if the matter was thrown into a red-hot crucible. *Shaw's Chem. Lectures*.

BLACK *Tin*, in minerology, a denomination given to the tin-ore when dreſſed, ſtamped, and waſhed ready for the melting-houſes, where it is refined into a pure metal.

It is prepared into this ſtate by means of beating and waſhing; and, when it has paſſed through ſeveral baddles or waſhing-troughs, it is taken up in the form of a Black powder like fine ſand, called Black tin.

BLADE, in botany, that part of the flower, or florid attire of a plant, which ariſes out of the concave of the ſheath, and, at the top, uſually divides into two parts, which are covered with globules of the ſame nature as thoſe of the apices, but not ſo copious.

The Blade runs through the hollow of the ſheath and baſe, and is faſtened to the convex of the ſeed-caſe, having its head and ſides beſet with globules, which, through a glaſs, appear like turnip-ſeeds, and which, in ſome plants, grow cloſe to the blade, and in others adhere to it by little pedicles, or foot-ſtalks. Theſe globules, as the Blade ſprings up from within the ſheath, are ſtill rubbed off, and ſo ſtand like a powder on both. In ſome plants, as knap-weed, they ſeem alſo to grow on the inſide of the ſheath, as appears on ſplitting it with a pin. The head of a Blade is divided uſually into two; but ſometimes, as in cichory, into three parts, which, by degrees, curl outward, like ſcorpion-graſs.

BLADE, in commerce, a thin, ſlender piece of metal, either forged

forged by the hammer, or run and caſt in moulds, to be afterwards ſharpened to a point, edge, or the like.

Blade *of a Chiſſel*, is the iron or ſteel part, as diſtinguiſhed from the wooden handle.

Blade *of Mace, or Cinnamon*, among apothecaries, are little ſlips or ſlices of thoſe barks.

Blade *of an Oar*, is the flat part which is plunged into the water in rowing. On the length of this does the force and effect of the oar depend.

Blade *of a Saw*, the thin part wherein the teeth are cut, which, to be good, muſt be ſtiff, yet bend equally into a regular bow all the way, without yielding more in one place than another.

Blade-*Mill*, is that contrived for grinding iron-tools, as ſcithes, reaping-hooks, axes, chiſſels, and the like, to a bright edge.

BLA'NCHING, in gardening, an operation performed on certain ſallets, roots, &c. as of cellery and endives, to render them fairer and fitter for the table. The time for Blanching of cellery is about the middle of June, when ſome of the firſt ſowing will be fit to plant out in trenches for this purpoſe. Theſe trenches are to be cut by a line eight or ten inches wide, and about as many deep; into which they put their plants, after having firſt pruned off the tops and roots. As they grow large, they earth them up within four or five inches of their tops, and ſo continue to do at ſeveral times, till whitened ſufficiently for uſe; which they will not ordinarily be till ſix weeks after earthing them up. For endive, as ſoon as it is well grown, they tie up ſome of it to whiten; and continue every fortnight, as long as it laſts, to tie up freſh parcels.

Blanching is alſo a term uſed by the people who cover thin plates of iron with tin, for that part of the work, which conſiſts in dipping the plates into the melted tin, in order to the covering of them. The people who do this part of the buſineſs are hence called Blanchers.

BLA'NKET, in commerce, a warm woolly ſort of ſtuff, light and looſe woven, chiefly uſed in bedding.

The manufacture of Blankets is chiefly confined to Witney in Oxfordſhire, where it is advanced to that height, that no other place comes near it. Some attribute a great part of the excellency of the Witney Blankets to the abſterſive, nitrous water of the river Windruſh, wherewith they are ſcoured; others rather think they owe it to a peculiar way of looſe ſpinning, which the people have thereabouts. Be this as it will, the place has engroſſed almoſt the whole trade of the nation for this commodity; inſomuch that the wool fit for it centers here from the furthermoſt parts of the kingdom. There are ſaid to be at leaſt threeſcore blanketers in this town, who, amongſt them, have at leaſt 150 looms, and employ 3000 perſons, from children of eight years old, who work out about a hundred packs of wool per week.

BLA'STING, among miners, a term for the tearing up rocks, which they find in their way, by gunpowder. The method of doing which is this: they make a long hole, like the hollow of a large gun-barrel, in the rock they would ſplit; this they fill with gun-powder, then they firmly ſtop up the mouth of the hole with clay, except a touch-hole, at which they leave a match to fire it. A ſmall quantity of powder does great things this way.

BLEA, in vegetables, is that part of a tree which lies immediately under the bark, and between that and the hard wood, and is the firſt progreſs of the alteration of the bark into wood, by the natural growth and ſtrengthening of the fibres.

BLEE'DING, according to Dr. Pringle, is the moſt indiſpenſable of all remedies in inflammatory diſeaſes; to the delaying of which too long, or not repeating it, are chiefly owing the bad conſequences of colds, as dangerous fevers, rheumatiſms, and conſumptions. He obſerves farther, that, in general, young practitioners are apt to be too ſparing in letting blood, by which means many lives are loſt: for a ſurgeon may be aſſured a ſoldier will never complain of a cough, or pains with inflammatory ſymptoms, wherein Bleeding is not neceſſary; and from the ſizineſs of the blood, and continuance of the complaints, he is to judge of the neceſſity of repeating it, which, in caſe of a ſtitch, or difficult breathing, is never to be delayed. In inflammatory caſes, from twelve to fifteen ounces may be taken for the firſt Bleeding, and ſomewhat leſs for all the reſt; and, when it is neceſſary to exceed this quantity, it may be proper to follow Celſus's rule, in minding the colour of the blood whilſt it flows, and when it is of a blackiſh caſt, which is always the caſe in difficult breathing and great inflammations, to let it run till it becomes more florid. In all caſes where plentiful Bleeding is indicated, it is beſt to do it in bed, to prevent fainting; and we may obſerve, that a perſon will bear the loſs of a much greater quantity of blood, if the ſtream is ſmall, than by a large orifice, which ſome have thought neceſſary for making a more ſpeedy revulſion.

Bleeding is highly neceſſary in the phrenitis, ophthalmia, quinſy, rheumatiſm, cough, hectic fits, and, in general, in all inflammatory caſes. *Pringle's Obſerv. on the Diſeaſes of the Army.*

It is to be obſerved, however, that, in malignant and putrid diſorders, Bleeding frequently renders them more malignant, and therefore to be omitted, or at leaſt not repeated, unleſs there appear evident marks of inflammations. See PHLEBOTOMY *Dict. and Suppl.*

BLEND-*Metal iron*, a coarſe ſort of iron from Staffordſhire mines, uſed for making nails and heavy ware; in ſome places alſo for horſe-ſhoes. *Plott, Nat. Hiſt. of Staffordſhire.*

BLEYME, in farriery, an inflammation in a horſe's hoof, occaſioned by blood putrified in the inner part of the coffin towards the heel, between the ſole and the coffin-bone.

There are three ſorts of Bleymes; the firſt, bred in ſpoiled wrinkled feet with narrow heels, are uſually ſeated in the inward or weakeſt quarter; the ſecond, beſides the uſual ſymptoms of the firſt, infects the griſtle, and muſt be extirpated, as in the cure of a guitter bone; the third is occaſioned by ſmall ſtones and gravel between the ſhoe and the ſole. For a cure, they pare the foot, let out the matter, if any, and dreſs the ſore, like the prick of the nail. *Dict. Ruſt. T. 1. in Voc.*

BLIGHT *(Dict.)*— There is nothing ſo deſtructive to a fruit-garden as Blights; nor is there any thing in the buſineſs of gardening which requires more of our ſerious attention, than the endeavouring to prevent or guard againſt this great enemy of gardens.

In order, therefore, to remedy this evil, it will be neceſſary firſt to underſtand the true cauſes of Blights: and, although many curious perſons have attempted to explain the cauſes of them, yet very few of them have yet come near the truth, except the reverend and learned Dr. Hales, who hath, in his curious book, intitled, Vegetable Statics, given us ſome accurate experiments upon the growth and perſpiration of plants; together with the various effects the air has upon vegetables; that, by carefully attending thereto, together with diligent obſervations, we need ſeldom to be at a loſs how to account for the cauſes of Blights, whenever they may happen.

Blights are often cauſed by a continued eaſterly wind, for ſeveral days together, without the intervention of ſhowers, or any morning dew, by which the perſpiration of the tender bloſſoms is ſtopped; ſo that, in a ſhort time, their colour is changed, and they wither and decay: and if it ſo happens, that there is a long continuance of the ſame weather, it equally affects the tender leaves; for their preſpiring matter is hereby thickened, and rendered glutinous, cloſely adhering to the ſurfaces of the leaves, and becomes a proper nutriment to thoſe ſmall inſects, which are always found preying upon the leaves and tender branches of fruit-trees, whenever this Blight happens.

The beſt remedy for this diſtemper, that I have yet known to ſucceed, is, gently to waſh and ſprinkle over the trees, from time to time, with common water (that is, ſuch as hath not had any thing ſteeped in it) and the ſooner this is performed (whenever we apprehend danger) the better; and, if the young and tender ſhoots ſeem to be much infected, waſh them with a woollen cloth, ſo as to clear them, if poſſible, from all this glutinous matter, that their reſpiration and perſpiration may not be obſtructed; and if we place ſome broad flat pans or tubs of water near the trees, that the vapours exhaled from it may be received by the trees, it will keep their tender parts in a ductile ſtate, and greatly help them; but, whenever this operation of waſhing the trees is performed, it ſhould be early in the day, that the moiſture may be exhaled before the cold of the night comes on; eſpecially if the nights are froſty: nor ſhould it be done when the ſun ſhines very hot upon the wall, which would be ſubject to ſcorch up the tender bloſſoms.

Another cauſe of Blights in the ſpring is, ſharp hoary froſts, which are often ſucceeded by hot ſunſhine in the day-time; which is the moſt ſudden and certain deſtroyer of fruits that is known: for the cold of the night ſtarves the tender parts of the bloſſoms, and the ſun riſing hot upon the walls before the moiſture is dried from the bloſſoms (which, being in ſmall globules, collects the rays of the ſun) a ſcalding heat is thereby acquired, which ſcorches the tender flowers, and other parts of plants.

But there is another ſort of Blight, againſt which it is very difficult to guard our fruit-trees; this is ſharp pinching froſty mornings, which often happen at the time when the trees are in flower, or while the fruit is very young, and occaſion the bloſſoms or fruit to drop off; and, ſometimes, the tender parts of the ſhoots and leaves are greatly injured thereby.

The only method yet found out to prevent this miſchief, is, by carefully covering the walls, either with matts, canvas, reeds, &c. which being faſtened ſo as not to be diſturbed with the wind, and ſuffered to remain on during the night, by taking them off every day, if the weather permits, is the beſt and ſureſt method that hath yet been uſed in this caſe; which, although it has been ſlighted, and thought of little ſervice by ſome, yet the reaſon of their being not ſo ſerviceable, as has been expected, was, becauſe they have not been rightly uſed, by ſuffering the trees to remain too long covered; by which means, the younger branches and leaves have been rendered too weak to endure the open air, when they are expoſed to it; which has often proved of worſe conſequence to trees, than if they had remained intirely uncovered.

Whereas,

Whereas, when the covering before-mentioned has been performed, as it ought to be, it has proved very serviceable to fruits; and many times, when there has been almost a general destruction of fruits, in the neighbouring gardens, there has been a plenty of them in such places where they have been covered; and, though it may to some seem very great, yet, if these coverings are fixed near the upper part of the wall, and are fastened to pullies, so as to be drawn up, or let down, it will be soon and easily done; and the success will sufficiently pay the trouble.

But there is another sort of Blight, that sometimes comes later in the spring, viz. in April or May, which is often very destructive to orchards, and open plantations, and against which we know no remedy. This is what is called a fire-blast, which, in a few hours, hath not only destroyed the fruit and leaves, but, many times, parts of trees, and, sometimes, whole ones, have been killed by it.

This is supposed to be effected by volumes of transparent flying vapours, which, among the many forms they revolve into, may sometimes approach so near to an hemisphere, or hemicylinder, either in their upper or lower surfaces, as thereby to make the beams of the sun converge enough to scorch the plants or trees they fall upon, in proportion to the greater or less convergency of the sun's rays.

The learned Boerhaave, in his Theory of Chemistry, observes, That those white clouds, which appear in summer-time, are, as it were, so many mirrors, and occasion excessive heat; these cloudy mirrors are sometimes round, sometimes concave, polygonous, &c. when the face of the heavens is covered with such white clouds, the sun, shining among them, must, of necessity, produce a vehement heat; since many of his rays, which would otherwise, perhaps, never touch our earth, are hereby reflected to us: thus, if the sun be on one side, and the clouds on the opposite one, they will be perfect burning-glasses.

I have sometimes, continues he, observed a kind of hollow clouds, full of hail and snow; during the continuance of which, the heat was extreme; since, by such condensation, they were enabled to reflect more strongly: after this came a sharp cold, and then the clouds discharged their hail in great quantities; to which succeeded a moderate warmth. Frozen concave clouds, therefore, by their great reflexions, produce a vigorous heat; and the same, when resolved, excessive cold.

Whence (as Dr. Hales observes) we see, that blasts may be occasioned by the reflexions of the clouds, as well as by the above-mentioned refraction of dense transparent vapours.

Against this enemy to fruits, &c. as hath been said, there is no guard to our plantations, nor any remedy to cure it: but as this more frequently happens in close plantations (where the stagnating vapours from the earth, and the plentiful perspirations from the trees, are pent in for want of a free air to dissipate and dispel them; which are often observed, in still weather, to ascend in so plentiful a manner, as to be seen by the naked eye, but especially with reflecting telescopes, so as to make a clear and distinct object become dim and tremulous) than in those that are planted at a greater distance, or are not surrounded with hills or woods; this directs us, in the first planting of orchards, &c. that we should allow a greater distance between the trees, and make choice of clear healthy situations, that the air may freely pass between the trees, to dissipate those vapours before they are formed into such volumes, whereby the circumambient air will be clear, and less subject to injuries; as also the fruits which are produced in this clearer air, will be much better tasted than those that are surrounded with a thick rancid air; for, as fruits are often in a respiring state, so they consequently, by imbibing a part of these vapours, are rendered crude and ill-tasted; which is often the case with a great part of our fruits in England. *Miller's Gard. Dict.*

BLIND, deprived of the sense of sight.

Blind is also used in speaking of vessels which are not perforated.

Thus the chemists say, a Blind alembic; that is, one which has no aperture. A tube is said to be Blind, when it is closed at top.

Blind, or Blinde, among mineralists, a kind of lead marcasite, by our miners called mock-ore, mock-lead, and wild-lead.

Blinde is a mineral mass, flaky, glossy, and breaking in angles, much like the potters lead ore, only of a colour more dusky, and approaching to black. In it are veins of a yellow shining marcasite, with a little white spar, and on one side a greenish æruginous matter. On a trial by the fire, it yielded a very little copper, less lead, and no tin. It is very obstinate, several attempts having been made with the alcaline fluxes to run it, in vain.

BLOCK-*Makers*.—Blocks are very material articles in a ship's rigging; and the making of them, and many other things, for the use of shipping, is a pretty handicraft enough, in which there is more ingenuity than some people imagine; and a very useful employ, though not a great number of masters in it; for, as the Blocks are what the ships ropes are fastened to, and run in by the help of the pullies fixed therein, if they are not made exactly to fit one another, the tackling will work but heavily, to the great hindrance of business, and fatigue of the seamen, &c.

They require ten pounds, or more, with a lad to be an apprentice; their hours are from six to eight, working altogether dry, and under cover; and the wages are fifteen or eighteen shillings a week.

This will take four hundred pounds, at least, to set a master up well.

The shivers and pins in large Blocks are generally made of lignum vitæ, by turning them in a lathe. See TURNING.

BLOOD (*Dict.*)—In order to ascertain the colour of the different parts of corrupted Blood, Dr. Pringle made the following experiment: he took a fresh quantity, without any inflammatory crust, and divided it into the crassamentum, the serum with a few red globules in it, and the pure serum. The phials containing these several liquors were put into a furnace, where they stood some days, till they became thoroughly putrid.

The crassamentum was changed from a deep crimson to a dark livid colour; so that, when any portion of it was diluted with water, it appeared of a tawny hue: of the same colour was the serum, in which the red globules remained: but the pure serum, after becoming turbid, dropped a white purulent sediment, and changed into a faint olive-green.

From this experiment he concludes, that the ichor of sordes, and that of dysentery fluxes, consist of the serum tinged with a small quantity of red Blood putrified; and that, when the serous vessels are of a tawny cast, we are not to refer that colour to inflammation, but to a sudden solution of some of the red globules mixed with the serum.

A few drops of this putrid crassamentum was mixed with the recent urine of a healthy person, which it immediately changed into a flame-coloured water, common in fevers and in the scurvy. After standing an hour or two, the same gathered a cloud, resembling what is seen in the crude urine of persons in acute distempers.

As to a green serum, it is, perhaps, never to be seen in the vessels of a living body, since it is not to be supposed that a person could survive so great a change of the blood. In foul ulcers, indeed, and in other sores, where the serum is left to stagnate long, the matter is found of a greenish colour, and is then always acrimonious. But the effects of a green serum are no where to be so much dreaded, as in the case of an ascites, where it is collected in so large a quantity: of which we had, some time since, almost a fatal instance in Mr. Cox, surgeon at Petersburg, who, upon tapping a woman but a few hours after death, was so affected with the poisonous steams of a green serum, that he was presently seized with a pestilential fever, and narrowly escaped with his life.

In regard to the sediment which the serum dropped on becoming turbid, and which resembled well digested matter, the doctor thinks it a terrestrial substance, intended for the nourishment or reparation of the solids; in which opinion he was the more confirmed, by observing it in the urine of men in perfect health; and therefore concludes, that the pus, or digested matter, of sores, is nothing but this substance separated from the serum of the blood: and hence it is, that all large ulcers are extremely weakening, from the great expence of blood in furnishing this substance: hence also it is, that issues are of more consequence for making drains, than one would expect from the visible evacuation: as near as the doctor could guess, an ounce of serum, after standing some days, not furnishing more of this matter than what might be produced in the daily discharge of a large pea-issue, or from a seton.

There are frequent instances of the tawny colour of the serum, the resolution of the crassamentum, and even of the offensive smell of blood recently drawn. And, indeed, if we reflect how putrescent blood is in a heat equal to that of the human body, we may be convinced, that no sooner is the perspiration by the lungs impeded, than a corruption begins in the whole mass; which, if not timely prevented, brings on some putrid disease. If the acrimony is great and sudden, a fever or flux will ensue; but, if the accumulation is so slow, that the body grows habituated to the putrefaction, a scurvy prevails. This is the case in long voyages, on board unventilated ships; in marshy countries; and, in a lesser degree, in all northerly climates, in most situations. *Pringle on the Diseases of the Army.*

BLOW-*Pipe*, among jewellers and other artificers, is a glass tube, of a length and thickness at discretion, wherewith they quicken the flame of their lamp, by blowing through it with their mouth. It is used in works of quicker dispatch, which do not need the bellows.

BLOWING *of a flower*, among florists, an artificial process, in order to bring a flower to display itself with greater perfection and beauty than it would arrive at in the natural way of Blowing. The usual method is thus: about April, when the flower-stems begin to put forth, or spindle, as the gardeners call it, they place by each flower a straight stick four feet long, and tie the spindles to it, as they shoot. As soon as the flower-buds appear, they leave only one of the largest on each flower-stem to blossom. About ten days before the flowers open themselves, the round-podded kinds will begin to to crack their husks on one side; when the careful gardener, with a fine needle, splits or opens the husk on the opposite side to the natural fraction; and, about three or four days before the complete opening of the flower, cuts off, with a pair of scissars, the points on the top of the flower-pod, and supplies the vacancies or openings on each side the husk with two small pieces of vellum, or oil cloth, slipped in between the flower-leaves on the inside of the husk; by which means the blossom will display its parts equally on all sides; and be of a regular figure. Besides this care, when the blossom begins to shew its colours, they use to shade it from the extreme heat of the sun with a trencher-like board, or other device of the like nature, fastened to the stick which supports it; for the flowers, as well as fruits, grow larger in the shade, and ripen and decay soonest in the sun. *Bradl. new Improv. Gard.*

BLUE *Azure*, in chemistry.—This colour may be drawn from silver: but Boyle and Henckel justly observe, that this happens only according to the proportion of copper, found mixed in this metal. The following is the shortest process of making it: dissolve sal gem, salt of tartar, and roche allum, in the strongest double-distilled vinegar; suspend, over the vinegar so prepared, thin plates of silver; and bury the vessel in the husks of grapes. Every three days remove the plates, and wipe off the Blue, which will be formed on them. Another method: put laminæ of silver, as thin as paper, into a pint of the strongest vinegar; add to it two ounces of sal armoniac, well pulverized; put this into a glazed earthen pot, carefully stopped; bury this in horse-dung for fifteen or twenty days; at the end of which time you will find the laminæ covered with a fine azure Blue.

Another method.—Take an ounce of silver dissolved in spirit of nitre, two scruples and an half of sal armoniac, and as much vinegar as will be sufficient to precipitate the silver. Decant the vinegar, put the precipitated matter into a bottle well corked, and let it stand for a month, and you will have a fine azure Blue.

Azure Blue is also extracted from copper, quicksilver, and lead: to extract it from copper, take of verdigrise and sal armoniac, of each three ounces; mix these two ingredients with water wherein tartar has been dissolved; make up the mass into a soft paste; put the whole into a vessel well stopped, and let it stand still for some days, and the operation will be finished.

Another.—Take æs ustum and lees of wine, of each two ounces; sulphur, one ounce; pulverize the sulphur and æs ustum; pour vinegar or urine upon them; put the mixture in a glazed pot, well stopped, and let it stand fifteen days.

BLUE *Enamel*, in chemistry, is a very beautiful Blue colour, of great use to enamellers.

Neri, in his Art of making Glass, has given us the following method of preparing it:—Take four pounds of the fritt, or matter, of which the enamel is made (see ENAMEL) four ounces of zaffer pulverized, and forty-eight grains of æs ustum, or copper three times calcined; these three ingredients being mixed carefully together, put them into the furnace of a glass-house in a white glazed pot; when the mixture is thoroughly melted, it must be poured into clean water, to purge it from any filth; and then melted again, and again quenched in clean water, to purify it. This operation, repeated two or three times, will produce very fine Blue enamel.

Kunckel, in his Remarks on Neri, observes it is scarce possible to prescribe the exact quantity of zaffer necessary to make Blue enamel. It is, therefore, best to begin with a little, by way of experiment; and, if the Blue be too light, to increase the quantity of zaffer, but cautiously; if it be too deep, more fritt of the enamel must be added. By varying the quantities of the ingredients properly, every different shade of the Blue may be produced: as, for example, if we would make a light Blue, we must alter the quantities given before, and then take four pounds of the fritt of enamel, two ounces of æs ustum, and only forty-eight grains of zaffer; mix these ingredients well together, and observe the same directions in their melting and cleansing as before. All these operations are very nice, and require a particular attention; for, without it, effects are produced quite contrary to our expectation; which Kunckel acknowleges happened to him in the operation of the light Blue we have just mentioned. He tried this method of Neri's, and, as he did not succeed, thought this author mistaken; but, on repeating the operation with more nicety, found his ill success owing to his inattention, in having kept the ingredients too long in the furnace.

The coarser the grain of the enamel, the Blue is more lively, and approaches to the violet, like the azure; but the best enamel is the finest sky-blue. The grain of this blue is so coarse, that it is not made use of without great difficulty, except in water colours, or put into starch, with which it mixes very well. They call it powder-blue, because, in order to make a fine ground for a Turkish Blue, it is thrown on a white, covered with oil, as thick as possible. This is immediately spread with a feather, or light brush; but care must be taken first to dry the Blue well on a paper before the fire. It must be laid on to a proper thickness, left there till the bottom is quite dry; by which means the white imbibes as much as it can; afterwards it must be shaken off; and what does not adhere to the white, is taken off by a feather or light brush. This is a lively colour, and lasts a long time, though exposed to the weather.

Enamel, which is so much the finer the paler it is, is made use of in water-colours and fresco, but not in oil, because it turns black, unless mixed with a great deal of white.

Ultramarine BLUE.—The basis of this colour is lapis lazuli, which makes it very dear; besides, the operations, necessary to procure it, are both tedious and expensive. See LAPIS *Lazuli* in the Dictionary.

In order to know whether the lapis lazuli be of a good quality, and proper to produce a fine Blue, put bits of it into a coal fire, and make them red-hot; if they do not split by the calcination, and, when they are taken and grown cold, lose nothing of the brightness of their colour, it is a proof of the goodness of the lapis. There is also another method of trying it: heat bits of the lapis, on a plate of iron red-hot and quench them in the strongest white-wine vinegar: if the lapis lazuli be really good, it will not lose its colour by this operation. After being assured of the goodness of the lapis, proceed thus to make the ultramarine Blue: heat it several times red-hot, and constantly quench it in water; or, which is better, in strong vinegar. The oftener this operation is repeated, the more easily it may be pulverized; this being done, pound the pieces of the lapis, levigate them on a porphyry stone, moistening them with water, vinegar, or spirits of wine; continue to levigate the whole, till it is reduced to an impalpable powder; then wash it in water, dry it, and put it up where it may be kept clean from dust. Then take clean linseed oil, yellow bee's-wax, black and yellow resin, of each one pound; mastic, two ounces; warm the linseed-oil gently; mix the other ingredients, by stirring the mixture well, as it boils over the fire, which should be for the space of half an hour; after which pass this mixture through a linen cloth, and let it stand to be cool. To eight ounces of this paste put four ounces of the lapis, prepared as above; knead the mass well for a considerable time; when the powder is well incorporated, pour warm water on the mass, and knead it again, which will become of a Blue colour; then let it stand still for some days, till the colour subsides to the bottom of the vessel; decant the water, and dry the powder, which is the ultramarine.

There are several methods of making this paste; but we shall content ourselves with giving only one more: take yellow resin, virgin's wax, turpentine, mastic, frankincense, and linseed-oil, of each two ounces; melt these together in a glazed dish, according to the directions given in the preceding operation. Kunckel recommends the following method of making this fine Blue, and assures us he has practised with success.

After having broke the lapis lazuli into pieces about the bigness of a pea, calcine it, quench it in the strongest vinegar, and reduce it into a very fine powder: then take virgin's wax, and black resin, of each half the weight of the powder of the lapis; melt them together in a glazed earthen pot; throw in the powder by degrees, mixing it carefully, and stirring the ingredients well; pour this mixture into clean water; let it continue there eight days; at the end of which time, fill a large glass vessel with water, as warm as the hand can bear; take a clean cloth, and knead the mass till the water is very much tinged; then take out the mass, and put it in another vessel of the same kind, knead it in like manner; and so continue the operation, till the colour be totally expressed from the mass. In three or four days the ultramarine will subside to the bottom of the vessels; but that contained in the first water, is by far the most valuable: thus the same mass will produce three or four sorts of ultramarine; but the finest is produced in very small quantities.

There are other methods of making ultramarine Blue; but, as the difference consists only in the pastes, with which the pulverized lapis is mixed, we thought it needless to mention them. It is known whether the ultramarine Blue be genuine by its weight; for the counterfeit is lighter; and, besides, it loses its colour before the fire.

BLUE *ashes* are very much used in water-colours; some are very lively; but in oil they grow dull and greenish; for they are something of the nature of verdigrise; and, the more oil you put to them, the colour becomes weaker. They are found in the form of a soft stone, in places where there are copper mines; and water only is made use of in levigating them, to reduce them to a fine powder. This kind of Blue ought to be used principally in water-colours, seen by candle-light, as in scene-painting; for, though a great deal of white be mixed with it, it appears very beautiful, notwithstanding it has a greenish cast, quite contrary to enamel, which looks bright by day, and dull by candle-light.

Some of these Blue ashes look as beautiful as ultramarine; but, by mixing them with a little oil, the difference is easily discovered; for they acquire no body of colour from the mixture, whereas the ultramarine becomes much higher on being mixed with oil.

BLUE. Mr. Boyle has given us the following method of making

ing tranſparent Blue, nearly equal to ultramarine. The principal ingredient of this beautiful colour is the cyanus, or Blue corn-bottle flower, which abounds almoſt in every corn-field, and may eaſily be had, during four of the ſummer-months; and may be gathered by children about the ſkirts or verges of corn-fields, without doing any damage to the corn.

This flower has two Blues in it, one of a pale colour in the larger outward leaves, and the other of a deeper Blue, that lies in the middle of the flower.

Both theſe will do, being ſeparated from the buttons or caſes, in which they grow; but the deep Blue leaves in the middle produce by much the beſt colour; which may be obſerved, by rubbing the leaves, while they are freſh, ſo hard upon a piece of good writing-paper, as to preſs out the juice, and it will yield an excellent colour, which will not fade, as has been found by the experience of two or three years.

This part of the flower is, therefore, the principal and what may be depended upon; which ſhould be picked from the reſt of the flower-leaves, the ſame day, if it may be, or the next; or at leaſt as ſoon as poſſibly can be.

A good quantity of theſe middle leaves being procured, preſs out what juice you can from them, and add to it a little alum, and you will have a laſting, tranſparent Blue, of as bright a ſtaining colour as can be deſired, ſcarce inferior in beauty to ultramarine, and is durable.

As for the outward flower-leaves which are paler, it is not certain that they will anſwer the end; but, upon ſome trials being made, that may alſo be known.

Let the flowers be gathered about the beginning of June, or in July or Auguſt; and ſome may be found in May; but the preparation of the colour, by picking out the middle deep Blue flower-leaves, and preſſing out the juice, muſt be performed with all the expedition poſſible, or they will loſe their perfections.

It is very probable, that, if the chives of theſe blue corn-bottle-flowers were cured in the ſame manner as ſaffron is, they would produce a much greater body of colour, from which a tincture might be drawn with more eaſe, than if preſſed raw or freſh from the field.

BLUE *of turnſole*. This blue is proper to paint on wood, and is made of the ſeed of the plant from which it has its name. They uſe four ounces of turnſole, which they boil, for an hour, in three pints of water. There is a famous Blue uſed in callico-printing, made from turnſole; for which, ſee CALICO-*Printing*.

BLUE.—To give the Blue to linens ſignifies, with the whitſters, or bleachers, to dip it into water, wherein they have diſſolved a little ſtarch with ſmalt, or Dutch azure. They commonly give two Blues to cambrics: the firſt is the bleaching Blue, given by the whitſters, and the other the ſtiffening Blue, given by the merchants.

BLUE is alſo uſed in the bleaching of ſilks, to give them that bluiſh caſt, which heightens their whiteneſs and luſtre. Silks are blued, by dipping them in a tub of cold water, in which a little ſoap and indigo have been diluted.

BLUE *Dyes* are rendered more lively and bright, if the ſtuff, after being dyed, and well waſhed, be dipped into lukewarm water; but it is much better done, by fulling the dyed ſtuff with melted ſoap, and waſhing it afterwards very clean.

Very deep Blues are brightened by boiling the ſtuffs once in clear water, and then putting them into a decoction of cochineal; but the azure and lighter Blues would loſe their colour, and become grey, if they were put into ſuch a decoction.

Stuffs, dyed Blue, paſs immediately from white to that colour, without any other preparations but what they have undergone at the fuller's mill.

BLUE *Japan*, is made in the following manner: take gum-water, what quantity you pleaſe, and white-lead, a ſufficient quantity; grind them well upon a porphyry. Then take iſing-glaſs ſize, what quantity you pleaſe, of the fineſt and beſt ſmalt a ſufficient quantity, mix them well; to which add of your white-lead, before ground, ſo much as may give it a ſufficient body; mix theſe together to the conſiſtence of paint.

With this mixture do over your work, and repeat this three or four times, till you ſee your Blue lies with a good fair body, letting it dry thoroughly between each time; if the Blue be too pale, put any more ſmalt into the ſize, without white-lead.

Then rub it very ſmooth, and go over it again with a ſtronger Blue; and, when it is thoroughly dry, waſh it twice over with the cleareſt iſing-glaſs-ſize alone; then cover it, and let it dry two days.

Then warm the piece gently before the fire, and, with a clean pencil, waſh your work over with the fineſt white varniſh, repeating it ſeven or eight times, and then let it dry two days as before; then repeat again your waſhes ſeven or eight times in the like manner.

Then let it ſtand to dry for a week, and then poliſh it as before directed; and, laſtly, to give it a poliſhed and gloſſed appearance, clear it up with lamp-black and oil.

You may make the colour either light or deep, according to your fancy; if it have but a ſmall proportion of the lead, it will be deep; but, if it has a larger, it will be lighter.

Alſo the ſize for laying Blues, white, or any other colour, ought not to be too ſtrong, rather weaker, and juſt ſufficient to bind the colours and make them ſtick on the work; for, if it be two ſtiff, it will be apt to crack and fly off; and the reaſon of waſhing twice, with clear ſize, is to keep the varniſh from ſinking into, or tarniſhing the colours.

A BLUE *colour for painting or ſtaining glaſs*.—Take, of fine white ſand, twelve ounces; zaffer and minium, of each three ounces; reduce them to a fine powder in a bell-metal mortar; then put this powder into a very ſtrong crucible, cover it and lute it well; and, being dry, calcine over a quick fire for an hour; then take out the matter, and pound it well in the mortar, as before; then, to ſixteen ounces of this powder, add fourteen ounces of nitre, powdered; mix them well together, and put them into the crucible again, cover and lute it, and calcine for two hours in a very ſtrong fire.

Take it out, and grind it as before; then add to it a ſixth part of nitre, and calcine again, as before, for three hours more; then take out the matter with an iron ſpatula red-hot, leſt it ſhould ſtick; it being very clammy, and not eaſily emptied.

Pruſſian BLUE, a very fine Blue colour, made in the following manner:

Take, of crude tartar and nitre, each four ounces, pulverize and mix them together; and, by decrepitation, bring them to a fixed ſalt; which, being powdered hot, add to it four ounces of thoroughly dried ox-blood, reduced to fine powder: calcine the mixture in a cloſe crucible, whereof it may fill two-thirds: then, lightly, grind the matter in a mortar, and throw it hot into two quarts of boiling water; boil them together for half an hour; afterwards ſtrain off the liquor, waſh the black remaining ſubſtance with freſh water, and ſtrain as before; continuing to do thus till the water poured off becomes inſipid: put the ſeveral liquors together, and evaporate them to two quarts: now diſſolve an ounce of green vitriol, firſt calcined to whiteneſs, in ſix ounces of rain-water, and filtre the ſolution: diſſolve alſo half a pound of crude alum, in two quarts of boiling water; and add this to the ſolution of vitriol, taken hot from the fire; pouring to them likewiſe the firſt lixivium, whilſt thoroughly hot, in a large veſſel: a great ebullition, and a green colour, will immediately enſue. Whilſt this ebullition continues, pour the mixture out of one veſſel into another, and afterwards let it reſt; then ſtrain the liquor through a linen cloth, and let the matter or pigment remain in the ſtrainer; from whence put it, with a wooden ſpatula, into a ſmall new pot; pour upon it two or three ounces of ſpirit of ſalt; and a beautiful Blue colour will immediately appear. Let the matter be now well ſtirred; then ſuffered to reſt for a night; afterwards thoroughly edulcorate it by repeated affuſions of rain water; allowing a proper time for the precipitate to ſubſide; and thus, at length, it will become exquiſitely Blue. Laſtly, let it drain upon a linen ſtrainer, and dry it gently; by all which means, it becomes the pigment that goes by the name of the Pruſſian Blue.

The ſucceſs of the experiment has a great dependence on the calcination. The crucible is firſt to be ſurrounded with coals, at ſome diſtance, that it may grow gradually hot, and the matter leiſurely flame and glow. Let this degree of heat be continued, till the flame and glowing decreaſe; then raiſe the fire again, that the matter may glow with an exceeding white heat, and but little flame appear above the crucible. The lixiviums ſhould be very hot, and mixed together with the utmoſt expedition.

The method of making this Pruſſian Blue in perfection has been held and purchaſed as a very valuable ſecret, both in England, Germany, and elſewhere; but it is now got into ſeveral hands. Its proceſs is very extraordinary, and could ſcarce be derived, a priori, from any reaſoning about the nature of colours. It is allowed an excellent Blue pigment, and by ſome preferred to ultramarine; though its durability might have been ſuſpected, from the vegetable and animal matters uſed in its preparation, if the colour did not ſeem wonderfully fixed by the operation.

Stone or powder BLUE, uſed in waſhing of linen, is the ſame with ſmalt, either in the lump or powdered.

When the ſmalt is taken from the pot, it is thrown into a large veſſel of cold water; this makes it more tractable, and eaſily powdered. Afterwards, when examined after cooling, it is found to be mixed with a greyiſh matter, reſembling aſhes, which they call eſchel. This grey matter is ſeparated by waſhing; and then the Blue ſubſtance is powdered and ſifted through fine ſieves, to bring it to what we call powder Blue. *Phil. Tranſ.* No. 396.

BLUING *of iron*, a method of beautifying that metal, ſometimes practiſed; as for mourning buckles, ſwords, and the like. The manner is thus: take a piece of grindſtone, or whetſtone, and rub hard on the work, to take off the black ſcurf from it; then heat it in the fire, and, as it grows hot, the colour changes by degrees, coming firſt to a light, then to a darker gold colour, and, laſtly, to a Blue. Sometimes alſo they grind indigo

indigo and sallad-oil together; and rub the mixture on the work with a woollen rag, while it is heating, leaving it to cool of itself. *New, Build. Dict.*

Among sculptors we also find mention of Bluing a figure of bronze, by which is meant the heating of it, to prepare it for the application of gold-leaf, because of the bluish cast it acquires in the operation. *Felib. Princ. Archit.*

BLUFF-*head*, or BLUFF-*headed*, in the sea language, is when a ship has but a small rake forward on, being built with her stern too streight up.

BOAR.—The wild Boar, among the huntsmen, has several names, according to its different ages; the first year, it is called a pig of the saunder; the second, it is called a hog; the third, a hog-steer; and the fourth, a Boar; when leaving the saunder, he is called a singler.

The Boar generally lives to twenty-five or thirty years, if he escapes accidents. The time of going to rut is in December, and lasts about three weeks. They feed on all sorts of fruits, and on the roots of many sorts of plants; the roots of fern, in particular, seem a great favourite with them: and, when they frequent places near the sea-coasts, they will descend to the shores, and demolish the tenderer shell-fish in very great numbers. Their general place of rest is among the thickest bushes that can be found; and they are easily put up out of them, but will stand the bay a long time. In April or May they sleep more sound than at any other time of the year; and this is therefore the successful time for taking them in the toils. When a Boar is rouzed out of the thicket, he always goes from it, if possible, the same way by which he came to it; and, when he is once up, he will never stop till he comes to some place of more security. If it happens, that a saunder of them are found together, when any one breaks away, the rest all follow the same way. When the Boar is hunted in the wood, where he was bred, he will scarce ever be brought to quit it; he will sometimes make towards the sides, to listen to the noise of the dogs; but retires into the middle again, and usually dies or escapes there. When it happens, that a Boar runs a-head, he will not be stopped, or put out of his way, by man or beast, so long as he has any strength left. He makes no doubles or crossings, when chaced; and, when killed, makes no noise, if an old Boar; the sows and pigs will squeak, when wounded.

The season for hunting the wild Boar begins in September, and ends in December, when they go to rut. If it be a large Boar, and one that has lain long at rest, he must be hunted with a great number of dogs, and those such as will keep close to him; and the huntsman, with his spear, should always be riding in among them, and charging the Boar as often as he can, to discourage him: such a Boar as this, with five or six couple of dogs, will run to the first convenient place of shelter, and there stand at bay, and make at them, as they attempt to come up with him.

There ought always to be relays also set of the best and staunchest hounds in the kennel; for, if they are of young eager dogs, they will be apt to seize him, and be killed or spoiled before the rest come up. The putting collars with bells about the dogs necks is a great security for them, for the Boar will not so soon strike at them, when they have these, but will rather run before them. The huntsmen generally kill the Boar with their swords or spears; but great caution is necessary in making the blows, for he is very apt to catch them upon his snout or tusks; and if wounded, and not killed, he will attack the huntsmen in the most furious manner. The places to give the wound with the spear, are either between the eyes, in the middle of the forehead, or in the shoulder; both these places make the wound mortal.

When this creature makes at the hunter, there is no avoiding him but by courage and address; if he flies for it, he is surely overtaken and killed; if the Boar comes straight up, he is to be received at the point of the spear; but, if he makes doublers and windings, he is to be watched very cautiously, for he will attempt getting hold of the spear in his mouth; and, if he does so, nothing can save the huntsman, but another person attacking him behind; he will, on this, attack the second person, and the first must then attack him again; two people will thus have enough to do with him; and, were it not for the forks of the Boar-spears, that make it impossible to press forward upon them, the huntsman, who gives the creature his death's wound, would seldom escape falling a sacrifice to his revenge for it.

The modern way of Boar-hunting is generally to dispatch the creature by all the huntsmen striking him at once; but the ancient Roman way was, for a person, on foot, armed with a spear, to keep the creature at bay; and, in this case, the Boar would run of himself upon the spear, to come at the huntsman, and push forward till the spear pierced him through.

The hinder claws of a Boar are called guards.

In the corn he is said to feed; in the meadows, or fallow fields, to rout, worm, or fern; in a close, to graze.

The Boar is farrowed with as many teeth as he will ever have, his teeth increasing only in bigness, not in number; among these there are four called tushes, or tusks, the two biggest of which do not hurt, when he strikes, but serve only to whet the other two lowest, with which the beast defends himself, and frequently kills, as being greater and longer than the rest. *Gent. Rur.* p. 1, 7, and 119. *Trev. Dict. Univ.* tom. 4.

It is very remarkable, that these creatures, in the West-Indies, are subject to the stone, in a very remarkable manner; few of them are absolutely free from it; yet scarce any have the stones of any considerable size. It is common to find a great number in the same bladder, and they are usually of about a scruple weight, and are angular, and that with great regularity, each having five angles. *Phil. Trans.* N°. 36.

Among the ancient Romans, Boar's flesh was a delicacy: a Boar, served up whole, was a dish of state. *Pitisc. Lex. Ant.* tom. 1. p. 123. voc. *Aper.*

The Boar was sometimes also the military ensign borne by the Roman armies, in lieu of the eagle. *Salmuth. ad Pancirol.* tit. 53. p. 278.

Among physicians, a Boar's bladder has been reputed a specific for the epilepsy. *Friend's Hist. of Phys.*

The tusk of the wild Boar still passes with some as of great efficacy in quinsies and pleurisies. *Alleyn's Dispens.*

BOB *of a pendulum*, the same with its ball, except that the former is used in speaking of short pendulums, the latter of long ones.

BO'BBING, or BOBBIN, in the manufactory of lace, a little piece of turned wood, whereon thread is wound, to be used in the weaving of bone-lace. *Hought. Collect.*

BO'CCA, in glass-making, the round hole in the working furnace, by which the metal is taken out of the great pots, and by which the pots are put into the furnaces. This is to be stopped with a cover made of earth and brick, and removeable at pleasure, to preserve the eyes of the workmen from the violence of the heat. *Neri's Art of Glass.*

BO'DY (*Dict.*)—The existence of Bodies is a thing incapable of being demonstrated: the order in which we arrive at the knowledge of their existence, seems to be this.—We first find we have sensations: then observe we have not those sensations, when we please: and thence conclude, we are not the absolute cause thereof, but that there is required some other cause for their production. Thus we begin to know, that we do not exist alone, but that there are several other things in the world together with us.—But this, Dr. Clarke owns, comes far short of a demonstration of the existence of a corporeal world: he adds, that all the proof we have of it is this, that God would not create us such, as that all judgments we make about things existing without us, must necessarily be false. If there be no external Bodies, it follows, that it is God who represents the appearance of Bodies to us; and that he does it in such a manner, as to deceive us.—Some think this has the force of a demonstration: "It is evident God cannot deceive us; it is evident he does deceive and delude us every moment, if there be no Bodies; it is evident, therefore, there must be Bodies.—But the minor of this argument may be denied without any suspicion of scepticism.

"In effect, were it possible for Bodies, i. e. solid, figured, &c. substances to exist without the mind corresponding to those ideas we have of external objects, yet how were it possible for us to know it? Either we must know it by sense, or reason: as for our senses, by them we have only the knowledge of our sensations or ideas: they do not inform us that things exist without the mind, or unperceived, like those which are perceived. It remains, therefore, that, if we have any knowledge at all of external things, it must be by reason inferring their existence from what is immediately perceived by sense. But how shall reason induce us to believe the existence of Bodies without the mind, when the patrons of matter themselves deny that there is any necessary connection betwixt them and our ideas? In effect, it is granted on all hands, and what happens in dreams, phrenzies, deliriums, extasies, &c. puts it beyond dispute, that we might be affected with all the ideas we have now, though there were no Bodies existing without, resembling them. Hence, it is evident, the supposition of external bodies is not necessary for the production of our ideas." *Berkeley's Princ. of Human Knowledge, p.* 59.

"Granting the materialists their external Bodies, they, by their own confession, are never the nearer knowing how our ideas are produced; since they own themselves unable to comprehend in what manner Body can act upon spirit, or how it is possible it should imprint any idea on the mind. Hence the production of ideas or sensations, in our minds, can be no reason why we should suppose Bodies or corporeal substances; since that is equally inexplicable with or without the supposition. In short, though there were external Bodies, it is impossible we should ever come to know it; and, if there were none, we should have the same cause to think there were that we now have." *Id. Ibid. p.* 60, 61.

"Try, whether you can conceive it possible for a sound, or figure, or motion, or colour, to exist without the mind, or unperceived.—If you can but conceive it possible for one extended, moveable substance, or, in general, for any one idea to exist otherwise, than in a mind perceiving it; I shall readily give up the cause." *Id. Ibid. p.* 63.

"It is worth while to reflect a little on the motives which induced

duced men to suppose the existence of material substance; that so, having observed the gradual ceasing and expiration of those motives, we may withdraw the assent grounded on them. First, therefore, it was thought that colour, figure, motion, and the rest of the sensible qualities did readily exist without the mind; and for this reason it seemed necessary to suppose some unthinking substratum or substance, wherein they did exist, since they could not be conceived to subsist by themselves. Afterwards, in process of time, men being convinced that colours, sounds, and the rest of the sensible secondary qualities had no existence without the mind; they stripped this substratum of these qualities, leaving only the primary ones, figure, motion, *&c.* which they still conceived to exist without the mind, and consequently to stand in need of a material support. But having shewn above, that none, even of these, can possibly exist otherwise than in a spirit, or mind, which perceives them, it follows, that we have no longer any reason to suppose the being of matter." *Id. Ibid. p.* 118, 119.

For the colours of Bodies: Sir Isaac Newton shews that Bodies appear of this or that colour, as they are disposed to reflect most copiously the rays of light originally endued with such colours. But the particular constitutions whereby they reflect some rays more copiously than others, remain yet to be discovered. However, some of the laws and circumstances thereof he delivers in the following propositions.

1. Those surfaces of transparent Bodies reflect the greatest quantity of light, which have the greatest refracting power, i. e. which intercede mediums, that differ most in their refractive densities: and, in the confines of equally refracting mediums, there is no reflection. 2. The least parts of almost all natural Bodies are in some measure transparent; and the opacity of those Bodies arises from the multitude of reflections caused in their internal parts, &c. 3. Between the parts of opake and coloured Bodies are many spaces, either empty, or replete with mediums of different densities; as water between the tinging corpuscles wherewith a liquor is impregnated, air between the aqueous globules that constitute clouds or mists: and even spaces void both of air and water, between the parts of hard Bodies, are not wholly void of all substance. 4. The parts of the Bodies and their interstices must be less than of some definite bigness, to render them opake and coloured. 5. The transparent parts of bodies, according to their several sizes, reflect rays of one colour, and transmit those of another, for the same reason that thin plates or bubbles do reflect or transmit those rays; and this appears to be the ground of all their colour. 6. The parts of Bodies, on which their colours depend, are denser than the medium which pervades their interstices. 7. The bigness of the component parts of natural Bodies may be conjectured from their colours, on this principle, that transparent corpuscles, of the same thickness and density with a plate, do exhibit the same colour. 8. The cause of reflection is on the impinging of light on the solid or impervious parts of Bodies, as commonly believed. 9. Bodies reflect and refract light, by one and the same power, variously exercised, in various circumstances.

BODY *of a coach*, a word used by joiners and coach-makers. With joiners, it signifies the bare cage or wooden frame of a coach, which the coach-makers are afterwards to line with leather on the outside, and with stuff on the inside: with coach-makers, it signifies the coach thus lined, before it be put on the wheels and on carriage.

BODY is likewise said of the materials which compose a stuff, or some other manufactured work. The Body of a woollen cloth; the Body of a serge; the Body of paper; the Body of velvet. In all those senses, traders say, the Body of this paper is too weak; the Body of this cloth, or of this serge, is good; the Body of this velvet is too loose, or too thin.

BODY *of reserve*, in the military art, a draught or detachment of a number of forces out of an army, who are to engage in case of necessity.

BOG (*Dict.*)—When the ground is drained, it is then, and no sooner, proper to begin the improvement of the soil. First, continue to plant as many potatoes in the dry land as in this season you can, for it is unexceptionable husbandry, equal to a summer-fallow.

Next, fallow all the rest of the ground this very season, and as soon in it as possible: for, besides the benefits of the fallow itself, by the plowings you may save a good deal of expence of levelling the ground, the plowed earth being easily thrown from the high places to the low; and the next plowings will always raise more earth on places where any was taken away. Plow not only all you can this year, but plow up the rest, every inch of it, that the plough can touch, as soon as by the draining it subsides, and becomes so firm, that it can bear the labouring cattle; that, without loss of time, you may get into the clover-husbandry: for ground, yielding grain and grass, from grass-seeds sown alternately, will very probably give more free profit than when it is constantly yielding either the one or the other, if the husbandry for both be equally good.

Where you cannot use the plough, employ the spade, and make your fallow compleat. Then consider which parts are fit for wheat, which for rye, and which want the assistance of dung for the one or for the other; and at any expence put your ground once in good heart, in confidence that, if it were, the method of husbandry I am to direct, will keep it in as good order, or make it better, with small expence of dung, in all time thereafter, though you keep it annually under the sock or scythe: for land in heart and strength is, I am much disposed to think, as much improved by some crops judiciously taken, as weak worn out land is by a summer fallow, at least such a sham fallow as is too often made, without any crop at all, unless it get dung.

When your ground is in all respects in good order, sow wheat on the strongest, and winter rye on the lighest parts of your soil, for the first crop of grain: for the second, sow pease; for they meliorate the ground, when they have proved a good crop, and you may expect it. Immediately after the pease are cut, and cut them high, plow down the stubble, without allowing cattle to eat it; and, after two spring-plowings, sow barley and the great clover, with only a small mixture of rye-grass; because clover is an enricher, and rye-grass impoverishes the ground, and fouls it. After the barley is cut, allow no cattle to enter your inclosure, except in very dry weather, lest they poatch the ground with their feet, and destroy the young clover. If you would keep them out in dry weather as well as wet, and allow the grass to rot among the stubble, by the dressing it would improve the ground, and keeping the roots of the clover-plants warm through winter, your advantage would be greater than though your cattle eat it.

Next year cut it twice, and put cattle upon the fog or eddish. The following year cut it only once, and, when it is beginning to flower, roll it down, plow it in, and harrow the ground, to close the seams, that the swaird may rot the better, and be ready for wheat or winter rye, upon another plowing. If it be not fit for these, it will answer well for barley: and sow pease for the subsequent crop; for two crops of white grain, running, impoverish ground, and make dung necessary. After the pease, sow barley, clover, and rye-grass, and manage as directed; and so go on with this course of husbandry without variation. If you do, I hope your ground will have little need of manure. But, if you find it necessary, and can get time, I advise you to sow it upon the young clover, among the barley stubble in the month of September: fifteen or twenty horse-loads may serve an acre; and will not only encourage the clover, but will incorporate itself with, and meliorate the earth, and so prepare it for succeeding crops; and, if you see cause to use it further, a gentle liming may be profitably and harmlessly repeated upon the young clover every fifth year: for the pease, clover, and tilling down of the clover as directed, will be sufficient dunging to make the lime work; and, it being thus laid upon the surface, there to lie, and incorporate itself with the ground, for the space of two years before it again suffer the plough, the hazard of subsiding below the reach of the plough, which lime is subject to, is prevented. Or you may sow soot, pigeon's dung, or ashes, in lesser quantities, in proportion to the hotness of their different natures, and the hotness or coldness of the quality of the different parts of your soil.

BOHEA, one of the kinds of tea brought from China. *See* TEA *in the Dictionary.*

BOILER.—The Boiler, in the alum works, is a vessel, in which the liquor is evaporated to a consistence, and is made of lead. The general size is about eight feet square, and they contain about twelve tons each.

They make them in this manner: first they lay long pieces of cast iron, twelve inches square, as long as the breadth of the Boiler, and about twelve inches distance from one another. These are placed twenty-four inches above the surface of the fire. On these massy bars of iron they lay, cross-wise, the common flat bars of iron, as close as they can lie together, and then make up the sides with brick work. In the middle of the bottom of this Boiler is laid a trough of lead, wherein they put at first about an hundred pounds weight of the rock. They use Newcastle coals in the boiling; and, if they find the liquor not strong enough, they add more of the rock at times, as it boils. *Phil. Trans.* N°. 142.

BOILERY, or Boilary, in the salt-works, denotes a salt-house, pit, or other place where salt is made.

BOILING (*Dict.*)—The phænomenon of Boiling may be thus accounted for: the minute particles of the fuel being detached from each other, and impelled in orbem, with a great velocity, (i. e. being converted into fire) pass the pores of the containing vessel, and mix with the liquid. By the resistance they here meet withal, their motion is destroyed; i. e. they communicate it wholly to the quiescent water; hence arises, at first, a small intestine motion in the water, and, from the continued action of the first cause, the effect is increased, and the motion of the water continually accelerated: so that the water, by degrees, becomes sensibly agitated. But now the particles of the fire, striking on those in the lowest surface of the water, will not only give them an impulse upwards, contrary to the laws of æquilibrium, but will likewise render them specifically lighter than before, so as to determine them

to

to ascend according to the laws of æquilibrium: and this, either by inflating them into little vesicles, by the attraction of the particles of water round them; or by breaking and separating the little spherules of water, and so increasing the ratio of their surface to their solid content. There will therefore be a constant flux of water from the bottom of the vessel to the top, and consequently a reciprocal flux from the top to the bottom: i. e. the upper and under water will change places; and hence we have the reason of that phænomenon, of the water's being hot at top sooner than at bottom.

Again, an intense heat will diminish the specific gravity of water, so as not only to make it mount in water, but also in air; whence arise the phænomena of vapour and smoak: though the air, inclosed in the interstices of the water, must be allowed a good share in this appearance: for that air, being dilated, and its spring strengthened by the action of the fire, breaks its prison, and ascends through the water into the air; carrying with it some of the contiguous spherules of water, so many as shall hang in its villi, or can adhere immediately to it.

The particles of air in the several interstices of the fluid mass thus expanded, and moving upwards, will meet and coalesce in their passage; by which means great quantities of the water will be heaved up, and let fall again alternately, as the air rises up, and again passes from the water: for the air, after coalition, though it may buoy up a great heap of water, by its elasticity while in the water, yet cannot carry it up together with itself into the atmosphere; since, when once got free from the upper surface of the water in the vessel, it will unbend itself in the atmosphere, and so its spring and force become just equal to that of the common unheated air. Add to this, that, were the spring and motion of the air sufficient to carry up the water with it, yet it would not have that effect, but the water would run off at the extremities of the air; all, except so much as should be either entangled in its villi, or immediately adhere to its surface by attraction: and hence we see the reason of the principal phænomenon of Boiling, viz. the fluctuating of the surface of the water.

Water, only lukewarm, boils very vehemently in the recipient of an air-pump, when the air is exhausted: the reason is obvious; for, the pressure of the atmosphere being taken off from its surface, the air included in the interstices of the water, dilated by a feeble heat, has spring enough to heave up the water, and disengage itself.—When the water ceases Boiling, it is again excited thereto by pouring cold water upon the recipient; and, when it boils the most vehemently, ceases by pouring on hot water; the reason whereof is scarce guessed at.

BOILING *of silk with soap*, is the first preparation in order to dying it. Thread is also boiled in a strong lixivium of ashes, to prepare it for dying.

BOILING, is also a method of trying or essaying the goodness or falseness of a colour or a dye, by Boiling the stuff in water with certain drugs, different according to the kind or quality of the colour to try whether or no it will discharge, and give a tincture to the water.

With this intention, red, crimson silks are boiled, with alum, and scarlets with soap, in a quantity equal to the weight of the silk.

BOLE, in natural history, a kind of earth constituting a distinct genus of fossils, and containing many different species, used principally in medicine. The characters of this genus are, that the earths of it are moderately coherent, ponderous, soft, not stiff or viscid, but in some degree ductile, while moist; composed of fine particles, smooth to the touch, easily breaking between the fingers, readily diffusible in water, and freely and easily subsiding from it. *Hill's Hist. Foss.*

BOLT *of a lock*, is the piece of iron, which, entering the staple, fastens the door; being the part which is moved backwards and forwards by turning the key.

Of these there are two sorts; one shuts of itself by only putting to the door, and is called a spring-Bolt; the other, which only moves when the key opens and shuts it, is called a dormant Bolt. *Moxon, Mech. Exer.*

BOLTERS, or BOULTERS, a kind of sieves for meal, having the bottoms made of woollen, hair, or even wire. *Hought. Collect.*

BOLTING, or BOULTING, the act of separating the flour from the bran, by means of a sieve or bolter.

BOLTING-*mill*, a versatile engine for sifting with more ease and expedition. The cloth round this is called the boulter.

BOMB (*Dict.*)—The shell being filled with gun-powder, the fusee is driven into the vent, or aperture, and fastened with a cement made of quick-lime, ashes, brick-dust, and steel filings, worked together in a glutinous water; or of four parts of pitch, two of colophony, one of turpentine, and one of wax. This tube is filled with a combustible matter, made of two ounces of nitre, one of sulphur, and three of gunpowder-dust, well rammed. To preserve the fusee, they pitch it over, but uncase it, when they put the Bomb into the mortar, and cover it with gunpowder-dust, which, having taken fire by the flash of the powder in the chamber of the mortar, burns all the time the Bomb is in the air; and, the composition in the fusee being spent, it fires the powder in the Bomb, which bursts with great force, blowing up whatever is about it; the great height the Bomb goes in the air, and the force with which it falls, makes it go deep into the earth.

Fig. 6. and 7. *plate* XXXV, in the Dictionary, may serve to give a more exact idea of the Bomb.

Fig. 6. exhibits a Bomb as it appears to the eye; *fig.* 7. its section or profile.

To prove whether it be staunch, after heating it red-hot on the coals, it is exposed to the air, so as it may cool gently; for, since fire dilates iron, if there be any hidden chinks or perforations, they will thus be opened and enlarged; and the rather, because of the spring of the included air continually acting from within. This done, the cavity of the globe is filled with hot water, and the aperture well stopped; and the outer surface washed with cold water and soap: so that, if there be the smallest leak, the air, rarified by the heat, will now perspire, and form bubbles on the surface.

If no defect be thus found in the globe, its cavity is filled with whole gunpowder; a little space, or liberty, is left, that when a fusee or wooden tube, of the figure of a truncated cone, is driven through the aperture, and fastened with a cement made of quick-lime, ashes, brick-dust, and steel filings, worked together in a glutinous water; or, of four parts of pitch, two of colophony, one of turpentine, and one of wax; the powder may not be bruised. This tube is filled with a combustible matter, made of two ounces of nitre, one of sulphur, and three of gunpowder-dust, well rammed.

This fusee, set on fire, burns slowly, till it reach the gunpowder, which goes off at once, bursting the shell to pieces with incredible violence; whence the use of Bombs in besieging towns.

Special care, however, must be taken, that the fusee be so proportioned, as that the gunpowder do not take fire before the shell arrives at the destined place; to prevent which, the fusee is frequently wound round with a wet clammy thread.

A Bomb, thrown out of a mortar eighteen inches one-third diameter, contains twelve pounds of powder in its chamber. Its thickness is two inches all over, except at the breech, where it is two inches five-sixths thick.

The aperture of the touch-hole on the outside should be one inch two-thirds; it contains forty-eight pounds of powder; and, before it is loaded, weighs somewhat above 490 pounds. It has two handles near the touch-hole.

A mortar-piece of twelve inches one-half diameter must have eighteen pounds of powder, for a proper charge; its Bomb must be eleven inches two-thirds diameter, the shell of one inch one-third thick all over, except at the breech, where it should be one inch two-thirds thick. The aperture of its touch-hole, on the outside, one inch one-third; it contains fifteen pounds of powder, and weighs, besides its load, about one hundred and thirty pounds.

Bombs thrown from mortars of twelve inches one-fourth, twelve inches one-third, and so on to twelve inches one-second diameter, observe the same proportion when the mortars are loaded with twelve and eight pounds of powder. The proportion is the same with regard to the Bomb of the common mortar, twelve inches diameter, whose charge is from five to six pounds of powder.

The Bomb thrown by a mortar eight inches one-third diameter, which carries one pound twelve ounces of powder, must be eight inches diameter, ten-twelfths of an inch thick, except at the breech, where it must be one inch one-twelfth thick. The aperture of its touch-hole one inch diameter on the outside; its charge is four pounds of powder, and, before loaded, weighs thirty-five pounds.

The Bomb, thrown by a mortar six inches one-fourth diameter, which carries one pound three-fourths of powder, or rather six inches diameter, five-sixths of an inch thick all over, except at the breech where it is eleven-twelfths of an inch, or an inch thick; its touch-hole is five-sixths of an inch on the outside, its charge three pounds and an half of powder, and weighs, before loaded, about twenty pounds. Those Bombs are commonly made without handles.

In some cases the quantity of powder may be lessened, as some Bombs are only designed to demolish buildings, without setting them on fire, or drop short of an army: for then the intention of the deed is only to make the Bomb burst: consequently there is no occasion for more powder than is necessary to produce this effect. According to M. Belidore's treatise on the Arms and Machines in use before the Invention of Gun-powder, three pounds of powder are sufficient to burst a Bomb of twelve inches diameter: and one pound of powder will have the same effect on a Bomb of eight, from whence we may conclude that eight or ten pounds of powder are sufficient to load a Bomb of eighteen inches diameter, instead of forty-eight pounds, the common charge.

BOMBA'RDING, the act of attacking a city or fortress, by throwing bombs into it, in order to ruin or set on fire the houses and magazines, and do other mischiefs.

BOMBA'ST, in matters of diction, a style too high and pompous for the subject and occasion; or words too big and sounding for the sense and meaning.

BOMBASI'NE, in commerce, a kind of silk-stuff manufactured

tured at Milan, and thence sent into France and other countries.

BOMBYLIUS, in natural history, the name of the common humble-bee, of which we have a great variety of species, many of them very beautiful.

BOMBYLOPHAGES, *Humble-bee-eater*, in natural history, the name of a fly of the tipula or father-long-legs kind, which is larger and stronger than the common kinds; and loving honey, without knowing how to extract it from the flowers, it seizes on the humble-bees, and destroys them, in order to get at the bag of honey which they contain. It is of a blackish colour in the body; its head is of a bright red, and the eyes very large and prominent. It is chiefly found in mountainous places.

BOND, a deed, by which a person obliges himself to perform certain acts; such as to pay a certain sum, or to answer for another, or to serve an apprenticeship with a master.

In England, a Bond is a deed or obligatory instrument in writing, whereby a person binds himself to another, to pay a sum of money, or do some other act, as to make a release, surrender an estate, for quiet enjoyment; to stand to an award, save harmless, perform a will, &c. It contains an obligation with a penalty annexed, and a condition which expressly mentions what money is to be paid, or what other things are to be perfomed, and the limited time for the performance thereof, for which the obligation is peremptorily binding.

It may be made upon parchment or paper, though it is usually on paper, and be either in the first or third person: and the condition may be either in the same deed or in another; and sometimes it is included within, and sometimes indorsed upon the obligation; but it is commonly at the foot of the obligation.

BONITO, in zoology, the name of a fish, of the tunny or trachurus kind, and called by some curvata pinima. It is a large sea fish, with a long, broad, and thick body: its eyes are large, as are also its gills, and the greater part of its body is free from scales.

BONNY, in minerology, a name given by our miners to a bed of ore found in many places in hills, not forming a vein, nor communicating with any other vein, nor terminating in strings, as the true veins do: it is a bed of ore of five or six fathom deep, and two, or somewhat less than that, in thickness, in the largest sort; but there are smaller, to those of a foot long. They have their trains of shoad-stones from them, and often deceive the miners, with the expectation of a rich lead vein. They differ from the squats only in being round beds of ore, whereas they are flat. *Philos. Transf.* N°. 69.

BOOK (*Dict.*)— *Cash* BOOK. This is the first and most important of the auxiliary books. It is so called, because it contains, in debtor and creditor, all the cash that comes in, or goes out, of a merchant's stock. The French call it, also, the Book of cash and of notes (livre de caisse & le bordereau) because, besides an account of the cash received and paid, it contains also notes of the several species of the money, or coin, that comes in, or goes out.

When a merchant does not keep that Book himself, he has it kept by a clerk or book-keeper, whom they stile cashier.

In this Book they write all the sums which are daily received and paid. The receipts on the debtor side, the persons of whom it was received, for what, and on whose account, and in what specie; and the payments on the creditor side, mentioning also the specie, the reason of the payment, to whom, and for whose account they are made.

The better to conceive the nature of this Book, it is to be observed, that in business, where cash happens to be an account which has numerous articles, it is convenient to keep a particular account thereof in a Book distinct from the ledger, and for this reason called the cash Book. This is formed in all respects like the cash accounts in the ledger, with a debtor and creditor side, in which all the cash received and given out is entered, either in a simple stile, or in that of the ledger: but, which way soever the narrative is made, every article must be duly entered on the opposite side of the corresponding account in the ledger, with a reference to the ledger account of cash: for such an account there must also be, into which the sums of the debtor and creditor sides of the particular account must be transferred once a week, or month, as is found most convenient. Thus in the cash Book, the sums being written down against them, say, transferred to the ledger, and mark the folio; and in the ledger account enter the sum, with the date of the transfer, debtor to, and creditor by sundry accounts, as per cash Book. The cash account in the ledger is necessary for the balance of the whole; and the conveniency of the separate account of all the particulars is, that we have them all together in one continued account: whereas, the rule of the ledger being not to allow more than one folio for one account, till that be filled up, the account might hereby lie in several folio's.

BOOK *of Debts or Payments*, is a Book in which is written down the day on which all the sums become due, either to be received or paid, by bills of exchange, notes of hand, merchandizes bought or sold, or otherwise; that, by comparing receipts and payments, one may in time provide the necessary funds for payments, by getting the bills, notes, &c. due, to be paid, or by taking other precautions.

BOOK *of Numero's, or Wares.* This Book is kept, in order to know easily all the merchandizes that are lodged in the warehouse, those that are taken out of it, and those that remain therein. Its form is commonly long and narrow, as of half a sheet of paper folded lengthways. Every page is ruled with transversal and parallel lines, about an inch distant from each other, with two other lines from top to bottom, the one next the margin, and the other next the sums.

Within the oblong squares formed by those lines, they write on the left page the volume of the merchandizes, that is to say, whether it be a bale, a chest, a ton, &c. their quality, as pepper, cloves, honey, soap, &c. and their quantity, or weight; and overagainst it, on the sides of the margin, the numbers which the bales, chests, &c. are marked with, as received into the warehouse.

On the right hand they follow the same method for the discharge of the merchandizes which are sent out of the warehouse, putting, overagainst each article on the left, first, in the margin, the date when the merchandizes were carried out of the warehouse; next, in the oblong squares, the names of those to whom they were sold or sent; and, finally, what quantity of each was sent out, in case the whole were not.

BOOK *of Invoices.* This Book is kept to preserve the journal from erasures, which are unavoidable in drawing up the accounts of invoices of the several merchandizes received, sent out, or sold, wherein one is obliged to enter very minute particulars; it is also designed to render those invoices easier to find, than they can be in the waste Book or journal. The invoices which must be entered here are those of the merchandizes bought, or sent away, for the account of another.

Those of merchandizes which one sells by commission.

Those of such merchandizes as are in partnership, of which others have the management.

Lastly, all the accounts which are not immediately closed, and which one would not open on the ledger.

This Book contains an account, or invoices, of all the goods which a person ships off, either for his own account, or for others in commission, according to the bills of lading, with the whole charges till on board, every invoice following after another, in order as they happen.

BOOK *of Accounts current.* This book is kept in the form of debtor and creditor, like the ledger; it serves to draw up the accounts which are to be sent to correspondents, in order to settle them in concert, before they are balanced in the ledger: it is properly a duplicate of the accounts current, which is kept to have recourse to occasionally.

BOOK *of Commissions, Orders, or Advice.* In this Book are entered all the commissions, orders, and advices, a person receives from his correspondents.

The margin of this Book ought to be very broad, that there be room to write overagainst each article the necessary notes, or remarks, concerning their execution. Some only cross each article, after it has been executed.

BOOK *of Acceptances, or of Draughts.* This Book is designed as a register of all the bills of exchange, which our correspondents advise us by their letters they have drawn upon us.

They are thus registered, to the end that, when the bills are presented, a merchant may know whether he has orders to accept them, or not.

BOOK *of Remittances.* In this Book are registered all the bills of exchange, as they are remitted by the correspondents, to require the payment thereof, when due.

BOOK *of Expences*, is a Book in which is set down a particular account of all the expences, either in their houshold, or for commercial affairs, which, at the end of every month, they cast up, and set down the sum total, either in the waste Book or in the journal, or rather in the cash Book.

This Book, being a separate account of all the expences of living, serves to keep both the profit and loss account, and also the cash Book, more distinct; the greater and more considerable articles are to be placed here particularly, but the several small articles of daily disbursements only in totals; though what denominations, and how general or particular the articles of this Book ought to be made, must be left to every one's choice: all that is necessary to observe here is, that the cash paid out on such accounts must be carefully entered here, and then once a week, or month, be transferred to the cash Book, and to the profit and loss account in the ledger, which is debtor to cash for it.

BOOK *of Copies of Letters.* This Book serves to keep copies of all the letters relating to business, which a merchant writes to his correspondents, that he may have recourse to them upon occasion, and know exactly what he wrote, and what orders he gave to them.

BOOK *of Postage*, is a small register, long and narrow, in which a merchant opens a particular account, to each of his correspondents, of the postage paid for them, which is afterwards cast up, when he thinks proper, and they are entered in the journal and ledger accordingly.

BOOK *of Vessels*, or the ship's Book. This Book is kept by the way

way of debtor and creditor, an account being opened for every ſhip. On the debtor's ſide is ſet down all the expences for victualling, fitting out, wages, &c. and, on the creditor's ſide, all that the ſhip has produced, either for freight or otherwiſe: the total of each is afterwards entered in the journal, making the veſſel debtor and creditor.

BOOK *of Workmen*. This Book is particularly uſed by thoſe traders who have manufactures, and is kept in debtor and creditor, there being an account for every workman that is employed. On the debtor ſide are ſet down the materials which are given to them for manufacturing, and, on the creditor's ſide, the work which they bring home, after it is manufactured.

Bank BOOK. Beſides all the above-mentioned Books, in thoſe cities where there is a public bank, as London, Venice, Hamburgh, Amſterdam, the merchants who keep caſh therein are obliged to keep a bank Book, which is likewiſe by way of debtor and creditor. Herein they ſet down all the ſums which they pay to, or receive from the bank; by which means they can eaſily know, in a very little time, how they ſtand with the bank, that is to ſay, how much caſh they have there.

The ſame may be obſerved with regard to thoſe merchants or other perſons, who keep their caſh at a banker's, which is much practiſed in London.

Month BOOK. This is alſo one of the auxiliary Books kept by ſome merchants. It is numbered in folio's, like the ledger, and divided into ſpaces, on the top of each of which are the names of the twelve months in the year, January, February, &c. allowing a whole folio, or what you pleaſe, to each month; and a different ſet of twelve ſpaces, for every different year. On the left hand page enter the payments to be made to you in that month, and, on the right hand page, the payments you are to make. Make a column likewiſe on the left hand of every page, in which write the day of payment, and after this the name of the debtor or creditor, and draw the ſum into the money columns. This does not differ much from the debt Book above-mentioned.

BOOK *of Rates*. This is a Book eſtabliſhed by parliament, ſhewing at what value goods that pay poundage, ſhall be reckoned at the cuſtom-houſe.

BOOK-*Keeper*, is, or ought to be, a perſon properly qualified to keep ſuch accounts as he is required to do, in a methodical and correct manner. The title is principally given to the chief clerks of merchants, and other eminent traders, and they generally keep the journal and ledger, all the other auxiliary Books being kept by the younger gentlemen clerks, or by others under the Book-keeper.

BOOM, in marine fortification, a chain, cable, &c. ſtretched a-croſs the mouth of harbour, or river, to hinder the enemy's ſhips from coming in.

To lay a BOOM.—Provide a great number of wooden battlings or ſpars of about 20, 30, or 40 feet long, more or leſs, and between 5 and 10 inches diameter: Then moor two boats, having a ſheet anchor in each, in the place near one ſide of the river where it is intended the Boom ſhall begin; bend two cables to theſe anchors, and round them place the ſpars or poles, frapping on each with rattling ſtuff, or better with four inch rope, until the Boom is 7, 8, 9, 10, or more feet diameter (according to the hands employed) the cables being in the middle; next, with iron hoops riveted together, worm the Boom, and drive through the hoop a nail into almoſt every ſpar: after having wrought a good birth from the anchors drop them, and continue the work till it is brought near the other edge of the river, and there drop two anchors more with the cables bent to them: then, over all, laſh the ſpare-yards and top-maſts with the top-chains, ſo far as the channel goes.

To that part of the cable in the channel that makes the Boom, let other cables be faſtened, and theſe bent to anchors laid down the ſtream; over the clinch of theſe cables let battlings or ſpars be wrought for near ten fathoms down the ſtream, that the enemy may not cut theſe cables: theſe will be ſerviceable when the enemy's ſhips come ſtemlings againſt it; for, if he force it in one place, the whole will not be opened by that fracture.

In places where wood is ſcarce, and proper ſpars' are not to to readily had; or in caſes where there is not time ſufficient be prepare them; it may be found ſufficient to laſh two cables together with old ropes, laſhing to them the oars, top-maſts, and yards, and worming the whole about with iron hoops; and let every part be well covered with pitch, and ſmall gravel ſtrewed on it while the pitch is warm. A Boom ſo prepared cannot be eaſily cut.

If on any particular occaſion it ſhould be found convenient and ſafe to open the paſſage, it may be done by tripping the anchors that are on one ſhore and thoſe down the ſtream, whereby the boats may ſwing down the ſtream upon the ebb, and upon the flood the Boom may be relaid, if the enemy appear in ſight, which he muſt do the firſt of the tide, for upon the ebb there is no danger of his coming; becauſe, if the wind be right in, a prudent enemy will not venture againſt the tide, a ſhip then making ſuch wild ſteerage; and, ſhould ſhe ground, ſhe muſt lie there till flood, which may prove fatal to her from the batteries aſhore; and againſt both wind and tide the enemy cannot come in. On the contrary, ſhould the Boom be carried up the flood, and the enemy appear at the beginning of the next flood, the Boom cannot be relayed till the ebb, and before that time the enemy may have accompliſhed his deſign.

If there be good ſtore of timber at hand, then a ſtockado may be made by driving ſeveral rows of piles in the channel before the Boom; or ſhould the depth of water be too great for this work, the trees may be uſefully applied, by making a raft to ride before the Boom by good anchors, obſerving that the cables are ſo made faſt, that the enemy cannot come to cut them: theſe rafts will be of ſingular uſe in putting the enemy into diſorder, by laying rubbiſh upon them to make fires of when the enemy appears, which will put him into ſome conſternation, and perhaps may cauſe him to come to an anchor, and loſe time or his tide; and this may be done each flood, obſerving not to have the ſmoak drive into the works, which might give the enemy too great an advantage.

To lay a BOOM *in a ſtreight Channel*.—Suppoſe the wind, for the moſt part, to blow obliquely acroſs the river or channel on the ſtarboard quarter, going up the river: now, if the Boom be laid directly thwart the channel, the ſhips coming with the tide or flood and a leading gale will run ſtemlings againſt it, and ſo hazard its breaking, by ſtriking with a force that comes direct; whereas, could the Boom be laid obliquely thwart the river, nearly in a line with the wind, ſo as the ſhip muſt take it with her bow, the blow would be diverted by the ſhip's caſting; becauſe, in this poſition the enemy cannot run ſtemlings againſt it; for in ſailing up the river, the ſhip muſt be near before the helm; and to bring her head to the Boom, the helm muſt be put down, and then it is ten to one whether ſhe come to ſo nicely as to take the Boom: not to mention the miſtakes, in a confuſion, committed by the man at the helm, and him upon the cond, nor the ſmoak; for excluſive of all theſe, it may be taken for granted, the ſhip would caſt alongſide the Boom: then the batteries at the end of the Boom on the larboard ſide would take fore and aft, while the oppoſite batteries on the ſtarboard ſide, playing on his broad-ſide with double round and partridge, muſt make a great ſlaughter among his men cutting at the Boom. And, ſhould he not ſwing alongſide the Boom, but lie ſtemling againſt it, then will the batteries on the ſtarboard ſide of the river, which are to be made above the weather end of the Boom, take him fore and aft, while thoſe on the larboard ſide, againſt the leeward end, play on his broad-ſide.

The ſhips within the Boom, which it is to protect, ſhould be moored in a kind of half-moon, with their broad-ſides flanking the Boom. And ſeveral old ſhips, or thoſe the leaſt uſeful, may be ſunk, as ſoon as a ſignal, ſignifying that the Boom will be cut, is made at one of the forts which defend it; for this purpoſe, thoſe ſhips ſhould have large ſcuttles ready cut: and for a further ſecurity, it would be very proper to have a ſmall Boom to divert the enemy, that the ſhips may be ſunk in the channel before he boards them.

As to the reſt of the ſhips, they are left to their commanders judgment; and, if there is no other remedy, the people may get aſhore to windward, if they can, and there make the beſt defence in their power againſt the enemy's boats and fire-ſhips. From duly weighing the whole of theſe circumſtances, it will be found that the chief ſtrength is in the Boom; therefore, if a double, triple, or fourfold Boom was laid, if the materials could be procured, and the value of the ſhipping and cargoes were of ſufficient importance, it would make the place ſo much the ſtronger, and the enterprize of the enemy more hazardous. In ſtretching theſe Booms, the trouble of many anchors may be ſpared, by making all the cables faſt to the firſt, and ſo letting them float in a bight, and by a ſmall anchor ride upon the ebb, to keep clear of one another.

To ſet up a BOOM *in the bend of a River*.—From the point formed by a bend, ſtretch two Booms acroſs the channel, one towards the middle of the oppoſite bight, and the other ſo much higher, as to lie directly thwart the channel, leaving a kind of angular ſpace between them.

Next the point from whence the two Booms ſtretch, erect a proper fort or battery to command the channel both below and above the bend.

On the other ſide the river, erect another fort or battery againſt the bight a little above the end of the lower Boom, and ſo diſpoſed, that its cannon may rake the channel coming up to the Boom, as well as command both the Booms.

A Boom being thus diſpoſed, it is a great chance if a ſhip anſwer her helm ſo timely in bearing or loofing about the point as to take it ſtemlings, and if ſhe ſtrike it with her bow, ſhe caſts; and in either caſe ſhe will be raked fore and aft by one fort, and have her broad-ſide battered by the other.

Let ſome old veſſels be fitted up for fire-ſhips, and placed between the two Booms; from each ſhip let two hauſers be carried aſhore, one on each ſide, and fixed to cramps ſet up; ſo that, as ſoon as paſſed the firſt Boom, theſe ſhips being ſet on fire, and heaved in their way, nothing can hinder the enemy's deſtruction: as ſoon as fire is ſet to the train, the boat may pull aſhore, under covert of the ſhip, without any apparent danger; for ſuch will be the enemy's conſternation,

that

that they will soon leave firing. The hausers may be fastened to cramps below the water line, that they be not burnt, nor in sight of the enemy to cut them. If the fire-ship is clapped aboard the weathermost ship, they may be both heaved together aboard another to leeward.

The ships to be defended may be moored in a half-moon, with their broad-sides so laid, as to batter the enemy when he attempts the Boom: and, if other works than what are here directed be judged necessary, they must be adapted to the situation of the place.

When no strong attacks by land are to be feared, the mooring of ships behind a point is best, on account of laying the Boom: now, should the Boom be forced, which must be upon the flood, a fire-ship, instead of falling on board a ship thus moored, will by the tide be hurried beyond her; and, if the place is any ways favourable to the ships moored there, it will be found impracticable to board a ship thus moored, with such a wind and tide as the enemy must have to break the Boom, unless he expose his boats in carrying out an anchor to warp over, which will be a very dangerous attempt, or some unaccountable accident intervene.

It may be objected, that ships thus moored cannot bring their broad-sides to bear upon the enemy when coming to force the Boom; and that they may be battered by the enemy over the point. To this it may be answered, first, it is no matter whether the broad-sides do or not, for perhaps it might be the best way to get the guns ashore, if there is time, to be there used; and to put the smaller sort only on the lower deck, and turned to flank the Boom. Secondly, the enemy will have but an uncomfortable birth in lying to batter the ships over the point, as they will have to deal with the fire from the fortifications on shore. What is here said, is only to be understood when five or six ships are to be defended; for the wake of a point could not hold any considerable fleet.

BORA'GO, *Borrage*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, of a rotated form; the cup is divided into several segments, and from it there arises a pistil, which is fixed in the manner of a nail to the middle part of the flower, and surrounded with four embryo's, which are afterwards changed into as many seeds. These are of the shape of the head of a snake, and are contained in the cups, which become much inlarged, till they are perfectly ripe.

The common borrage has long held its rank as a cordial of the first class, though perhaps it would not be easy to say on what foundation. Its flowers are of the number of the four cordial ones of the shops, and it has been recommended as a medicine of great efficacy in malignant and pestilential fevers, and against the bites of poisonous animals.

BO'RAK, among Mahometans, a fabulous animal, supposed to be of a middle kind, between an ass and a mule, whereon their prophet was carried in his nocturnal flight from Jerusalem into the heavens.

BO'RAX (*Dict.*)—*Method of refining* BORAX. It is no wonder that all Europe did not fall into the way of purifying Borax for medicinal and other uses at once, since there is no salt in the world in which the process for doing that is so troublesome. The common methods will indeed dissolve it in water, and evaporation will separate it again, but that not in a form fit for sale, or in large and fair crystals. This is only to be done by a process, like that by which it is originally prepared from the water of the mines. When it has been dissolved, and the solution properly evaporated, it is not to be exposed to the cold air in a still place as other salts are in order to the crystalling, but it is to be kept in the hot vessels, and covered close down in them, and the fire is to be continued under them, though only in a gentle degree. By this means we are able to imitate here the sun's heat in the countries where it is produced, and the clay cover, which the people who work it, extend over it, at the time when it is to crystallize; and the effect is the same: the salt shoots into large crystals about the sides of the vessel, and about brass wires, let down from the lid into the liquor.

The Borax is by this means purified from a great deal of its fatty matter, the separating of which renders the operation very offensive, but it is not yet pure; it is yellow and foul even in those crystals. These are to be separated from the liquor, and again dissolved in a lixivium of pot-ashes and lime; and then, on being set to shoot again in the same manner as before, it forms itself into those pure and pellucid crystals which we meet with in the shops.

They, when perfectly formed, as they seldom are indeed, except by a very nicely managed evaporation, are of an octohædral figure, and very pellucid. They are of a very rude and irregular shape, as they generally shoot, and, the process of recrystallizing them not being easily hit upon by those who had not been informed of the manner of it, many have sought a long time in vain to find what was the true figure of the salt.

Borax is of great use in the collecting the particles of any metal over the fire, and running them into a mass; and this, with very little diminution of their weight. Dirt or ashes, though in ever so small a quantity, will certainly hinder some small particles of gold or silver from running together into a mass over the fire; but, if they are so disposed by a very strong fire as to meet into a regulus, a great part of the metal will always adhere to the dirt that is thrown away. The less perfect metals not only suffer the above-mentioned accidents, but, their surfaces being greatly increased, copper and iron turn intirely into scoriæ, and are destroyed, and lead and tin are so in great part. It is therefore very detrimental when these baser metals are mixed in any, even in ever so small a quantity, with gold or silver; for, in the melting, there come upon the surfaces light scoriæ, in which part of the gold or silver is retained, as in the pores of a spunge, and prevented from running into a regulus.

To remedy this mischief, Borax is added, because, as it helps the melting of metals and of all bodies by fire, its bringing the whole mass into a quick fusion gives the metals an opportunity to sink together in a mass to the bottom, and vitrifies the lightest scoriæ, throwing them off to the surface; and this use of this salt is not restrained to gold and silver, but takes place as well in regard to iron as copper.

This salt also causes metals to melt in a much less fire than they otherwise would, and is of very singular use in preserving the less perfect metals while in fusion. It flows over them and covers their surface, while tortured in the fire, as if it were with a kind of very thin glass, which defends them against the combined force of the fire and air, so destructive to the imperfect metals.

The assayers have a custom of rubbing with Borax the insides of vessels, in which the more precious metals are to be melted, which always fills up the small cavities in their sides, that might otherwise take in a part of the metals. When gold is melted with Borax alone, it makes it pale; but this is obviated by adding a small quantity of nitre, or of sal armoniac. Care must be taken, however, not to add both these salts together, because they would cause a detonation.

The above-mentioned use of Borax has caused it to be reckoned, by some writers, among the reducing bodies; that is, such bodies as restore metals, however destroyed, to their pristine form: but this is an error; for Borax does not reduce the destroyed metals, but only the scattered particles of them, while they yet retain their true metallic form. *Cramer's Art of Assaying*.

BORDA'T, a small narrow stuff, which is manufactured in some parts of Egypt, particularly at Cairo, at Alexandria, and at Damieta.

The Bordats of Cairo are sold for about 18 medimns per piece, those of Alexandria for about 24, and those of Damieta for 25 or 26.

BO'RDERS, (*Dict.*)—Borders are of four sorts: those are the most common, that are continued about parterres without any interruption; and wrought with a gentle rising in the middle, like an ass's back, and planted with low shrubs and flowers.

The second sort of Borders are such as are cut into compartments, at convenient distances, by small passages, and being also raised in the middle, as before-mentioned, are likewise set off with shrubs.

The third sort are such as are laid even and flat, without flowers, having only a verge of grass in the middle; being edged with two small paths, raked smooth, and sanded. These are sometimes garnished with flowering shrubs, and flowers of large growth; or with vases and flower-pots placed regularly along the middle of the verge of grass.

The fourth sort are quite plain, and are only sanded, as in the parterres of orangery; and are filled with cases ranged in a regular order along those Borders, which are edged with box on the sides next to the walks; and on the other, with verges and grass-work next the parterre. Sometimes a yew is planted between each case, which makes the Border appear richer, and the parterres handsomer, during the winter season.

Borders are either made straight, circular, or in cants; and are turned into knots, scrolls, voluces, and other compartments.

Florists also make Borders either long walks, or detached; and in these they raise their finest and choicest flowers. These are frequently encompassed with Border-boards painted green, which makes them look exceeding neat.

But, in large parterres, this is not to be expected; since, if they be stocked with flowers succeeding one another in their several seasons, it is sufficient, so that nothing appears bare and naked.

It is usual to discontinue the Borders at the ends next to the house, that the embroidery and rise of the parterre may not be hidden by the shrubs and flowering plants, and that the design may be better judged of.

And sometimes there are branched out of it foliage, palm-leaves, and shells sporting among the sands.

Since the modern taste of gardening has been introduced into England, all the French taste of parterres, scroll Borders, and fret work in box, has been justly banished our gardens; therefore I have only mentioned them here, to expose the taste of those architect-gardeners, who have no idea of the noble

simplicity

fimplicity of an open lawn of grafs, properly bounded by plantations; but, inftead of this, divide that part of the garden, near the houfe, into various forms of Borders edged with box, and fand or gravel-walks leading about them; by which the ground is cut into many angles, fcrolls, &c. which is very hurtful to the eye of a judicious perfon: therefore, where flowers are defired, there may be Borders continued round the extent of the lawn, immediately before the plantations of fhrubs; which, if properly planted with hardy flowers to fucceed each other, will afford a much more pleafing profpect than the ftiff Borders made in fcrolls and compartments, after the French manner, can poffibly do.

Thefe Borders may be made fix or eight feet wide, in proportion to the extent of the garden, and fize of the lawn: for a fmall lawn fhould not have very broad Borders; nor ought a large lawn to be bounded by fmall Borders; fo that a due proportion fhould be always obferved in the laying out of gardens. *Miller's Gard. Dict.*

BO'RING, the act of perforating a folid body, or making a hole throughout its whole length or thicknefs.

Boring of mafts, from top to bottom, is propofed by Dr. Hook as a means of ftrengthening and preferving them; as this would make them dry and harden the better, and prevent their cleaving and cracking: for want hereof, the outfide drying, when the infide does not, the former fhrinks fafter than the latter can keep it company; the confequence of which is eafy to forefee. *Hought. Collect.*

Boring *of Water-pipes*. The method of Boring alder-poles for water-pipes is thus: being furnifhed with poles of a fit fize, horfes, or truffels, are procured of a due height, both to lay the poles, and reft the augre on in Boring; they alfo fet up a lath, whereby to turn the leffer ends of the poles, and adapt them to the cavities of the greater ends of others, in order to make the joint fhut each pair of poles together. The outer or concave part is called the female, and the other, or inner, the male part of the joint. In turning the male part, they make a channel or fmall groove in it, at a proper diftance from the end; and, in the female part, bore a fmall hole to fit over this channel; they then bore through their poles, fticking up great nails at each end, to guide them right; but they commonly bore a pole at both ends; fo that, if it be crooked one way, they can neverthelefs bore it through and not fpoil it. *Neve, Build. Dict.*

A Machine for Boring *Pipes.—Plate* V, *fig.* 9. is a perfpective view of this machine. A, is the water-wheel, on the axis of which there is another wheel B, of a fmaller diameter. This turns the upright wheel or lantern C, on the axis of which is a cog-wheel D, which turns two fmall wheels E and F; the firft E, which is vertical, turns the augre; and the fecond F, which is horizontal, caufes the carriage to advance, by the help of the two arms H and I. The firft, H, draws the wheel G, and the other, I, pufhes it in a contrary direction.

As the augre muft be near twelve feet long, the weight of it muft be fupported, to hinder it from bending, that it may pierce the wood uniformly. L, L, reprefent two fupporters. Thefe fupporters, in order to give no obftruction to the augre, may be made as follows: C, C, *fig.* 7, 8, are two pieces, which muft be faftened to fome of the timber work of the mill; thefe encompafs a fmall plank hung by a cord, at the bottom of which are fixed the pieces *b*, *b*, with joints at the places *e*, *e*; and, that they may not move out of the vertical plane, they are accompanied with tenons *f*, *f*, made in the quarter of a joined circle of the thicknefs of the plank *a*, that they may work freely: on the fide of one of thefe pieces is fixed a fpring *g*, in order to hinder them from uniting, by forceing them to enter below into a mortife made about the thicknefs of the end of a rule; then thefe two pieces make but one bored with a hole, through which the augre is to pafs. See *fig.* 7.

Fig. 6. fhews the cord which is faftened to the plank *a*, and goes on the two pullies *b*, *b*; at the other end of this cord there is hung a weight *e*, refting on the piece N, which is fupported at one end by the piece O, and fixed at the other by a joint to the lever K, which has its center of motion fixed to a piece of wood H; fo that, leaning againft the extremity M of the leaver, the piece N quits the fupport O, the weight finks down, and draws up the piece *a*; then the fides *b*, *b*, *fig.* 8. quit the mortife *d*, and the fpring *g* feparates them; fo that the fupporter does not hinder in the leaft the motion of the augre. *Belidor's Hydraulics.*

Boring in farriery, an operation fometimes practifed for the cure of horfes whofe fhoulders are wrenched. The method is thus: they cut a hole in the fkin through the middle of the fhoulder, and, with the fhank of a tobacco-pipe, blow it as a butcher does a fhoulder of veal; then they run a cold flat iron, like a horfeman's fword-blade, eight or ten inches up, between the fhoulder-blade and the ribs, which they call Boring; after that, they burn him round his fhoulder with a hot iron. *Burd. Gent. Farr.*

Boring, among miners: fee MINEROLOGY in the Dictionary.

BORSE'LLA, in the glafs-works, an inftrument wherewith they extend or contract the glafs at pleafure.

BOSQUE'TS *, (*Dict.*)—Bofquets are groves, or fmall plantations of trees.

* The word is derived from *Bofchetto*, Italian, a diminutive of *Bofco*, a wood or grove.

Thefe fmall compartments in gardens, are formed of trees, fhrubs, or tall large-growing plants, planted in quarters; and are either difpofed regularly in rows, or in a more wild and accidental manner, according to the fancy of the owner: thefe quarters are commonly furrounded with ever-green hedges, and the entrances formed into regular porticoes with yews, which are by far the beft and moft proper trees for this purpofe. In the infide of thefe quarters may be made fome walks, either ftraight or winding; which, if the quarters are large, fhould be fix or eight feet broad, and may be laid with turf, and kept well mowed and rolled, which will render the walking much eafier and pleafanter than if the walks are only the common earth, which in fmaller quarters cannot be otherwife; for, if the trees are clofe, and the walks narrow, fo as to be fhaded and over-hung by the trees, the grafs will not grow.

Thefe quarters may be alfo furrounded with hedges of lime, elm, horn-beam, or Beach; which fhould be kept well fheared, and not fuffered to rife too high; that the heads of the trees may be fully feen over them, and the ftems only hid from the fight, when in the walks on the outfide of the quarters.

In planting of thefe Bofquets you fhould obferve to mix the trees, which produce their leaves of different fhapes, and various fhades of green, and hoary or mealy leaves, fo as to afford an agreeable profpect: befides, there is a great variety of different fruits, which thefe trees produce in autumn; which, although of little or no ufe, that we know of, yet have a very good effect, in affording an agreeable variety for fome time after the leaves are gone; as the euonymus, or fpindle-tree, the opulus, or marfh-elder, the cock-fpur-hawthorn, with many other forts, too numerous to mention in this place. But I would advife never to mix ever-greens with deciduous trees; for, befides the ill effect it hath to the fight, efpecially in winter, they feldom thrive well together; fo that thofe quarters where you intend to have ever-greens, fhould be wholly planted therewith; and in the other parts mix as many varieties of different trees, which caft their leaves, as you can conveniently; and alfo plant fome of the largeft-growing flowers (efpecially near the outfide of the quarters) which will add greatly to the variety, if they have but air enough to grow; but if any of the ever-green trees are mixed with the deciduous, it fhould be only to border the wood.

Thefe Bofquets are proper only for fpacious gardens, being expenfive in their firft making, as alfo in keeping. *Miller's Gard. Dict.*

BOTA'LE *Foramen*, in anatomy, an aperture in the heart of a fœtus, whereby the blood is enabled to circulate, with going into the lungs, or the left ventricle of the heart.

BO'TANIST, a perfon who underftands the nature, hiftory, and diftinction of vegetables, on fettled and certain principles, and can call every plant by a diftinct, proper, and intelligible name. *Linnæi Fundam. Botan.*

BOTT, among bone-lace weavers, a kind of round cufhion of light matter placed on the knee, whereon they work or weave their lace with bobbins, &c. See LACE.

Botts, in zoology, a fpecies of worms which infeft horfes and other cattle; having large heads and little tails; generally found in the ftraight gut, near the fundament. *Ruft. Dict. Skin. Etym.*

The name is alfo given to a fort of grubs which deftroy the grafs in bowling-greens, &c.

BO'TTLING, or Botteling, the operation of putting up liquors in bottles corked, to keep, ripen, and improve.

Cyder requires fpecial precautions in the Bottling, being more apt to fly, and burft the bottle, than other liquors. The beft way to fecure them, is to have the liquor thoroughly fine before it be bottled. For want of this, fome leave the bottles open a while, or open them after two or three days Bottling, to give them vent. If one bottle break through fermentation, it is beft to give them all vent, and cork them up again. Mean cyder is apter to break the bottles than rich. Some foak the corks in fcalding water, to render them more pliant and ferviceable.

Another obfervation is, to lay the bottles fo as that the liquor may always keep the cork wet and fwelled. Something alfo depends on the place where the bottles are fet, which ought to be fuch as expofes them as little as poffible to the alterations and impreffions of the air: the ground is better for this purpofe than a frame, fand better than the bare ground, and a running water, or a fpring often changed, beft of all.

To haften the ripening of bottled liquors, they are fometimes fet in a warm place, or even expofed to the fun, when a few days will bring them to maturity. *Hought. Collect.*

BO'TTOM-*Stone*, a kind of iron-ftone, or ore, in the Staffordfhire mines.

BO'UGIE, in furgery, a kind of large medicated tent, worn in the urethra, for the cure of a gonorrhœa, &c.

The properties requisite in the Bougie, are a sufficient degree of firmness, that it may be introduced with some force; a suppleness and tenacity, that it may conform to the motions of the body without breaking; a lenient suppurative disposition to bring on a discharge without pain; and, lastly, a smoothness of surface, that it may not only be introduced with more ease, but that it may lie easy in the passage till it begins to dissolve.

The best basis of such a Bougie, in my opinion, is diachylon simplex, which may be rendered efficacious, by a great variety of mixtures; but though an addition of certain gums, or of the mucilage plaister, will alone answer the purpose in some disorders of the urethra; yet, as a long use of mercurial applications is almost a specific for venereal ulcers, and has also a powerful effect on every other species of stubborn ulcers, I have chiefly confined my experiments to preparations of mercury.

I have often used white precipitate, red precipitate, calomel, and æthiops mineralis; and, though the precipitates, at least the red precipitate, are properly escharotic powders, yet, when they are mingled in plaister, they lose their corrosive property, in the same manner as elixir of vitriol does by dilution; and, on this account, may be employed with the utmost innocence: however, it may be proper to observe, that the red precipitate ought to be finely levigated, for levigation abates the escharotic quality of it, even when in powder; and in this state I have often carried the proportion of powder from one drachm to three drachms for every ounce of plaister, without producing any mischief, or without discovering any notable difference of operation in the Bougies, so effectually sheathed are the caustical qualities of the mercury by the plaister they are mixed with.

But, though these remedies often work a cure in some stubborn diseases of the urethra, yet a very large quantity of crude quicksilver, added to the plaister, seems to be better calculated for the purpose; as quicksilver, mingled with axungia or plaister, is not only an excellent topical medicine for ulcers, but has also a peculiar discutient quality, which it exerts, even when there is no rupture of the vessels. This operation of the quicksilver, therefore, seems to give it greatly the preference to the other compositions, because it not only acts as favourably upon the surface of the ulcers, but also exerts its other virtues on the fungous or indurated parts of the urethra.

Perhaps we shall discover, hereafter, the proper proportion of quicksilver to the plaister: at present I have allotted half an ounce to every ounce of plaister, which renders it excessively more mercurial than any plaister now in use. The diachylon must be made with oil, and a little pix Burgundica added to it, that it may be sufficiently tenacious: to every ounce of plaister I have usually flung in two drachms of crude antimony, finely levigated, from an opinion that it greatly conduces to the smoothness and good consistence of the Bougie; besides, that it may, possibly, have other virtues. Upon this plan the prescription stands thus:

Diach. cum pice Burgund. ℥ii.
Argent. viv. ℥i.
Antim. crud. pulv. ℥ſs.

The quicksilver, whether it be divided in balsams, sulphur, or honey, must not be put into the plaister till the moment before the Bougies are made; nor must the plaister be boiling-hot at that time, lest, by the heat, the quicksilver should separate from the body it is divided in, and fall down to the bottom in form of globules. When the quicksilver is mingled with the plaister moderately hot, the slips of fine rag must lie ready to dip in the composition. These slips must be of different lengths, from six to nine or ten inches, and about three inches broad; roll them up loosly, and, taking hold of one extremity with the left-hand, let it fall in upon the surface of the plaister, and then draw it out gently; as it is drawn out, it will unrol, and take up a quantity of plaister upon its surface, equal to the thickness of a silver groat; though, to facilitate the unrolling of the rag, it will be proper to assist its motion with the end of a spatula, or any such instrument: the plaister must, however, be so hot, as to soak through and discolour the rag, otherwise it will not make so good a Bougie. Several slips of rags may be dipped in the same composition, one after another, before it becomes too cold; but, to do this more handily, the ladle in which it is melted ought to be broad and flat at the bottom; and the plaister must be kept stirring, that it may preserve an equal consistence.

If the cloth be exactly three inches broad, it will make six Bougies of a moderate size; but their size may be increased or diminished according to the occasion. It is generally adviseable, that the Bougie should be smaller at the end which is introduced through the strictures, than at that which is left out at the penis; for that purpose, many cut off a part of the oblong square I have described, in such a manner as to reduce it almost into the shape of a long right-angled triangle: but, as this way of cutting it weakens the Bougie exceedingly, and it is not at all necessary the Bougie should be taper from one extremity to the other, it is much better to cut off a little slope of about an inch and an half long, from the end that is to be passed into the urethra, which will lessen it where it is requisite to be small, and leave it strong in the other parts where the diminution is not necessary.

The plaister taken up by the cloth, when dipped, will have little bubbles upon its surface, and not be so smooth, as if it had been spread; therefore an iron-spatula, a little warmed, may be passed over the plaister before it be cut into Bougies, which will render it more compact and even. It is a much more exact and speedy method to cut the Bougies off with a knife and ruler, than with sciffars. When they are rolled up, it must be with that side outwards which is covered with plaister; and they must first be rolled up with the finger and thumb as close as possible, before they are rolled upon a board or marble; for, upon this circumstance, the neatness of the Bougie depends: I think too they may be rolled up more neatly by the hand than any kind of machine. Holding the plaister a little before the fire, if it be in winter, will facilitate the rolling, unless it has been just dipped, when it is not necessary. *Sharp's Critical Enquiry.*

BOU'NTY, in commerce, denotes a premium paid by the government to the exporters of certain commodities, on their taking oath, or, in some cases, giving bond, not to re-land the same in England.

Queen Anne's BOUNTY, for augmenting poor livings under 80l. per annum, consists of the produce of the first-fruits and tenths, after the charges and pensions, payable out of the same, are defrayed. A corporation for management of the same was settled, &c. in 1704.

BOURDONNE', in heraldry, is understood of a cross, whose extremities are turned round like the ends of a pilgrim's staff; more frequently called pommeté, globatus.

BOW, in music, denotes a machine that serves to play, or give the sound to viols, violins, and instruments of that kind, by drawing it gently over the strings thereof.

The Bow consists of three parts; the first is the stick, or wood, to which the hair is fastened; the second is composed of about eighty or an hundred horse hairs, or filaments of silk; the third is the nut, a sort of half-wheel, which serves to keep the hairs in due degree of tension. *Playf. Treat. of Music.*

Bow, in trade and manufactures, denotes a flexible instrument, consisting of a piece of steel or iron; to the two ends of which is fastened a cat-gut, used by smiths, watchmakers, and other artificers, for piercing and turning of divers sorts of works.

Bow-*Dye*, a new kind of scarlet-red, superior to madder, but inferior to the true scarlet grain for fixedness and duration.

BO'WER, in gardening, a shady place, under covert of trees, or branches interwoven.

A Bower differs from an arbour, in that the latter is always built long and arched; but a Bower is either round or square at the bottom, and made with a sort of dome or ceiling at the top.

BOX *of a watch*, the outer case or cover.

Box *of a wheel*, the aperture wherein the axis turns.

Box *of a plough*, a name by which the farmers call that cross piece in the head of the plough, through which the spindle of the two wheels passes, and to which are fastened the two crow-staves, serving, by their holes, to regulate the height of the beam, the tow-chain below, the stake which supports the bridle-chain above, and the gallows behind, into which are fixed the wilds with the crooks of iron, for the drawing the whole plough along. This part of the plough is placed crosswise with the beam, and stands much below it, and not far from the ground. *Tull's Husbandry.*

Box-*Tree*, *buxus*, in botany, a genus of trees, whose characters are: the leaves are pennated, and ever-green: it hath male flowers, which are produced at remote distances from the fruit on the same tree: the fruit is shaped like a pottage-pot inverted, and is divided into three cells, containing two seeds in each, which, when ripe, are cast forth by the elasticity of the vessels.

Botanists enumerate seven species of this tree, viz. 1. The Box-tree. 2. The narrow-leaved Box-tree. 3. Striped Box. 4. The gold-edged Box-tree. 5. The dwarf Box. 6. The dwarf striped Box. 7. The silver-edged Box.

The first and second sorts grow in great plenty upon Box-hill, near Darking in Surry, where were formerly large trees of these kinds; but of late they have been pretty much destroyed; yet there are great numbers of these trees remaining, which are of a considerable bigness. The wood of this tree is very useful for turners, engravers, and mathematical-instrument-makers; the wood being so hard, close, and ponderous, as to sink in water; which renders it very valuable for divers utensils.

All the varieties of the trees, or large Box, are proper to intermix in clumps of ever-greens, &c. where they add to the variety of such plantations: these may be propagated by planting the cuttings in autumn in a shady border, observing to keep them watered until they have taken root; when they may be transplanted into nurseries, till they are fit for the purposes intended. The best season for removing these trees is in October; though, indeed, if care be used to take them up with a good ball of earth, they may be transplanted almost at any time, except in the summer: these trees are a very great ornament to cold and barren soils, where few other things will

will grow, they may also be propagated by laying down the branches, or from seeds: the last being the best method to have them grow to be large, the seeds must be sown, soon after they are ripe, in a shady border, which must be duly watered in dry weather.

The dwarf kind of Box is used for bordering of flower-beds, or borders; for which purpose it far exceeds any other plant, it being subject to no injuries from cold or heat, and is of a long duration; is very easily kept handsome, and, by the firmness of its rooting, keeps the mould in the borders from washing into the gravel-walks, more effectually than any plant whatever: this is increased by parting the roots, or planting the slips; but, as it makes so great an increase of itself, and so easily parts, it is hardly worth while to plant the slips that have no roots; but it is now become so common, that it may be purchased from the nurseries at a cheap rate. *Miller's Gard. Dict.*

BRACE, in writing, a term used to signify a certain crooked stroke or figure of a pen, made at the end of two or more lines, in an account which express two or more articles, charged with one and the same sum at the end, which is usually placed at the end, and in the center of the Brace; and expresses, that the sum there specified is the joint price of both the articles mentioned in the lines connected by the Brace.

BRACHIA'LIS, in anatomy, an oblong, thick, and broad muscle, lying immediately on the anterior part of the lower half of the os humeri; the upper part of it is forked, or sloped, and, at the bending of the joint of the elbow, the lower part of it contracts. It is fixed to the surface of the os humeri, by a great number of fleshy fibres, from the lower insertion of the deltoides, almost down to the two fossæ, at the lower extremity of the bone, and from one edge of the fore-side of this lower extremity to the other. The fibres are, for the most part, longitudinal; those nearest the surface of the muscle being longest, the more internal growing gradually shorter.

The lateral fibres are a little oblique; and this obliquity increases, as they descend lower. These lateral fibres are partly fixed in the intermuscular ligaments of the os humeri, of which ligaments, that which lies toward the internal condyle, is longer and broader than that toward the external. The lowest of these fibres are very oblique, and form on each side a kind of small separate fasciculus. In passing over the joint, all these fibres contract in breadth, and afterwards end in a strong flat tendon, inserted in the muscular impression, which is directly below the coronoide apophysis of the ulna.

The sloped or forked extremity of this muscle embraces the large tendon of the deltoides; the internal part of the fork meets the inferior insertion of the coraco-brachialis; and the foreside of the whole muscle is covered by the two fleshy bodies of the biceps. *Winslow's Anatomy.*

BRA'CHMANS, (*Dict.*)—These were a branch of the ancient gymnosophists, or philosophers of India, remarkable for the severity of their lives and manners.

The Greeks usually give them the name gymnosophists; though Clemens, Porphyry, &c. make the Brachmans only a branch of the gymnosophists, whom they divide into two sects, bracmanes and samanæi.

There are some in the Indies who still bear the name, and live in the same manner as the ancient Brachmans: the Portuguese call them bramanes or bramenes; we, usually, bramins. See BRAMINS.

Some say, they derive their name from the patriarch Abraham, whom, in their language, they call Brachma, or Brama. Others deduce it from the name of their god Brachma; which some again take to be the same with Abraham: whence Postel calls them abrachmanes. F. Thomassin fetches the word from the Hebrew, barach, to fly, or escape; because the Brachmans retire into the country, and live in desarts. The same author gives us another derivation, viz. from the Hebrew, barach, benedicere, orare, to bless, pray; in regard this is their principal occupation.

Porphyry observes, that the ancient Brachmans succeeded into the order, by right of family; whereas the Samanæans were elected into it: the former therefore were all of the same family, the latter of various.

The Brachmans were perfectly at liberty, paid no taxes, nor were under the command of any person: they lived on herbs, pulse, and fruits; abstaining from all animals, and thinking it an impiety to touch them. The greatest part of the day and night they spent, in singing hymns in honour of the Deity; praying and fasting continually. The generality of them lived in solitude, without marrying, or possessing any estates.

The Brachmans maintained, that life was a state of conception, and death the moment of birth; that the soul of a philosopher, detained in his body, was in the state of a chrysalis, and displays itself, at the instant of death, like a butterfly, which breaks its shell, and takes its flight. The events of life, according to them, were neither good nor bad; because the same thing which pleases one man, is displeasing to another; nay, the very self-same thing is agreeable and disagreeable, to the same person, at different times.

They granted the world to be finite, to have a beginning and an end. They admitted of a God for a creator, who governed the world; thought the universe formed of the different elements; looked on the heavens as the result of a quintessence; maintained the immortality of the soul, and supposed tribunals of justice among the shades below, &c. Clemens, of Alexandria, erroneously makes the two sects of gymnosophists but one. When they were weary of living, they themselves built up their own funeral pile, lighted it with their own hands, and then ascended it with a grave majestic pace.

Such were these sages whom the Grecian philosophers went so often to consult. Pythagoras is said to have received the doctrine of the metempsychosis from them. We read in Suidas, that they were called brachmanes, from king Brachman, their founder. This sect subsists yet in the East, under the name of bramines, or BRAMINS; which see.

BRACHYTELO'STYLA, in natural history, the name of a genus of crystals, composed of a short hexangular column, terminated at each end by an hexangular pyramid.

BRA'CKET, in building, denotes a kind of wooden stay, in form of a knee or shoulder, serving for the support of shelves, &c. *Neve, Build. Dict.*

BRACTEA'RIUM, in natural history, the name of a genus of fossils of the talc class; the characters of which are: each piece is composed of small plates, in form of spangles; and each of these, naturally thin or fissile, into very thin ones. See *plate* IV. *fig.* 32.

BRAINS *microscopically examined.*—The accurate Mr. Lewenhoeck examined, on several occasions, the Brains of different creatures by his microscope; as that of the Indian hen, the sheep, the ox, the sparrow, &c. He could there always distinguish multitudes of vessels so extremely small, that, if a globule of blood (a million whereof exceed not a grain of sand in bigness) were divided into five hundred parts, those parts would be too large to pass into such vessels. He observed also, that the vessels in the Brain of a sparrow were as large as in that of an ox; and argues from thence, that there is really no other difference between the Brain of a large animal and that of a small one, but only that the one contains a much greater number of these vessels than the other; and that the globules of the fluid, passing through them, are in all animals of the same size. *Baker on the Microscope.*

BRAKE, a name given by husbandmen to a place where female fern grows, and sometimes to the fern itself.

BRAKE is also used for a farrier's instrument, otherwise called barnacles.

BRAKE, in the hempen manufactory, denotes a wooden-toothed implement, wherewith to bruise and break the bun of hemp, and separate it from the rind.

There are two kinds of Brakes used in the dressing of hemp, viz. an open and wide-toothed, or nicked Brake, and a close and streight Brake; the first serving to crush the bun, the latter to beat it forth. When the hemp is braked, they proceed to swingle it. *Hought. Collect.*

BRAKE *of a pump*, signifies the handle wherewith it is wrought.

BRA'MA, in ichthyology. See BREAM.

BRA'MINS, in modern history, a sect of Indian philosophers, formerly called brachmans.

They are priests, and have three principal objects of veneration, the god Fo, his law, and the books which contain their ordinances. They believe that the world is nothing but an illusion, a dream, a deceit; and that bodies, to exist really, ought to cease to be in themselves, and mix themselves with that nothing, which, by its simplicity, makes the perfection of all beings. They make sanctity consist in absolute apathy, to desire nothing, to think of nothing, to perceive nothing, to remove every idea from the mind, even that of virtue, so far, as that it may not disturb the repose of the soul; which is the perfection of holiness, according to the Bramins. This state so much resembles sleep, that a dose of opium appears more likely to sanctify a Bramin, than all his other attempts. This quietism has been attacked in the Indies, and defended with warmth. They are ignorant of their first origin. King Brachman is not their founder. They pretend themselves to have issued from the head of the god Brama, whose brain was not only fertile, but that his feet, hands, arms, stomach, and thighs, also generated beings, though of an inferior class to the Bramins. They have ancient books, which they call sacred, and carefully preserve the language in which they were written. They admit the metempsychosis; assert that the chain of beings descends from the bosom of God, and continually ascends up to it again; like the filament which comes from the belly of the spider, and enters it again.

Their system of religion is various in different parts of the country. On the coast of Coromandel they worship Wistnou, and believe Brama was the first man; that Brama received from Wistnou a power of creating; that he made eight worlds like ours, the government of which he left to eight lieutenants or deputies; that the worlds perish and revive again; that our earth began in water, and shall end in fire; that from the ashes of this present earth a new earth shall be formed, which shall neither have sea, nor vicissitude of seasons. The Bramins make the soul circulate in different bodies. The soul of a man, say they, who was of a quiet gentle disposition, passes into the body of a dove; the soul of a tyrant animates a vulture. In consequence of this doctrine

trine, they hold all animals in great respect; they have founded hospitals for them, and, under a notion of religion, purchase the birds which the Turks take. They are in very great esteem among the Banians throughout all the Indies; but are reverenced in a more especial manner by those which inhabit the coast of Malabar, who carry their veneration to a very extraordinary degree; trusting their brides with them before consummation, to dispose of them according to their holy will, in order to make the bridegrooms happy and prosperous. They are at the head of religion, and explain the dreams of it to the people. The austerity of their lives, and the ostentation of their fasts, promotes the imposture; they are dispersed all over the Indies, but their college is at Banassi. We might proceed farther to expose the extravagances of the philosophy and religion of the Bramins; but it is now unnecessary. Philosophy, in this enlightened age, has made a gigantic progress, and absurdities meet the contempt they deserve.

BRA'NCHERY, in anatomy of vegetables, denotes the vascular parts of divers fruits, as apples, pears, plums, and berries.

BRANCHI'DÆ, in antiquity, priests of Apollo, serving in his temple at Dydima, in Miletus; which was famous for its oracle.

The denomination is taken from branchus or branchides, an epithet given to Apollo as worshipped here; though on what account the title was given, is not agreed on.

BRA'NCHUS, βράγχος, in medicine, a species of catarrh, affecting chiefly the jaws, throat, and aspera arteria.

BRA'NDRITH, among builders, denotes the fence or rail about the mouth of a well.

BRA'NDY (*Dist.*)— The French Brandies, most generally esteemed, are produced up the Loire, or near Cognac, Nantz, and Rochelle. Next to these are the Bourdeaux, or entre deux Meres Brandies; those of Languedoc, and the islands of St. Martin, Oleron, &c.

According to the different species and growth of the grapes, the Brandies always differ; whence there are various kinds of French spirits, having particular flavours; by which the conoisseurs readily distinguish one sort from another; though the vulgar call them all by the name of French Brandy indiscriminately. But an ordinary judgment may easily distinguish Languedoc Brandy from that of the isles, or Bourdeaux from Cognac: nor would there be so great a similarity between the several species of French Brandies as there is, but that only the weakest and lowest-flavoured wines are distilled for their spirit, or such as prove absolutely unfit for any other use: but, when, out of curiosity, or good husbandry, they distil the bottoms, or refuse parcels of the grosser-bodied and full-tasted wines, the Brandy got from them is what we, in England, emphatically call a wine-spirit.

Every kind of grape, therefore, as it affords a wine, so does it also a Brandy of its own peculiar flavour; which is an observation that should be well attended to, when any parcel of French Brandy is proposed to be imitated; for it is ridiculous to expect Cognac Brandy should be perfectly resembled with a quintessence made from Bourdeaux grapes; though the spirit, or subject-matter of the operation, were previously rendered ever so pure or tasteless.

A large quantity of Brandies is made in France during the time of the vintage; for all those poor grapes, that prove unfit for wine, are usually first gathered, pressed, and their juice fermented, and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a rule with them to distil no wines that will fetch any manner of price as wine; for in this state the profits upon them are vastly greater than when reduced to Brandies. This large stock of small wines, wherewith they are almost over-run in France, shews the reason of their making such vast quantities of Brandy, more than other countries, which lie warmer, and better for grapes.

But this is not the only fund of their Brandies; for all the wine that pricks, or turns eager upon their hands, is also condemned to the still; and, in short, all that they can neither export, nor consume at home, which amounts to a large quantity; since much of the wine, laid in for their family provision, is so poor, as not to keep the spending.

Their general method of distilling Brandies in France needs no formal description, as not differing from that vulgarly practised among ourselves in working from wash or wines: nor are they one jot more cleanly or exact in the operation. They only observe, more particularly, to throw a little of the natural lee into the still, along with the wine, as finding this gives their spirit the flavour, for which it is generally admired abroad; though not at all by themselves at home, who have a most contemptible opinion of Brandy in general, but especially the high-flavoured kinds; so that, as the distillation of this commodity is usually left to the meanest and most servile hands amongst them, the spirit itself is very little used by any other sort of people throughout the kingdom.

Their notion of proof squares with our's to a tittle, and they stand upon it to a punctilio, as if the whole excellence of the Brandy lay there. And in this form of strong bubble-proof all their fine spirits are constantly found.

But they have one particular expedient for such Brandies as prove foul, feedy, or retain the taste of certain weeds apt to grow among the wines, viz. to draw them over again, with a design to cleanse them of that adventitious flavour: in which operation they leave out the faints, or rather change the receiver, as soon as ever the stream comes proof; then, mixing together all that run off before, they call it by the name of trois-cinque; that is, Brandy consisting of five parts alcohol, and three parts phlegm.

Higher than this the brewers, or common distillers, in France, seldom bring their Brandies; that refined nation having the address to persuade the foreign merchants that the phlegm of French Brandy is a natural part, as essential to it as the body to the soul. The truth is, if people were so disposed, they might easily reduce French Brandies, or the Brandies of any other nations, to half their usual bulk, without impairing their virtues: for, if the essential oil of the wine be the thing required, this is much better preserved in alcohol than in proof spirit. But whether the charge of bringing Brandies into alcohol would exceed that of a double freight, and double stowage, is the merchant's business to consider; or whether it be not proportionably as advantageous to import low wines as Brandies, which, with respect to alcohol, are nothing but a stronger low wine.

They use no manner of art to colour their Brandies, nor to give them any additional flavour; the thing they principally value themselves upon, both in wines and Brandies, being to make them perfectly natural; so that all the colour of their Brandies is acquired from the cask, and the length of time they usually lie therein; which is sometimes twelve or eighteen months, and often two or three years; during which, it is no wonder if they acquire a yellow or brownish cast. Their lying thus long, as it were in a state of slow digestion, wonderfully takes off from that hot, acrid, and foul taste, peculiar to all spirits or Brandies newly distilled; and gives them a coolness and softness not easily to be introduced by art, without great care being had in the first operation. But these fine and grateful Brandies, as they prove after having lain thus long, were at first hot, acrid, foul, and fiery. This fine colour, and an agreeable softness or coolness in the mouth, going along with French Brandies of a good natural flavour, are the things that principally recommend them to the judicious purchaser.

And upon these properties are founded several methods of trying their goodness, or discovering whether they are debased or adulterated by the admixture of coarser spirits. But there is little danger of any such practice in France, as they have no cheaper spirits to debase or adulterate their Brandies withal, especially since the prohibition of melasses spirits in that country: and the same reason, in good measure, holds in favour of the Dutch, who, though generally suspected as great adulterators, yet, in this case, seem but little qualified for it, as, having no treacle spirit, and their malt spirit they despair of rectifying, it being so intolerably fœtid and nauseous, that almost a single gallon would taste through a whole piece of Brandy: all, therefore, that the Dutch seem fitted to do in this case, is to mix Brandies with wine spirits, or the spirit drawn from wine lees, which they have in very great plenty. But even this cannot be very gainful, considering how cheap the Brandies are in Holland; for, paying no duty, they come almost as cheap there as in France itself. The temptation to adulterate French Brandies is much greater in England, where the duties upon them are high; though they are also very much adulterated up and down the continent, and all considerable trading towns and sea-ports. In England, it has been above observed, they use all kinds of spirits to mix with them; malt, melasses, cyder, sugar-spirit, &c. and often do it so dexterously, or so sparingly, as vulgarly to pass undiscovered. The same arts are likewise practised in many other countries: but certain brokers, factors, and under merchants, who deal largely in Brandies, are said to have a particular liquor, which, being added to a glass of any suspected Brandy, will shew, by the colour it makes therewith, whether, and in what proportion, the whole parcel is mixed with a corn spirit. But such proof is erroneous, and not to be trusted. The fact is this: if a few drops of a certain vitriolic solution be let fall into a glass of old French Brandy, it will, if the vitriolic solution were rightly prepared, turn the Brandy of a fine purple, or deep violet colour; by the strength or diluteness of which colour, they judge the Brandy to be either pure, or mixed with a malt spirit, proportionably. The foundation of the thing lies here: old French Brandy, by having long lain in an oaken cask, thus really becomes a dilute tincture of oak, which, upon the addition of the vitriolic solution, necessarily turns of a blue colour, after the manner that ink is made of a tincture of galls and vitriol. But if the Brandy be perfectly pale, or very lately distilled, it will not thus change its colour, upon the addition of the solution, though the Brandy were totally French. And in the same manner a light tincture of oak, extracted with a malt spirit, or any other spirit, will, upon affusion of the same solution, exhibit the same appearance. Hence this kind of proof is nothing more than a way of determining how rich a tincture of oak any common spirit or Brandy is. Calcined vitriol of iron, lightly infused in in a certain dilute, or aqueous mineral acid, gives this solution to great perfection; being, when well made, of a fine yellow colour, and capable of giving, for a season, the finest blue to a spirituous tincture of oak. And here it may not be amiss to mention, that the experiments I formerly made of this kind led me, at the first sight of Dr. Eaton's styptic, to conjecture the manner of its preparation; which, upon a second attempt, I hit to great exactness. I should not mention so small a matter, if the discovery of that famed styptic had not been somewhat unsuccessfully attempted by others; so far, I mean, as concerns the appearance and phænomena, though not, perhaps, the virtues of it. The whole secret is this: to a parcel of old French Brandy add a very minute proportion of calcined green vitriol; and thus there will presently be made a dilute ink, which very slowly deposits a black or dusky cloud, that afterwards rests at the bottom of the glass, and causes the liquor to exhibit all the phænomena, and answer the ends of Dr. Eaton's styptic.

To proceed, it is manifest that the French Brandies naturally receive their colours from the cask. The discovery of which particular might probably be the reason why high-coloured Brandies have of late years sunk in the esteem of many, so as to occasion pale ones to be much ordered; and, for a while, nothing would go down but pale Brandies. Hence, both in France and Holland, they fell to work upon redistilling their old Brandies, to make them of a water whiteness. And to such a length this humour ran, and the difference in price between pale and brown Brandies grew so considerable, that much profit was made in Holland, barely by the re-distillation of Brandies, to render them colourless. This also made very well for France, who had much rather dispose of her new colourless Brandies, for an advanced price, than for a lower, after having kept them in a wasting state, to colour them, many months in the cask: which colour, where not artificially introduced, is a sure sign of age, that is, excellence, on the side of Brandy.

The vulgar method of examining Brandies by the bead-proof may be of good service, in procuring such as will best serve to mix with, and conceal an ordinary spirit; as this proof, when strong, shews they contain a good deal of the essential oil of the grape, which gives an agreeable flavour. But, when intended for other curious or chemical uses, as much labour is often employed to get out this fine-tasted essential oil in France, as the more curious chemists employ to get the fœtid oil out of malt spirits in England: and, indeed, there are many operations where the nidorous odour of either spirit would be very unsuitable, nor is it often proper to use a menstruum to act upon one body, whilst it is already saturated with another. But no judgment can by this kind of proof be formed of Brandies, as to their mixed or adulterated state.

The surest way, for this purpose, is, to acquire the habit of judging from use and practice. The taste and smell, by proper methods, are so far improveable in this particular, as not to be easily imposed upon. Care indeed must be had, not to taste Brandies in too high a state; for this scorches the mouth, and confounds the judgment. Nor should many sorts be tasted soon after one another: for thus a mixture of tastes will be made, the taste of the preceding being not yet gone off the tongue.

The best method is to dilute Brandies well with water, in order to their being smelt and tasted; or rather, to burn away all their inflammable spirit, and afterwards examine the phlegm.

From this history of French Brandies, compared with the doctrine of simple distillation and rectification, it will appear, that many of our English spirits are convertible into Brandies, that shall hardly be distinguished from the foreign, in many respects, provided this operation be neatly performed. And, in particular, how far a cyder spirit, and a crab spirit, may, even from the first extraction, be made to resemble the fine and thin Brandies of France, we would recommend to the practice of those distillers, who have any skill and curiosity this way.

To the same curious persons we would also recommend the discovery of that desideratum, in the business of rectifying French Brandies, which the distillers in France and Holland scarce know how to attempt, though it would be a profitable business in either country. By this rectification is meant the method of clearing Brandies from a certain seedy taste, with which they are frequently impregnated; and, upon which account, they cannot find purchasers, but upon disadvantageous terms. Thus sometimes a cask of French Brandy shall resemble aniseed, or caraway-water, rather than Brandy; so that the proprietor, to get it off, is reduced to the necessity of mixing it among other Brandies, in such small proportions as may render it undiscoverable: whereas, could he but clear it of this flavour, he might readily be reimbursed, with a handsome profit.

The foundation for this kind of rectification is so fully laid under the article RECTIFICATION, that our English distillers, it is hoped, may, from thence, be enabled to effect the thing.

It is a mistake to imagine, that all the Brandies made in France are so good and fine, as we usually taste them upon our keys at London. No; there are many hundreds of pieces made, every year, almost as disagreeable and nauseous as our malt spirit. But the case is, they send the best Brandies, as they do their best wines, to England, where they get the best prices for them. But in Holland, the mart for goods of all sorts, you shall sometimes not be able to pick a good piece of French Brandy out of fifty: the general run of them being either seedy, oily, musty, or otherwise infested with some unnatural and disagreeable flavour. And these are the sorts which, in France, they despair of curing by re-distillation, or bringing towards the state of alcohol, or to what they call three fifths.

These cases require a better method of rectification, than our common one by fixed alkalies: but if due care and skill were employed from the first gathering of the grapes, to the making up of the Brandies; not only such inconveniencies might be prevented, but the Brandies of France might be rendered much finer.

Some prefer Rhenish Brandy to that of France; and, particularly in Holland, it sells for double the price. It is indeed a very fine spirit; but the English know little of it farther, than that a dash thereof serves to fill up a cask of French.

The Spanish Brandies are much coarser than the French, though sometimes made to pass for them in Holland, and other places of great traffic. *Shaw's Essay on Distil.*

The still-bottoms of French Brandy are useful to all the purposes above-mentioned of the still-bottoms of wine-spirit.

BRASS (*Dict.*)—The calamine does not enter the copper under its earthy state, but is first converted by the phlogiston into the form of a metal: Kunkel, it is true, imagined that only the mercurial part of the calamine was added to the copper, without any of the sulphur; but this opinion later chemists seem to have sufficiently refuted. *Vid. Junk, Consp. Chem.*

Brass may be cleansed, first, by rubbing it with a cloth dipped in equal quantities of aqua-fortis and common water; then with an oily cloth, and lastly with a dry one dipped in lapis calaminaris.

Brass is tinged of a gold colour, first, by burning, then dissolving it in aqua-fortis, and, lastly, reducing it to its metalline state. It may be whitened by heating it red-hot, and quenching it in water distilled from sal armoniac and egg-shells. It is silvered, or coloured superficially white, by rubbing it with balls made of silver dissolved in aqua-fortis, with powder of white tartar, sufficient to absorb all the moisture thereof.

BRASS, in the glass trade. Thrice calcined Brass is a preparation which serves the glassmen to give many beautiful colours to their metal. The manner of preparing it is this: place thin plates of Brass on tiles on the leer of the furnace near the occhio; let it stand to be calcined there for four days, and it will become a black powder, sticking together in lumps. Powder this, and sift it fine, and recalcine it four or five days more; it will then not stick together, but remain a loose powder, of a russet colour. This is to be calcined a third time, in the same manner: but great care must be taken, in the third calcination, that it be not over done, nor under done; the way to be certain of making it right, is to try it several times in glass while melting. If it makes it, when well purified, to swell, boil, and rise, it is properly calcined; if not, it requires longer time. This makes, according to the different proportions in which it is used, a sea green, an emerald green, or a turquoise colour. *Neri's Art of Glass, p.* 42.

Brass, by a long calcination alone, and without any mixture, affords a fine blue or green colour for glass; but they have a method of calcining it also with powdered brimstone, so as to make it afford a red, a yellow, or a chalcedony colour, according to the quantity and other variations in the using it; the method of making the calcination is this: cut thin plates of Brass into small pieces with sheers, and lay them stratum super stratum, with alternate beds of powdered sulphur, in a crucible; calcine this twenty-four hours in a strong fire, then powder and sift the whole; and, finally, expose this powder upon tiles, for twelve days, to a reverberating furnace; at the end of this time, powder it fine, and keep it for use. *Neri's Art of Glass, p.* 37.

The glass-makers have also a method of procuring a red powder from Brass, by a more simple calcination, which serves them for many colours. The method of preparing it is this: they put small and thin plates of Brass into the arches of the glass furnaces, and leave them there till they are sufficiently calcined, which the heat in that place. not being enough to melt them, does in great perfection. The calcined matter, powdered, is of a dusky red, and requires no further preparation. *Neri's Art of Glass, p.* 41.

Brass is used to make great guns: some reckon the best method is to put, into the quantity of eleven or twelve thousand weight of metal, ten thousand of rose copper, nine hundred pounds of tin, and six hundred of Brass.

But Mr. Chandler observes, that the best Brass guns are not made with pure copper and calaminaris, but that coarser metals must be mixed therewith, as lead and pot metal, to make it run close and sounder. See FOUNDERY.

What they call Brass wire, or Brass in hoops, is Brass drawn through the wire-drawing iron.

For making the finest statues of Brass, the proportion is one half of copper, and one half of Brass. The Egyptians, whom some think the inventers of this art, used to put two thirds of Brass to one third of copper: rose copper is not so proper for casting statues as that which is hammered.

In common Brass the allay is made with tin, and even with lead, when people would be saving. But the latter ought not to be used in Brass designed for statues. For Brass guns, they put ten or twelve pounds of tin to a hundred of Brass. For bells, they put twenty or twenty-four pounds of tin to the same weight of copper, to which they add two pounds of antimony, to render the sound more soft; and they put but three or four pounds for kitchen furniture.

Corinthian Brass has been famous in all antiquity. L. Mummius having sacked and burnt the city of Corinth, in the 158th Olympiad, or 146 years before Christ, it is pretended, that this precious metal was formed from the immense quantity of gold, silver, and copper with which that city abounded, which, being all melted and mixed together by the fierceness of the fire, composed as it were a new metal. The statues and vessels which were afterwards made of it, by excellent artists, were esteemed of great value: and, though it is commonly the sculptor's hand, which enhances the price of those pieces of workmanship, yet, on this occasion, the matter seemed to vie with, or even to excel above the ordinary perfection of art.

They who have given an accurate account of this metal, distinguish three sorts of it; in one gold was predominant, in the next silver, and in the last gold, silver, and copper were in equal parts. It is very probable, that what was formerly owing to chance, might at present be imitated by art: but, as most things are valued on account of their scarcity, it is but too true, that the ease with which an artist might now make such Brass, would render it less valuable, how like soever it might be to that of Corinth.

Brass is also a colour prepared by the braziers and colourmen to imitate Brass. There are two sorts of it; the red Brass, or bronze, as the French call it, and the yellow or gilt Brass. The latter is made only of copper filings, the smallest and brighest that can be found; with the former, they mix some red ocre finely pulverized. They are both used with varnish. In order to make a fine Brass, that will not take any rust or verdigrise, it must be dried with a chafing-dish of coals, as soon as it is applied.

The finest Brass colour is made with powder-Brass, imported from Germany, diluted into a varnish, made and used after the following manner: the varnish is composed of one pound and four ounces of spirit of wine, two ounces of gum-lac, and two ounces of sandarac: these two last drugs are pulverized separately, and afterwards put to dissolve in spirits of wine, taking care to fill the bottle but half full, otherwise it would burst; in all processes, in which spirit of wine is made to act by means of fire, the vessels must be exactly stopped with a hog's bladder, and but half full. The varnish being made, you mix such quantities as you please of it, with the pulverized Brass, and apply it with a small brush to what you would Brass over. But you must not mix too much at once, because, the varnish being very apt to dry, you would not have time to employ it all soon enough; it is therefore better to make the mixture at several times. After this manner they Brass over figures of plaister, which look as well as if they were of cast Brass.

BRASS *Lumps*, in minerology, a common name given by the miners and diggers of coal, &c. to the globular pyrites. This stone, when kept in the air, often sends forth its efflorescences of salt, in the form of small and slender fibres, perfectly transparent, and sometimes of near an inch long. The place where these stones are exposed to the air, will greatly alter the figures and colours of their efflorescences; if they are laid in a cellar, the shoots will be shorter, and green, like the common copperas; and, if laid in the way of the sun-shine, they will be white and dusty.

Both are the same salt, which is true green vitriol or copperas, and both will, in the same manner, turn a decoction of galls into ink. The white salt is only the green powdered and calcined by the sun's heat. The figure of the fibres of these efflorescences is not easy to be determined; sometimes they seem round, sometimes angular. These, however, are the natural figures of the salts of these stones; and the other shoots into which they form themselves after solution, and bringing them together in a body by water, are rather their accidental forms, though, under a like course of accidents, they generally appear the same. *Philos. Trans.* N°. 110.

BRAWN, in the culinary art, signifies the flesh of a boar, boned, rolled up, or collared, boiled, and, lastly, pickled for a winter's eate.

Brawn is made only of the flitches, without the legs; the oldest boars are chosen for this use, it being a rule that, the older the boar, the more horny the Brawn.

There is also Brawn of pig, which is made by scalding, drawing, and bonding the beast whole, except the head; then cutting it into two collars, soaking it in brine, seasoning, rolling, putting it into a cloth, binding it up, boiling it, and, when boiled, hooping it up in a frame. *Russ. Dict. T.* I. *in voc.*

BRAZEN *Age*, *seculum æreum*, is used by the poets to express the third age of the world.

What Hesiod and the Greeks called the Brazen, the northern nations call the rocky or stony age. *Phil. Trans.* N°. 301.

BRAZEN DISH, among miners, is the standard by which the other dishes are gauged, and is kept in the king's hall. *Hought. Compl. Miner.*

BRA'ZIER, an artificer who makes and sells pans, pots, kettles, and other kitchen utensils and brass ware.

The implements used by Braziers are, a forge, wherein they burn only charcoal to heat their metal: a twibil wherewith to hold their work to the fire; divers sorts of anvils and hammers, wherewith to beat; also pans, ladles, sheers, and punches of divers sorts, soldering irons, borax box, lath for turnings, &c. See BRAZING *in the Dict.*

BRAZIL-WOOD (*Dict.*)—It is differently surnamed, according to the several places from which it is imported: thus there is the Brazil-wood of Fernambuco, or Pernambuco; the Brazil-wood of Japan, that of Lamon, that of Santa Martha, and lastly the brasilet, which is esteemed the worst. This last comes from the Antilles islands.

The Brazil-wood of Japan is otherwise called sapan: there is the large and the small: the large is simply called sapan, and the small sapan bimais.

The tree of the Brazil-wood grows commonly in dry barren places, among rocks. It becomes very thick and tall, and pushes out long branches, whose twigs are furnished with a vast quantity of small leaves, half round, of a fine bright green, pretty much like those of box, but longer, hard, dry, and brittle. Its trunk is seldom straight, but crooked and knotty, almost like the hawthorn. There come, twice a year, at the extremity of the branches, and between the leaves, small bunches of flowers, which are somewhat long, pretty much like those of the lilly of the valley, of a bright red, and an agreeable aromatic smell, very comfortable to the brain, which they strengthen: these are succeeded by a flat red fruit, which contains two small flat seeds, of a most lively red; these seeds are a kind of almonds, of the form of a pumkin seed.

Though the trunk of this tree be very thick, yet it is covered with so gross a bark, that, when the savages have taken it off from the wood, a trunk, which before was as thick as a man's body, remains, as it were, a log not bigger than his leg.

The Brazil-wood is very heavy, very dry, and very hard; it crackles very much in the fire, and emits hardly any smoke, because of its excess in dryness.

None of these different sorts of Brazil-woods have any pith, except that of Japan: that of Fernambuco is reckoned the best. It must be chosen in thick pieces or logs, heavy, compact, very sound, without any part of the inner bark upon it, and without the least rottenness, and such, as after splitting it, from pale becomes reddish; and that, being chewed, it has a sweetish taste like sugar.

This wood is proper for turner's work, and takes a good polish: but its chief use is for dying, where it serves for a red colour. However, by the regulations made in France, the dyers of rich and valuable stuffs are forbidden to use it, because it yields but a spurious colour, which fades very soon; yet the dyers of inferior stuffs are suffered to use it, though it is subject to very great inconveniences.

From the Brazil-wood of Fernambuco, they extract, by means of acids, a kind of carmine: they also make of it a liquid lacca for painting in miniature. And, with a tincture of this wood often repeated, they make that reddish chalk, which is called rosetta; but it is nothing but the white of Roan, to which the Brazil-wood gives the colour of an amaranthus.

BREAD.--Among us, Bread is chiefly divided into white, wheaten, and houshold; differing only in degrees of purity. In the first, all the bran is separated; in the second, only the coarser; in the third, none at all: so that fine Bread is made only of flour; wheaten Bread, of flour, with a mixture of fine bran; and houshold, of the whole substance of the grain, without taking out either the coarse bran, or fine flour.

We also meet with symnel Bread, manchet or roll Bread, and French Bread; which are only so many denominations of the finest or whitest Bread, made of the purest flour; except that in roll Bread there is an addition of milk, and, in French Bread, of eggs and butter also. To which may be added, ginger Bread, made of white Bread, with almonds, liquorice, aniseed, rose water, and sugar; and maslin Bread, panis mixtus, made of wheat and rye, or sometimes of wheat and barley.

For armies the Bread is either baked in the park of provisions in the camp, or in the town nearest the army; for the conveniency of ovens, an army ought always to have at least four days Bread before-hand. In some cases, the distance of the places, from whence Bread is to be had, or the army's march from one country to another, obliges the general to distribute for six or even for eight days; a thing never done without

PLATE VII. *Engraved for the Supplement.* *Facing* Brew-house.

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without absolute necessity, by reason of the abuse which some soldiers make of it, who sell their Bread without regard to future subsistance. For long marches through an enemy's country, they sometimes make bisket instead of Bread.

Horse Bread is made of wheat, oats, and beans; to which sometimes are added aniseed, gentian, liquorice, fenugrec, eggs and ale; and sometimes rye and white wine are used.

For race-horses, three sorts of Bread are usually given with success, for the second, third, and fourth fortnights feeding; they are all made of beans and wheat, worked with barm; the difference consisting chiefly in the proportion of the two former. In the first kind, three times the quantity of beans is used to one of wheat; in the second, equal quantities of both; in the third, three times the quantity of wheat to one of beans.

The process of making houshold Bread, amongst us, is thus: to a peck of meal they add a handful of salt, a pint of yeast, and three quarts of water, cold in summer, hot in winter, and temperate between the two; the whole, being kneaded in a bowl or trough by the fire in winter, from it in summer, will rise in about an hour; they then mould it into loaves, and put it into the oven to bake. *Haught. Collect.*

For leavened Bread, part of the flour intended for it, being made into dough with warm water and a little salt, is laid in the rest of the flour an hour or more, in which time it rises to three times the bulk; then they mix and knead the whole with more water, till it be brought into a stiff dough; which, being formed into loaves, is baked in the oven: though the more usual way is to take a piece of dough kneaded, and leave it in the tub till next time, when they break it small, and mix it with the meal, adding some yeast. *Haught. Collect.*

For French Bread, they take half a bushel of fine flour, ten eggs, and a pound and a half of fresh butter, into which they put as much yeast, with manchet; and, tempering the whole mass with new milk, pretty hot, let it lie half an hour to rise; which done, they make it into loaves or rolls, and wash it over with an egg beaten with milk: care is taken the oven be not too hot. *Rust. Dict.*

BREAM, *brama*, in ichthyology, a river fish of the leather-mouthed kind, esteemed a species of carp, and called by the generality of authors cyprinus latus.

It is a very broad and thin fish; the head is small, the back of it broad and flat, and the back rising from the head and tail toward the middle, like that of a hog; the side lines are turned into a sort of arched figures near their origin at the gills, and run much nearer the belly than the back. When the fish is full grown, its sides are of a yellowish hue, and its belly reddish; the scales are large, and striated downwards; the mouth is very small for the size of the fish, and has no teeth. It lives in ponds, and rivers of slow current, and sometimes grows to more than two feet in length, and is not accounted a delicate fish. *Willughby, Hist. Pisc. Gesner de Pisc.*

This is but a coarse fish for the table, but it affords great sport to the angler. The method of taking it is this: procure about a quart of large worms, put them into some fresh moss, well washed and dried; let this be changed every three days, and let then be put, at the bottom of the vessel, some good black mould, with some fennel chopped small amongst it. This will clean them perfectly; and, in about three weeks, they will be fit for use. The lines must be silk alone, or silk and hair, and the floats large goose or swans quills; a plummet must be prepared of a piece of lead, of the shape of a pear, with a ring at the small end; the lead must be fastened to the line, and the line hook to the lead; about ten or twelve inches space will be enough between the lead and the hook; and the lead must be heavy enough to sink the float. The hook to be baited with a strong and vigorous worm, which will draw it up and down at the bottom, and provoke the Bream to bite more greedily. It will be best to fit up three or four rods in this manner, and set them all at once. Find the exact depth of the water, if possible, that the float may just lie even with the surface, directly over the lead; then provide the following ground bait.

Take a peck of sweet gross ground malt, boil it a little, strain it through a bag, and take it to the water side; throw in this malt by handfuls, squeezed hard together, that the water may not separate it before it gets to the bottom; it should be thrown in about a yard above the place where the hook is to be. This is to be done about nine o'clock at night, and, about three in the morning, go again to the place, approaching cautiously, so as to keep out of sight of any fish that may be at the top of the water, while the rest are feeding at the bottom; then throw in the line, with the hook nicely baited, and the others at about a yard distance above and below the first, and one another; let the rods lie on the ground, and, when one is taken, there is no occasion to run up hastily; but the fish may be left to tire himself a little, and then be taken up.

BREAST-PLATE, in the manage, denotes a leathern strap running from one side of the saddle, cross the horse's breast, to the other; intended to keep the saddle from slipping backwards, in mounting up rising grounds. It is otherwise called tee; sometimes the poitrail.

BREAST-PLATE, among artificers, denotes a drill-plate, against which to set the blunted end of the drill. *Moxon's Mechan. Exercises.*

BREEDING *of fish.* The necessary qualities for a pond, in order to its serving well for the Breeding of fish, are very different from those which are to make it serve for feeding them; insomuch that some particular ponds serve only for one of these uses, and others for the other; and scarce ever the same pond is found to serve for both. In general, it is much more rare to find a good Breeding pond than a good feeding one. The best indications for a Breeding pond are these: that there be a good quantity of rushes and grass about its sides, with gravelly shoals, such as horse-ponds usually have: when a pond has this property, and takes to the Breeding of fish, it is amazing what a progress will be made in a little time. The spawn of fish is prodigious in quantity, and, where it succeeds, one is able to produce many millions: thus, in one of these Breeding ponds, two or three melters, and as many spawners, will, in a very little time, stock the whole country. When these ponds are not meant intirely for Breeding, but the owner would have the fish grow to some size in them, the method is to thin the numbers, because they otherwise starve one another, and to put in other fish that will prey upon the young, and then devour them in the quickest manner. Eels and pearch are the most useful on this account; for they prey not only upon the spawn itself, but on the young fry, from the first hatching to the time that they are of a considerable size. Some fish are observed to breed indifferently in all sorts of waters, and that in considerable plenty; of this nature are the roach, pike, and pearch. See the article FISH.

BRE'NTA, in zoology, the name of a fowl of the goose-kind, known among us by that of the brent-goose, and, by some, supposed to differ from the barnacle no other way than in sex; but this is erroneous. It is somewhat larger than the barnacle, and is longer-bodied; the head, neck, and upper part of the breast, are black; the neck, however, is ornamented on each side with a sort of chain of white. Its back is of a brownish grey, but somewhat blackish towards the tail; the feathers immediately over the tail are white; it is white also on the belly, and of a brownish grey on the breast. *Ray's Ornith.* See *Plate* IV. *fig.* 34.

BRETE'SSE, in heraldry, a term used to express a line in some coat of arms, of the same nature with what is usually called the crenelle, or embattled line; except that this last is only embattled on one side, and the Bretesse or crenelle on both sides. Some authors seem, however, to have understood the terms Bretesse and crenelle as synonymous words, and, when they would express such a line, they call it, if embattled on both sides, contre-Bretesse. *Nisbet's Heraldry.*

BREW-HOUSE, a building adapted to the brewing, &c. of malt liquors.

In order to erect a large or public Brew-house to the best advantage, several circumstances should be carefully observed. 1. That three sides in four, of the upper part, or second floor, be built with wooden battons about three inches broad, and two thick, that a sufficient quantity of air may be admitted to the backs or coolers. 2. That the coppers be erected of a proper height above the mashing-stage, that the hot water may be conveyed by means of cocks into the mash-tuns, and the worts into the coolers. 3. That the fire-places of the coppers be very near each other, that one stoker, or person who looks after the fire, may attend all. 4. That the yard for coals be as near as possible to the fire-places of the copper. 5. That the malt be ground near the mash-tuns, and the mill erected high enough that the malt may be conveyed from the mill immediately into the mash-tuns by means of a square wooden spout or gutter. 6. That the upper backs be not erected above thirty-three feet above the reservoir of water, that being the greatest height water can be raised by means of a common single pump. 7. That the pumps which raise the water or liquor, as the brewers call it, out of the reservoir into the water-backs, and also those which raise the worts out of the jack-back into the coppers, be placed so that they may be worked by the horse-mill, which grinds the malt.

Explanation of *Plate* VII. being a section of that part of a large Brewhouse, which contains the coppers, mash-tuns, &c.

a a a a, the coppers.

1 1 1 1, copper-pumps, which throw the wort out of the coppers into the boiling-backs.

2 2 2 2, boiling-backs.

3 3, cocks to supply the coppers with water.

4 4 4 4, cocks which convey the water out of the coppers into the mash-tuns. The water is carried from these cocks through a wooden trunk to the bottom of the mash-tun, above which is a false bottom full of small holes, through which the water rises and wets the malt in the mash-tun.

5 5 5, mash-tuns.

6 6 6 6 6, men mashing, or stirring with utensils, called oars, the malt and water in the mash-tun.

7, an utensil called an oar, used in mashing.

8 8 8, the mashing-stage, or floor on which the mash-tuns are placed.

9, 9 9, 9, Cocks for letting the wort, or, as brewers call it, the goods, out of the mash-tuns, into the under backs.

10, 10, 10, Under backs, which receive the goods from the mash-tuns.

11, The jack-back. This back is placed something lower than the under backs, and has a communication with them all; and out of this back the wort is pumped into the coppers.

12, 12, Two wort-pumps, by which the wort is pumped out of the jack-back into the coppers. These pumps, as well as those which raise the water from the reservoir into the upper backs, and which could not be shewn in the figure, are worked by the horse-mill which grinds the malt.

13, The miller, or person who grinds the malt.

14, A boiling-curb. Its use is to prevent the wort from boiling over the copper.

15, The master-brewer.

16, A gutter for conveying the wort out of the wort-backs into the cooling-backs.

17, Pipes which carry the wort from the wort-pumps into the coppers.

BREWING (*Dict.*)—*Method of* BREWING *Butt-beer*, or *Porter*. When the water just breaks or boils, they let in a quantity of cold to keep it from scalding, which they let run off by a great brass-cock down a wooden trunk, fixed to the side of the mash-tun, and up through a false bottom into the malt: then mash with wooden oars half an hour; by this time the water in the copper is scalding hot, which they likewise let run into the malt, and mash half an hour longer. This they cap and cover with fresh malt, and let it stand two hours; then spend away by a cock-stream into the under back, where it lies a little while until a second liquor is ready to boil, but not boil, with which they mash again to have a sufficient length of wort that they boil at once, or twice, according to the bigness of their utensils. Others will make a third mash, and boil a second copper of wort. The first wort is allowed an hour and a half's boiling with three pounds of hops to each barrel. The second wort two hours with the same hops, and so on. Some calling the first hop-wort; the second, mash-wort; the third, neighbour-wort, and the fourth, blue. Which last, being a most small sort, is sometimes allowed six or seven hours boiling with the same used hops. When in a right temper, they let down the worts out of the backs into the tun from their grosser contents, where they cooly ferment it with yeast, till a fine curled head rises and just falls again, which sometimes requires twenty-four, sometimes forty-eight hours, as the weather is hot or cold to perform this operation. Then they cleanse it off into barrels.

Uses of sap in BREWING.—The sap or juice of trees not only improves malt liquor, but renders it much cheaper. The sycamore is the best tree for tapping for this purpose; it yields a great quantity, and that without any other trouble than boring a hole properly, and placing a vessel under it. One bushel of malt brewed with this juice will make as good beer as four bushels in the ordinary way. The best way of procuring the sap is this: take a large augre, and with it bore two holes on the opposite sides of the tree, each so deep as to the pith. Each hole is to be bored sloping upwards, and the best place for it is immediately under a large arm of the tree near the ground; and, if the arm be pierced through with the augre in the way to the tree, it will be so much the better: in this manner, there needs no spiggot or stone to keep open the hole, or to direct the course of the liquor, for it will of itself run down into a vessel placed to receive it; and one tree will thus, in a few days, yield a sufficient quantity of liquor to brew with.

In order to preserve the sap in a proper condition for Brewing, what is first gathered must be insolated by a constant exposition of it to the sun, in proper glasses, till the rest be obtained; otherwise the first will contract an acidity that will spoil it. When a sufficient quantity of the sap is thus collected, as much rye-bread must be put into it, cut thin and well toasted, but not burnt, as will serve to ferment it; when it works well, the bread is to be taken out, and, at a convenient time, it is to be bottled up, and will thus afford a pleasant liquor, of considerable strength, without malt or any other addition. Some people add sage to this liquor, baking it in their crusts of rye bread, till thoroughly dry, and then adding it with the bread to the working liquor. If a few cloves be tied up in a rag, and put into the vessels into which the sap is received from the tree, they will preserve it the year round, without any fermentation: they are very apt to give a taste to the liquor; but, if it be so contrived that they are taken out before they give this taste, the liquor will keep well without any flavour of them. The adding a few drops of oil of sulphur will have the same effect; and so will the fuming with sulphur itself. A little spirit of wine, poured on the top of the juice in every bottle, will also be very instrumental in the preserving it.

Many people, instead of adding malt, and Brewing the sap of the sycamore or birch into ale, use raisins, and make a sort of wine of it; and some add sugar. Some have used the rye toasts with very good success, though they were not put into the liquor, but only hung over it, at such a distance as to give warmth and motion to the surface. Common ale-yeast has been tried by some to ferment the juice of the birch; but it usually spoils it, turning the liquor into a very bad small beer. The Flemish wheat ferment would probably in time excel the bottled juice of the birch or sycamore; but it would require a considerable time for it. Cinnamon is worthy to be tried in the stead of cloves, as of an infinitely more agreeable flavour. Honey has no effect on cyder at all; for it will not mix with it, though boiled in it, to make mead; but, after a time, the cyder lets fall the honey, and becomes simple cyder again: it is a question whether it would mix with these juices; but, if it will, it will probably make a great improvement in them. The tops and young leaves of birch, boiled in the sap, are said by some to preserve it. *Philos. Transact.* N°. 146.

BREWING *for Distillation*, implies the extracting a tincture from some vegetable substance, or making a solution of it by hot water, fitted for vinous fermentation.

Such a fermentable tincture or solution is obtainable from any vegetable whatever, under proper management and regulation; but, the more readily and perfectly the subject dissolves, the better it is disposed for fermentation, and the production of spirits. Thus sugar, honey, treacle, manna, and other inspissated vegetable juices, which totally unite with water, into a clear and uniform solution, are more immediate, more perfect, and better adapted subjects of fermentation, than roots, fruits, or herbs in substance, the grains, or even malt itself; all which dissolve but very imperfectly in hot water.

Yet malt, for its cheapness, is generally preferred in England; and brewed for this purpose, much after the common manner of Brewing for beer; only the worst malt is generally chose for distillation; and the tincture, without the addition of hops, and the trouble of boiling, is directly cooled, and fermented.

To brew with malt for distillation in the most advantageous manner, it is requisite, 1. That the subject be well prepared. 2. That the water be suitable and duly applied, and, 3. That some certain additions be used, or alterations made, according to the season of the year, or the intention of the operator.

By an exact regulation in these respects, all the fermentable parts of the subject will be brought into the tincture, and thus become fit for fermentation.

The due preparation of the subject consists in its being justly malted, and well ground. When the grain is not sufficiently malted, it is apt to prove hard and flinty, so that the water can have but little power to dissolve its substance; and, if it be too much malted, a part of the fermentable matter is lost in the operation.

The harder and more flinty the malt, the finer it ought to be ground; and perhaps in all cases, when designed for distillation, it ought to be reduced to a kind of coarse meal. For it is found by experience, that, if it be ground thus fine, good part of the trouble, the expence, and the time usually consumed in Brewing, may be saved, and a greater yield of spirit procured. For thus the whole substance of the malt may all along remain mixed among the tincture, and be fermented and distilled along with it: which is a particular that deserves the attention of the malt-stiller; as he principally consults dispatch, and making the most of his subject, without sollicitously regarding the purity and perfection of the spirit.

The secret depends upon thoroughly mixing, or briskly agitating and throwing the meal about, first in cold, and then in hot water; and repeating this brisk agitation after the fermentation is over: when the thick turbid wash being immediately committed to the still, already hot and dewy with working; there is no danger of burning, unless by accident, even without the farther trouble of stirring: which in this case is found needless, though the quantity be almost ever so large, provided the requisite care and cleanliness be used. And thus the business of Brewing and fermenting may very commodiously be performed together, or reduced to one single operation.

There are some also, who, the better to prepare their malt, sprinkle it, before grinding, with an aqueous solution of nitre, or common salt: for the same purpose others use lime-water; which seems not so well adapted, if the design, besides preventing the avolation of the finer flour in the grinding, be to promote the fermentation, increase the quantity of spirit, or add to its pungent, acid vinosity.

The best or most profitable water for the purpose of Brewing, is that of rain; as being not only very thin, soft, and thence well fitted to extract the tincture of the malt, but also abounding in fermentable parts; whereby it quickens the operation, and adds something to the yield of the spirit. Next to this is that of rivers or lakes, especially such as wash any large tract of a fertile country, or receive the sullage of populous towns; especially if taken up near the place where great Brewing or distilling works are constantly carried on.

But where neither of these waters are commodiously procurable, or only a hard, aluminous, or vitriolic spring-water is to be had; this may be made fitter for the purpose, either by laying a chalk bottom, for it to run upon; or by adding ſome particular preparation to a parcel of it, after it is pumped. A prudent uſe of quick-lime and fixed alkali will in ſuch caſe be of ſervice, and precipitate the offending mineral matter. There are alſo other ſimple preparations, and ſome compoſitions made with the liquor of calcined flints, &c. that anſwer this end ſtill better; but they come too dear to be uſed in that quantity they are here required

Whatever water is made choice of, it muſt ſtand in a hot ſtate upon the prepared malt; eſpecially if a clear tincture be deſigned: but a known and very conſiderable inconvenience attends its being applied too hot, or near to a ſtate of boiling, or even ſcalding, with regard to the hand.

To ſave time in this caſe, and prevent running the malt into clods or lumps, the beſt way is to put a certain meaſured quantity of cold water to the malt firſt, and ſtir that very well in with it, ſo as to form a kind of thin uniform paſte; after which the remaining quantity of water required may be added, in a ſtate of boiling, without the leaſt danger of making what, in the language of diſtillers, is termed a pudding. And thus the proper or preciſe degree of heat, neceſſary to extract the full virtue of the malt, with all advantages, may be very expeditiouſly hit, or aſſigned, to a great exactneſs; as the heat of boiling water is a ſtandard, which may at once be let down to any deſired point of warmth, by a proper addition of cold water; due allowance being made for the ſeaſon of the year, and the temperature of the air. And this little obvious improvement, applied to the method juſt above hinted, for reducing Brewing and fermentation to a ſingle operation, will render it practicable to conſiderable advantage.

The quantity of the water employed muſt be ſuited to that of the malt: the rule is, that a clear tincture, or turbid mixture, be made ſo dilute and thin, as to ferment with eaſe and expedition, yet not needleſsly increaſe the bulk of the whole. Too little water makes a viſcous, clammy, tincture or mixture, ſcarce at all diſpoſed to ferment, before it is let down lower with water; nor can the water ſo clogged extract all the ſoluble parts of the malt: on the other hand, when the tincture is too thin and aqueous, it takes up too much room, and adds to the trouble and expence of all the parts of the operation. A due medium therefore is here to be choſe: and, in general, the goodneſs or richneſs of the malt-ſtillers waſh ſhould be much the ſame as of the weakeſt French wines, or that ordinarily deſigned by the brewers of London for ten ſhilling beer. But, if a more exact ſtandard is required, recourſe muſt be had to the eſſay-inſtrument, water-poiſe, hydroſtatical balance, or other methods of trying the ſtrength of ſolutions, and finding their ſpecific gravity or tenacity: which afford a ſurer rule than that obtained by weighing the malt and meaſuring the water, becauſe of the different goodneſs of different parcels of malt, and the accidents of the operation. But, if a fine ſpirit be the thing in view, it is much better to make the waſh too weak, than in the leaſt too rich.

Under the right application of the water, muſt alſo be conſidered the proper manner of agitating the maſs; ſo that all the parts of the aqueous fluid may come fully and frequently in contact with all the ſoluble particles of the ſubject: and when once the water is thus well ſaturated, by ſtanding the proper time, it is to be drawn off, and freſh poured on: and the agitation repeated, till at length the whole virtue, or ſaccharine ſweetneſs of the malt, is extracted and nothing but a fixed huſky matter remains behind, uncapable of being farther diſſolved by the action of hot or boiling water; or of being advantageouſly waſhed, or rinſed by the bare affuſion of cold. This artificial and external agitation is requiſite, as well in the ordinary way of Brewing, as the ſhorter above-mentioned; and may to advantage be repeated more than once in both caſes, towards the beginning of the operation, and at each affuſion of freſh water; but eſpecially in the ſhort method which has a great dependence thereon.

The difference of ſeaſons is found to require ſome alteration in the direction and management of the buſineſs of Brewing: thus it is particularly found neceſſary to uſe the water colder in the ſummer, than in winter; to cool the tincture ſuddenly in cloſe ſultry weather, leſt it ſhould turn eager; and to check the too forward diſpoſition which malt has to ferment, when the air is hot, by a ſuitable addition of unmalted meal; which, being much leſs diſpoſed to fermentation than malt, thus helps to reſtrain and moderate its impetuoſity, ſo as to render the operation ſuitable and effectual to the production of ſpirit, that might otherwiſe, in great meaſure, be diſſipated and thrown off by an over-haſty and violent fermentation; eſpecially when the warm air is ſuffered freely to come at the fermenting liquor. Others, for the ſame purpoſe, uſe rye-meal; but this gives the ſpirit a moſt diſagreeable and nauſeous flavour, not eaſily to be got off or altered to advantage, by any known method of rectification.

It has likewiſe been thought of ſervice, in general, or at ſome particular ſeaſons eſpecially, to acidulate the water employed in Brewing, with a ſmall proportion of ſome vegetable, or light mineral acid; which is ſuppoſed to curb and regulate the fermentation of the tincture, improve the acid vinoſity of the ſpirit, and occaſion ſome ſmall increaſe of its quantity; and, with the ſame view, common ſalt, nitre, and tartar have likewiſe been employed in the manner hinted above.

The particular intention of the operator may render various other additions neceſſary: thus ſome, to improve the tincture, and diſpoſe it to yield more ſpirit, or to give it a particular flavour, add ſtrong and pungent aromatics in the Brewing; chuſing the cheapeſt for this purpoſe, ſuch as gran. paradiſ. cort. winteran. ginger, &c. But, in the common way, it is to be feared theſe additions do not effectually anſwer the intention; becauſe a particular encheireſis is requiſite to make the practice advantageous. Upon this foundation ſtands a very inſtructive method, uſed abroad for preparing geneva ab origine, by mixing the bruiſed berries of the Juniper among the malt, and Brewing them together; whence they procure a compound tincture, which, by fermentation and diſtillation, affords a ſpirit much more intimately and homogeneouſly impregnated with the fine eſſence of the berry, than that prepared in the common way of diſtillers.

The inconveniences that attend the Brewing directly with malt, are very conſiderable; the malt being of a very large bulk in proportion to the ſoluble, ſaccharine, or truly fermentable parts it affords; whence numerous large veſſels, much labour, and conſequently great expences are required to conduct and manage ſuch a buſineſs in the large way. The remedy here, as in all other caſes, may be much eaſier ſtarted than effectually applied. However, the foundation for it ſeems to reſt in practically reducing the perplexed buſineſs of the malt-ſtiller to the ſimple buſineſs of the fine-ſtiller; or, in other words, in reducing malt to a treacle. The thing in itſelf may be done to perfection; but how, in the large way, it will anſwer as to expence, muſt be left to thoſe who think it worth their care to conſider. The experiment is no more than this; when a parcel of wort, brewed in the common manner, is become fine by ſtanding, let it be decanted clear, and directly boiled in a common copper, till it begins to inſpiſſate or change a little towards a brown or duſky colour: at which time it muſt be directly emptied, into a balneum mariæ, where it may be exhaled to the full conſiſtence of treacle; which is a proper form to preſerve it in, till occaſion calls for it.

If the operation were finiſhed in the copper, the matter would be in great danger of burning, or unavoidably contracting an empyreuma, that could ſcarce ever be got off again; whence the whole might come to be abſolutely unfit for the purpoſe: or, if it eſcaped this accident, it would ſtill, through the unſuitableneſs and violence of the heat, or fire, now acting immediately upon the containing veſſel, be greatly indiſpoſed to ferment; ſo as, if it fermented at all, not to yield one fourth of the ſpirit the wort itſelf would otherwiſe have afforded.

But if the operation be dextrouſly and carefully performed, which perhaps is not quite ſo eaſy a thing as it may at firſt ſeem, the ſaccharine matter, though of as full a body, will be abundantly paler than treacle, a little more glutinous, very ſweet, pleaſant, and finely bitter, though no hops were uſed in the preparation. In this ſtate it will keep long, without any alteration; and remain capable at all times of being brought back by water to a wort again, that will ferment fully, and yield a ſpirit after the manner of treacle.

If upon full experience this method ſhall be found advantageouſly practicable in large, plentiful years, convenient ſituations, proper helps, &c. may be pitched upon for ſetting up a new trade of treacle-making, for the diſtillers at leaſt; if it ſhall not be found farther practicable to turn this new treacle into potable liquors or ſugars: which might poſſibly, under due regulation, lay the foundations of a work not unlike the ſugar-works of our plantations, though manageable with abundantly leſs trouble and expence.

When once the fermentable parts of vegetables are thus concentrated, and brought together into a ſmall compaſs, the buſineſs of Brewing becomes very facile; as being now no more than mixing, diſſolving, or ſufficiently diluting the inſpiſſated juice with lukewarm water: whence the ſolution, either alone, or with additions, is now perfectly fitted for fermentation. See FERMENTATION in the Dictionary and Supplement.

BRICKS (*Dict.*)— Bricks, among us, are various, acquiring various forms, dimenſions, uſes, method of making, place where, &c. Thoſe from their form, are compaſs Bricks, of a circular form, uſed in ſteyning of walls. 2. Concave or hollow Bricks, on one ſide flat, like a common Brick, on the other, hollowed. They are uſed for the conveyance of water. 3. Feather-edged Bricks, which are like the common ſtatute Bricks, only thinner on one edge, than the other, and are uſed for penning up the Brick-pannels in timber-building. 4. Triangular Bricks.

Thoſe from their dimenſions are, the great and ſmall, or ſtatute, and didoron, tetradoron, and pentadoron.

Great Bricks, are twelve inches long, ſix broad, and three thick; the weight of one is about fifteen pounds, ſo that a hundred will weigh fifteen hundred pounds, and a thouſand of them fifteen thouſand pounds.

Thoſe from cuſtom, are, ſtatute and cogging Bricks.

Statute Bricks, are thoſe whoſe dimenſions are conformable to the ſtatute, viz. nine inches in length, four and a half in breadth, and two and a quarter in thickneſs.

Cogging Bricks are uſed for making the indented work under the coping of walls built with great Bricks.

Thoſe from the method of making, are place and ſtock Bricks. Place Bricks, are ſuch as are made in a place prepared on purpoſe for them, near the building they are to be uſed in. Theſe are uſually ſmall common Bricks, and ought to be nine inches long, four and a half broad, and two and a half thick. Stock Bricks are thoſe made in a mould, and burnt in a kiln. Theſe are alſo Dutch, or Flemiſh Bricks, which are uſed in paving yards, or ſtables, and for ſoap-boilers fats and ciſterns.

Thore from their uſe, are buttreſs or pilaſter, coping and paving Bricks. Buttreſs or pilaſter Bricks, are of the ſame dimenſions with the great Bricks, only they have a notch at one end of half the breadth of the Brick. Their uſe is to bind the work at the pilaſters of fence-walls which are built of great Bricks. Coping Bricks are formed on purpoſe for coping-walls; paving Bricks, or tiles, are of ſeveral ſizes in ſeveral counties and places.

Thoſe from accident, are clinkers, ſamel, or ſandal. Clinkers are ſuch Bricks as are glazed by the heat of the fire, in making. Samel or ſandal Bricks, are ſuch as lie outmoſt in a kiln or clamp, and conſequently are ſoft and uſeleſs, as not being thoroughly burnt.

Manner of making Stock BRICKS.— They chuſe a piece of earth, called haſle-mold, or ſtiff loam, with a mixture conſiſting of a little ſand and a great deal of earth, without any clay.

Some little time before Chriſtmas they begin to dig as deep as the earth allows, laying it as level as poſſible, and end before Candlemas, that it may lie to mellow; that is, that the hard lumps may fall to pieces, which they will do either by the help of rain or froſt; when it is thus dug, they let it lie till Lady-day or Eaſter, when they have commonly fair weather. Then they water the earth well, and temper it with a narrow ſpade about five inches broad, with which they dig it down, and then temper it with their feet till it is in good caſe to make a Brick, that is, like a piece of dough, ſuch as will juſt ſtick in the mold or frame when lifted up, and not fall off of itſelf: they then bring to the earth a table ſtanding upon four legs, about three feet high, five feet and a half long, and three feet and a half over, and load it with as much as it will well bear at the right-hand end about half way; at the other end are boards nailed about nine inches high to lay ſand in, and in the middle they faſten with nails a piece of board, which they call a ſtock; this ſtock is about half an inch thick, and juſt big enough for the mold to ſlip down upon: the mold or frame is made of beech, becauſe the earth will ſlip eaſieſt from it. This mold, frame, or voider is made of the bigneſs of the Brick, only half an inch deeper, to give way for the ſtock aforeſaid; and it muſt be ſhod with a thin iron of half a quarter of an inch thick, both at the top and bottom, and this keeps it from breaking and wearing out: they alſo have upon the table, before the mold or frame, a little trough, that will hold about three or four quarts of water, and in it a ſtrike to run over the mold to make the Bricks ſmooth. This ſtrike is uſually made of fir, nine inches long, an inch and a half broad, and half an inch thick: they have alſo, on a little form juſt by the ſand-bin, about thirty little pieces of board twelve inches long, ſix inches over, and half an inch thick, called pallat-boards. When they are thus prepared with utenſils, one man ſtrews ſand on the table and moulds the earth upon it; then rubbing the ſtock and inſide of the mold with ſand, with the earth he forms a Brick, ſtrikes it, and lays it upon the pallat; then comes a little boy, and takes away three of theſe Bricks and pallats, and lays them upon a hackſtead, a raiſed place like a balk in a field, or a border in a garden; which is a piece of ground five or ſix rods long, two feet over, with a gutter on each ſide about a foot deep, and as wide a top; which is made by digging half a foot deep, and the earth that comes thence raiſes the hackſtead: this hackſtead muſt be well beaten, that it may be ſmooth, level, and hard, and upon it the boy lays his Bricks edgeways, the thickneſs of the pallats one from another, on each ſide of the hackſtead a row, and ſo that the heads of each row may be two or three inches aſunder, when they are pretty hard, which in dry weather will be in a day; then the boy lays another courſe croſsways, till they come to be ten courſes high, when they are covered with ſtraw till they are hard and dry, which uſually is in three weeks or a month, and then they burn them. One perſon, without a man to temper, or boy to carry them away, but to temper and lay them himſelf, will make a thouſand in a ſummer's day, viz. about fourteen or fifteen hours; but with a man to temper, and a boy to carry them, and lay them as above, he will make two thouſand, and an extraordinary man three thouſand in a day; and the uſual price for this tempering, making, and laying, is four ſhillings per thouſand, of which the maker has one half, and the temperer and the boy the other.

The Bricks being thus prepared, they are next burnt; for the method of which, ſee BRICKS, in the Dictionary. *Hought. Collect.*

Manner of making Place BRICKS.— Theſe are generally made in the eaſtern parts of Suſſex, and are ſo called, becauſe there is a place hard by, where they ſtrike or mold their Bricks, which is a level ſmooth piece of ground, prepared for the bearer-off (i. e. him who carries the Bricks from the ſtriker) to lay them down ſingly in rows (which are by them called ricks) as ſoon as they are molded; where they are let lie until they are a little dried, viz. until they are ſtiff enough to be turned on their edges, and dreſſed (i. e. until their inequalities are cut off) and, when they are dried, they carry them to the hacks (or places where they are rowed up like a wall of two Bricks thick, with ſome ſmall intervals between them, to let in the wind and air to dry them.) When the hack is filled, they cover them with ſtraw on the top, till they are dry enough to be carried to the kiln to be burnt.

Worlidge, and others after him, have laboured to excite Brick-makers to try their ſkill in making a new ſort of Brick, or a compoſition of clay and ſand, whereof to form window-frames, chimney-pieces, door-caſes, and the like. It is to be made in pieces faſhioned in moulds, which, when burnt, may be ſet together with a fine red cement, and ſeem as one intire piece, by which may be imitated all manner of ſtone work.

The thing ſhould ſeem feaſible by the earthen pipes made fine, thin, and durable, to carry water under ground at Portſmouth, and by the earthen backs and grates for chimneys, formerly made by Sir John Winter, of a great bigneſs and thickneſs.

In reality, much might be done towards making chimney-pieces, ſtone-mouldings, architraves, faſcias for fronts of buildings, and the like, if men of this profeſſion had a little tincture of chemiſtry, which would enable them to contrive ſome good compoſition of earth, and a proper way to manage it in the moulding, burning, &c. Might not even a compoſition, ſomething like common crockers earth, in ſome meaſure, anſwer the deſign? It is apparent, into whatever form the crockers put their earth, it retains it after drying and burning, although the crocks be very thin. If chimney-pieces, thus made in moulds, and dried and burnt, were not found ſmooth enough, they might be poliſhed with ſand and water: or, were care taken, when they were half dry, in the air, to have them poliſhed with an inſtrument of copper or iron, and then leave them till they were dry enough to burn, it is likely they would not want much poliſhing afterwards. The work might even be glazed, as potters do their fine earthen ware, either white, or of any other colour; or it might be veined in imitation of marble, or be painted with figures of various colours, which would be much cheaper, and perhaps equally durable, and as beautiful as marble itſelf. *Neve, Builder's Dictionary.*

BRICKS, or BRIQUES, in heraldry, are figures or bearings in arms, reſembling a building of Bricks; being of a ſquare form, like billets and tablets, from which they only differ in this, that they ſhew their thickneſs, which the others do not. *Coat. Dict. Herald.*

BRICKLAYER, an artificer whoſe buſineſs is to build with bricks, or make brick-work. See the articles BRICKS and BRICKLAYING.

Bricklayers work or buſineſs, in London, includes tiling, walling, chimney-work, and paving with bricks and tiles. In the country, it alſo includes the maſons and plaiſterers buſineſs. *Neve, Build. Dict.*

There is ſome diſpute, as to the point of priority, between the white maſon, or hewer of ſtone, and the red maſon, or hewer of bricks: ſcripture, it ſeems, favours the latter, making mention of making bricks, before any account of hewing or digging of ſtones. *Moxon's Mechan. Exerc.* See the article MASON.

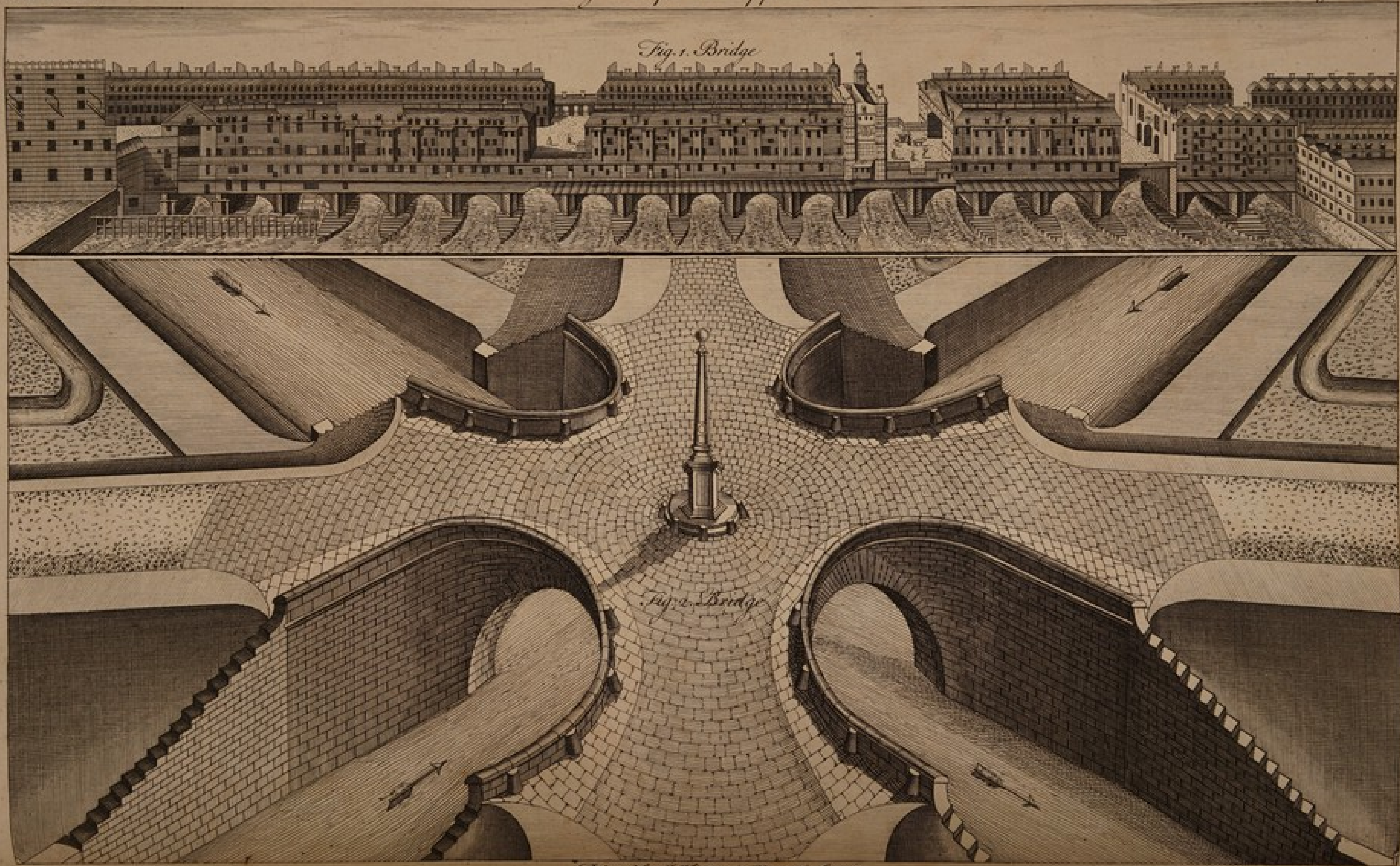
The materials uſed by Bricklayers, are bricks, tiles, mortar, laths, nails, and tile-pins.

Their tools are, a brick trowel, wherewith to take up mortar; a brick ax, to cut bricks to the determined ſhape; a ſaw, for ſawing bricks; a rub-ſtone, on which to rub them; alſo a ſquare, wherewith to lay the bed or bottom, and face or ſurface of the brick, to ſee whether they be at right-angles; a bevel, by which to cut the under ſides of bricks to the angles required; a ſmall trammel of iron, wherewith to mark the bricks; a float-ſtone, with which to rub a moulding of brick to the pattern deſcribed; a banker, to cut the bricks on; line-pins, to lay the rows or courſes by; plumb-rule, whereby to carry their work upright; level, to conduct its horizontal; ſquare, to ſet it off at right-angles; ten feet rod, wherewith to take dimenſions; jointer, wherewith to run the long joints; rammer, wherewith to beat the foundation; crow and pick-ax, wherewith to dig through walls. *Moxon, Ib. cit. p.* 245 *& ſeq.*

The London Bricklayers make a regular company, which was incorporated in 1568, and conſiſts of a maſter, two wardens, twenty aſſiſtants, and ſeventy-eight on the livery. *New View of London.*

Tilers and Bricklayers were incorporated, 10 Elizabeth, under the name of maſter and wardens, of the ſociety of freemen of the myſtery and art of tilers and Bricklayers.

PLATE VIII. *Engraved for the Supplement.* *Facing* Bridge



Printed for J. Hinton in Newgate Street.

The universal call for this trade is so well known to every one, that little need be said of it.

This, however, is to be observed, that it is mostly an out-door business, much exposed to the weather, by which they are often hindered from working.

As to the work itself, it is not very difficult to be learned, nor laborious (for they have labourers to do their heavy work) but handy and ingenious in contriving. With respect to the masters, most of them live handsomely: and some, who employ many hands, and undertake large works, commonly called master-builders, obtain good estates; but then they are such, who not only have money at command, but take great pains to qualify themselves for projecting, drawing plans, surveying and estimating buildings.

BRICKLAYING, the art of building edifices with bricks.

The following directions, with regard to the best method of laying bricks, have been recommended by experienced workmen.

1. Take care to procure good strong mortar. See the article MORTAR, *Dict. and Sup.*

2. If your bricks are laid in winter, let them be kept and laid as dry as possible. If they are laid in summer-time, it will quit cost, to employ boys to wet them; because, being wetted, they will unite much better with the mortar, than if they were laid dry, and will render the work much stronger.

But if it shall be objected, that, if the building be large, it will be a great deal of trouble to wet all the bricks, by dipping them in water; and also that it will make the workmen's fingers sore in laying them.

To prevent these inconveniences, water may be thrown on each course of bricks after they have been laid; as is said to have been done by the order of the ingenious Mr. Robert Hook, the surveyor at the building of the Physicians-college in Warwick-lane.

3. If bricks are laid in the summer-time, do not fail to cover them, to prevent their drying too fast; for, if the mortar dry too hastily, it doth not cement so firmly to the bricks as when it dries leisurely.

4. If the bricks are laid in the winter-time, take care to cover them well, to defend them from rain, snow, and frost; the last of which is a mortal enemy to all mortar, especially to all such as has taken wet just before the frost seizes it.

5. Take care that bricks be not laid joint in joint on the middle of walls, but as seldom as may be; but let there be good bond made there, as well as on the outsides: for some workmen, in working a brick and half wall, lay the header on one side of the wall, perpendicular on the other side of the wall; and so all along through; which, indeed, necessarily follows, from the unadvised setting up of the quoin at a toothing; for it is common to tooth in the stretching-course two inches with the stretcher only; and the header on the other side to be perpendicular over the header on this side; which causes the headers to lie joint in joint in the middle of the work.

Whereas, if the header on one side of the wall were toothed as much as the stretcher on the other side, it would be a stronger toothing, and the joints of the headers on one side would be in the middle of the headers of the course they lie upon on the other side.

All that can be pretended in excuse of this ill practice in working thus, is this: that the header will not hang two inches over the bricks underneath it.

This, indeed, is an objection: but yet the inconveniency may be avoided without much difficulty, viz. as follows: by having a piece of wood of the thickness of a course of bricks, and two inches broad, and laying it on the last toothing-course, to bear it; or a brick-bat, put upon the last toothing, will bear it till the next quoin is set upon it, and then the bat may be taken away.

6. The same inconvenience at an upright quoin in a brick and half wall; where it is usual to lay a closer next the header, on both sides of the walls; and, in so doing, it is joint in joint all the length of the wall, except, by chance, a three-quarter bat happen to be laid.

In order to avoid this inconveniency, and by that means to make the wall much firmer, lay a closer on one side; but lay a three-quarter bat on the stretching-course, and join a header next to the header at the quoin, in the heading-course.

7. Also, in two brick-walls, it will be the best way in stretching-courses, in which stretching is laid on both sides the walls next the line, to lay also stretching in the middle of the wall, and the closers next to each stretching-course which lies next the line.

BRIDGE (*Dict.*)— The ancients built many stupendous structures of this kind: and the remains of several of them over the Tyber are still to be seen at Rome.

The emperor Adrian caused the first to be built, which is the Pont Ælius, at present called Pont St. Angelo, or Angel's Bridge, the finest of all those that are at this day at Rome. It was called the Bridge Angelo, on account of an angel pretended to have been seen at the entrance of it. It was garnished on the upper part with a covering of brass, supported by forty pillars of the same.

The second was the Triumphal Bridge, of which the ruins are still to be seen in the river Tyber. Over this Bridge the emperors and consuls used to pass, when they had a triumph decreed them; which was at that time adorned with all imaginable art.

The third was the Pons Janiculensis, at present called Sixtus's-Bridge; because pope Sixtus IV. caused it to be rebuilt in the year 1475. This Bridge was antiently built of marble.

The fourth was that called Pons Cæstius; at present, St. Bartholomew's-Bridge; which was re-edified in the time of the emperor Vespasian.

The fifth was that named Fabricius, or Tarpeius; at present called Ponte Caspi, or Quatro Capi.

The sixth was the Senatorian, or Palatine Bridge, now called Sancta Maria.

The seventh was the Pons Horatius, or Sublicius; one of the finest Bridges of Rome, and of which the ruins are still to be seen in the Tyber, and which has not yet been re-edified.

An Italian author in his works concerning the antiquities of the city of Rome, has given a full account of the elevation, &c. of this celebrated structure.

The figure of it seems extraordinary and fantastical: to see a second Bridge raised over a first, and, in a like work, columns and other ornaments of architecture over that; so that it appeared more like a triumphal arch, or portico, than a Bridge. This Bridge was demolished in the reign of the emperor Otho, but rebuilt by Antoninus Pius.

The eighth and last was that without the city of Rome, and about two miles distant; which was called Milvius, in the Flaminian Way.

Besides these Roman Bridges, we have modern ones, which are not without their merit.

Among those of France, may be reckoned those of Avignon, of Saint Esprit, and of Lyons upon the Rhone. The first of these is demolished; there remaining only some arches on the side of Avignon.

The second is still subsisting, and may be said to be one of the finest Bridges in the universe. One thing particular in these three Bridges, is, that their plan is not in a straight line, especially those of Avignon and Saint Esprit.

The angle is little sensible in that of Lyons, but nevertheless perceivable; and is on the upper side of the stream.

But, as for the two preceding, it is certain, that they have an angle, or a sort of bending, the convexity of which opposes the waters of the Rhone, as though being by this disposition centered, and are bouted, the better to resist the weight and current of the waters.

The Bridge of Avignon was composed of eighteen arches, in length one thousand three hundred and forty paces, making about five hundred fathoms. It was begun in the year 1176, and finished in 1188.

The schism between Benedict and Boniface was fatal to it in the year 1385; but a greater calamity happened to it in the year 1602, by the negligence of repairing one arch fallen down, which caused the fall of three others. In fine, in the year 1670, the cold was so violent, that the Rhone was frozen so as to bear waggons with the heaviest loads for several weeks; and, upon the thaw happening, such mountains of ice dashed against the piers, as shook them, and caused several arches to fall down.

But, nevertheless, the third pile on Avignon side, with the chapel of St. Nicholas built upon it, has always borne up against all accidents.

Pont Saint Esprit is finer and more bold than that of Lyons, or Avignon: it consists of nineteen great arches, besides seven smaller ones. It has arches from fifteen to twenty fathoms, opening, rather more than less, which make the length of the Bridge upwards of four hundred fathoms.

The Bridge of Lyons, upon the Rhone, has twenty arches. It is observed farther of these Bridges, that they are defended by towers to secure the passages.

Among the fine Bridges of France, are reckoned the Pont Royal of the Thuilleries, that of Tolouse upon the Garonne, and one arch of Pont-Neuf at Paris.

But the most famous Bridge in France is that of four arches built on the section of two navigable canals, and may be looked upon as a very great improvement in architecture.

This famous Bridge is situated on the section of the canals of Calais and Ardres, on the new road between Calais and St. Omer. By its ingenious contrivance it has centered to a single point the navigation of four different canals, the passage of a great road, and the communication of the four principal parts of the country, which, before the building of it, were separated, and could not be joined without making several Bridges, whereas this alone answers the end. The eight banks of these canals, besides the use in drawing of the boats, serve likewise for the conveniency of carriages to and from the adjacent parts, and one may perceive twelve different ways leading to the center of the Bridge which facilitates the commerce and the carriage of provisions to the neighbouring towns, as well as for carrying manure, &c. to the lands; whereas, before, the farmers were obliged to transport their

grain,

grain, and to be at annual expences and great losses, by loading and unloading their commodities at different places.

The invention of this Bridge is owing to M. Barbier, engineer of Bridges and causeys, who contrived it in 1747, when he was impowered by the generality of Picardy for carrying on works of this kind.

The court having approved of his plan, the execution of it was committed in 1750 to M. Bessara, engineer in the same generality, who brought it to its present perfection. See a perspective view of this celebrated Bridge, *Plate* VIII. *fig*. 2.

This Bridge is formed of four circular arches, over which rises a vault, and over the center a semi-spheroid vault, one and twenty feet high, which is penetrated with the four arches for the passage of boats, &c.

England can boast of several fine Bridges, particularly that over the Thames at Westminster; a full account of which we have given under the article BRIDGE, in the Dictionary.

London-Bridge was begun in the reign of Henry II, in the year 1176, and finished in the reign of king John, in the year 1209. Since that time, it has been divers times burnt, and ruined by ice, and as often repaired, or re-built. The king and the city contributed to the charge. This Bridge is made of hewn stone: it has nineteen arches of a hundred and twenty-five fathoms, Paris measure, or eight hundred feet long, and thirty or twenty-eight feet and one eighth broad. Some say sixty or fifty-seven feet one quarter; for the London foot is fourteen sixteenths of that of Paris. In height, on the two sides of the Bridge, are built two rows of stately houses; and a considerable fund is settled for the maintaining it. This Bridge is continually assaulted by the flux and reflux of the tide. Large vessels, which come up to the Thames, do not go above the Bridge; but small ones pass through it. Its piers are perfectly well guarded by starlings. See a perspective view of this structure, *Plate* VIII. *fig*. 1.

When any one projects a Bridge, he ought to begin,

1. With making an exact local plan; which plan shall precisely lay down the extent of the water, the sands, if it has any, the banks, or brinks of the river, and the ways or streets that abut upon this Bridge.

2. He must project upon this plan the Bridge designed, whether of masonry, or carpentry; with the number of arches, and quantity of piles, bays, or joists. He must always lay down the Bridge over the river upon the square, and never slanting.

3. He must, upon this plan, trace a line which shall cut the Bridge in the middle, and there found the depth of the water from fathom to fathom, or from two to two, or from three to three, according as there shall be occasion.

This founding is to be made either by a pole, divided into feet, at the end of which is a leaden weight, according as the current of the water shall require.

If this shall not be sufficient, he must make use of a cannon-ball, put into a little bag, tied to the end of a cord, which has been before divided into feet and fathoms.

He must make use of these, or other methods, which shall be found to be most proper, according to the rapidity of the water that is to be surmounted.

All this is to be done by means of a boat, which may be conducted in different manners; either by a cable, which is carried a-cross the river, or by other cords made fast to trees, or stakes on the bank, or to stakes drove down for that purpose; round which the cable that is to hold it is to be many times turned, and slackened, according as occasion requires, to guide the boat more to one side than the other.

4. The foundings of the water being made, and set down on the plan, they serve for making a profile of the river, which marks or sets out the depth of the water that has been found; and the line under the water, whether it be sandy or rocky, to which attention must be given, marking the difference on the profile.

Upon this profile is marked by a line the depth of the water, at the lowest it is at any time of the year, which the Bridge-masters of great and navigable rivers will acquaint you with; and the peasants or inhabitants of the neighbouring places to small rivers will inform as to the height of those inundations, which have happened in their memory.

These may also be drawn in the profile, which shall shew the a mean of the height of the waters.

All these lines being drawn by a perfect level, parallel the one to the other, may be washed with a water colour.

5. The profile being thus raised, a founding-iron may be made, of a convenient length, for founding below the depth of the water, the ballast, or sand; and no certainty can be attained till this is done, and the depth of the water be known: and, in order to this, there are two methods used, either by a founding instrument of iron, made on purpose, having a large ring at its head for a crowning, cross which there goes the arm of a borer, larger or smaller, in order to turn it with; and having at the top a head to be driven down, to make it enter till it comes to a firm bottom below the sands.

This founding-iron is made pointed and barbed at the end with four angles; so that being bored or forced through the sand or part of the rock, or solid ground, that it meets with below the sand, by being turned several times, in order to bring up in the hollows of the barbs some small quantities of the solid ground it meets with, and thus being drawn up, the quality of it is to be entered down in the memorial that is provided for this purpose, in order to know what kind of ground the bottom is.

There are instruments for founding of another sort, which have a little pocket in the form of a snail-shell at the end in the shape of a borer, which receives nothing but sand in turning one way, and the earth under the sand by turning it the other.

These founding instruments must be all of one piece, that they may be as strong as possible; sometimes they are adjusted according to the hardness or easiness of the ground to be penetrated; sometimes they are of no use, especially when the sand is too gross, and meets with flints that the founder cannot remove.

In this case, they make use of a stake of oak made round, of the straightest piece of a tree of three, four, five, or six inches diameter; which having determined to what depth of the earth they would found, they arm with a lardoir, or pointed iron at the end, for removing the flints; with a ferrel at the head, to be able to resist the strokes of a beetle with two or three helves, with which the founder is driven down.

All this requires a great deal of pains, care, and expence too; but the satisfaction of doing the work well, and making a faithful relation of it on the profile, of the depth of the sand or gravel that is to be piled, or which ought to be removed for the foundation of the piles, in order to settle the dams necessary, will make amends for them; and, so long as a person is ignorant of the depth, he can neither project a Bridge, nor know how to compute the expence, since he cannot tell what timber it will take up, nor what precautions ought to be taken for securing the work.

6. When a knowledge of the consistence of the ground has been obtained, as whether sand, earth, rock, &c. then a person may proceed with safety upon the profile he has made, to lay down the projection of the Bridge, whether of masonry or carpentry; then the length and thickness of the piers and piles may be known, according as the foundation must be more or less in depth.

7. This being done, and the height of the highest inundations being known by the information of the oldest neighbouring inhabitants, marks are to be made at this height; and supposing three feet upwards to be the intradosse, or inward face of the arches of the Bridge that one would lay down a projection of, and also the bays, joists, beams, &c. of a wooden Bridge, which is the same: the work may be so regulated, that it may be known to what height the greatest inundation will rise, and to what depth the foundation of the piles, &c. must be carried.

8. The next thing to be done, is to provide the materials which are to be employed in the work.

For a stone Bridge. It ought to be considered from whence the free-stone may be had, its distance, the easiness or difficulty of cutting it, its carriage, its nature, as to its being strong or weak, in regard to the effort it is to sustain, being pressed by the reins of the arches, if it will be able to sustain the weight; for there are some stones so tender, especially having been but lately taken out of the quarry, as one may say bleeding, that they will crack, split, or shiver to pieces.

As to the lime, it is to be considered from whence that is to be had, its nature, and when it takes hold, whether as soon as it is used, or a long time after; the wages of workmen, the cheapness and conveniency of having provisions, the conveniency of the place, and number of the workmen required to finish the work in a certain time, before the rains of autumn, which make rivers overflow; and many precautions are necessary to be taken, that cannot well be enumerated.

For a Bridge of carpentry. The builder must inform himself from whence the timber must be had: if it be found and good; the time for procuring it; the charge of it, as to what it will cost, laid down at the place; what quantity must be fashioned for piles, and what for centers, scaffolding, &c. that all the materials may be ready in time, to begin the work without hindrance, and to be able to finish it before the contrary seasons for the compleating of the Bridge commence. See PLANS *of Bridges*.

BRIGA'DE-*Major*, in the military art, an officer chosen from among the most ingenious and expert captains. Brigade-majors are to wait, at proper times, to receive the word and orders which they carry first to their brigadier, and afterwards to the adjutants of regiments at the head of the Brigade, where they regulate together the guards, parties, detachments, and convoys, and appoint them the hour and place of rendezvous at the head of the Brigade, where the Brigade-major takes and marches them to the place of the general rendezvous. A major of Brigade ought to keep a roll of the colonels, lieutenant-colonels, majors, and adjutants, belonging to the Brigade. When a detachment is to be made, the major-

major-general of the day regulates with the Brigade-majors, how many men and officers each Brigade shall furnish; and they again with the adjutants of the regiments, how many each battalion is to send, which the adjutants divide among the companies. The complements each regiment is to furnish, are taken by the adjutant at the head of each regiment, at the hour appointed, who delivers them to the Brigade-major at the head of the Brigade, who again delivers them to the major-general of the day, and he remits them to the officer who is to command the detachment. *Vide Bland's Milit. Discipl.*

BRI'MSTONE-*Marble*, a preparation of brimstone in imitation of marble.

To do this, you must provide yourself with a flat and smooth piece of marble; on this make a border or wall, to encompass either a square or oval table, which may be done either with wax or clay. Then having provided several sorts of colours, as white-lead, vermilion, lac, orpiment, masticot, smalt, Prussian blue, &c. melt on a slow fire some Brimstone, in several glazed pipkins; put one particular sort of colour into each, and stir it well together; then, having before oiled the marble all over within the wall, with one colour quickly drop spots on it, of a larger and less size; after this, take another colour and do as before, and so on, till the stone is covered with spots of all the colours you design to use. When this is done, you are next to consider what colour the mass or ground of your table is to be; if of a grey colour, then take fine sifted ashes, and mix it up with melted Brimstone; or, if red, with English red oker; if white, with white-lead; if black, with lamp or ivory-black. Your Brimstone for the ground must be pretty hot, that the coloured drops of the stone may unite and incorporate with it. When the ground is poured even all over, you are next, if judged necessary, to put a thin wainscot board upon it: this must be done while the Brimstone is hot, making also the board hot, which ought to be thoroughly dry, in order to cause the Brimstone to stick the better to it. When the whole is cold, take it up, and polish it with a cloth and oil, and it will look very beautiful. *Smith's Laboratory.*

BRIMSTONE *Medals, Figures*, &c. are cast in the following manner: melt half a pound of Brimstone over a gentle fire; with this mix half a pound of fine vermilion, and, when you have cleared the top, take it off the fire, stir it well together, and it will dissolve like oil; then cast it into the mould, which must first be anointed with oil. When cool, the figure may be taken out; and, in case it should change to a yellowish colour, you need only wipe it over with aqua-fortis, and it will look like the finest coral.

BRINE-*Pans*, the pits wherein the salt water is retained, and suffered to stand, to bear the action of the sun, whereby it is converted into salt.

There are divers sorts of salt-pans, as the water-pan, second-pan, sun-pan; the water being transferred orderly from one to another. *Coll. Disc. of Salt and Fish.*

BRINE-*Pit*, in salt-making, the salt spring from whence the water to be boiled into salt is taken. There are of these springs in many places; that at Namptwich in Cheshire is alone sufficient, according to the account of the people of the place, to yield salt for the whole kingdom; but it is under the government of certain lords and regulators, who, that the market may not be overstocked, will not suffer more than a certain quantity of the salt to be made yearly. *Ray's Engl. Words.* See the article PIT.

Leach-BRINE, a name given to what drops from the corned salt in draining and drying, which they preserve and boil again; being stronger than any Brine in the pit. *Hought Collect.*

BRI'STLE, the strongest hair standing on the back of a hog, or a wild boar.

Hog Bristles are put to several uses, particularly in making several sorts of brushes: they are commonly sent in barrels or hogsheads, in parcels of several sizes, which are sold by weight. Wild boar's bristles are much stronger than hog's, and are much more valued, but then they are also much dearer. Shoemakers, harness-makers, sadlers, and others, use them, putting one of them as a needle or awl at the end of their thread, to sew their work.

There is a great deal of this commodity imported from Muscovy and Livonia, by the way of Hamburgh and Holland; whence it is sent away in small parcels tied in the middle, and put in little deal boxes about a foot long, and two or three inches broad: it is commonly sold by weight.

Bristle, both of hogs and wild boars, is part of the ironmongers trade in France, who buy it by wholesale, and sell it by retail, to such workmen as make it into brushes, &c. or have occasion for it in their own way of business.

BRITA'NNICA, in the materia medica of the ancients, the name of a plant described as having leaves of a dark colour, very large, and in shape resembling those of the common wild dock, but somewhat hairy, and of an astringent taste; the root small and slender, and the stalk not large. This is the description of Dioscorides, who attributes to its inspissated juice great virtues, as an astringent, and a remedy for ulcers of the mouth and tonsils; and Pliny acquaints us of its prodigious efficacy in a distemper attending the army of Germanicus, who, when they had crossed the Rhine, encamped in a place where there was only one spring of water, the drinking of which affected them in a terrible manner in their mouths, and made their teeth drop out; and that the physicians, who called the disease stomacace and scelotyrbe, were at length directed to a remedy by the Frisians who were in their camp, which was the herb Britannica.

The virtues attributed to this plant are observed by the later physicians to agree very well with those of the hydrolapathum majus, or great water dock, a plant produced very abundantly with us, but at present neglected in the practice of physic; and Muntingius, who has written professedly of the Britannica of the ancients, is persuaded that this is the true and genuine plant. He by no means countenances the opinion of its having its name from the island of Britain, but deduces it from a very expressive phrase in the Frisian language, in which brit signifies to consolidate, tan a tooth, and ica loose; so that it plainly had its name from its virtues of fastening the teeth, when loosened in the mouth by distemperature. Every part of the herb is powerfully astringent, and the root, which is its most efficacious part, is very serviceable in hæmorrhages of all kinds, and in whatever disorders the cold astringents are required in. It is said also to be very useful in nervous complaints; and is very powerful in the cure of quinsies, inflammations of the tonsils, and almost all the disorders of the mouth and throat, and is by some esteemed a specific in the scurvy.

Its leaves are styptic, and bitter to the taste, and strike a strong red upon blue paper; the root has the same effect, but in a more remiss degree. The bark of it is of a flesh colour, and streaked, and the heart of a pale yellow. Experience confirms its efficacy in some disorders of the mouth; the chewing it in a morning having been found an effectual remedy for the bleeding of the gums. *Muntingius de vera Herba Britan.*

BRIZE-*Vents*, or BRISE-*Vents*, a kind of shelters used by gardeners, who have not walls on the north side, to keep the cold winds from damaging their melon beds.

BROAD-SIDE, in the sea language, a discharge of all the guns on one side of a ship at the same time.

BROCATE'LLE, a slight stuff made with cotton, or coarse silk, in imitation of brocades. There are some all of silk, and others also of wool. That which was manufactured at Venice was always the most valued.

They also give the name of Brocatelle to another sort of slight stuff, which is otherwise called ligature, or mezeline.

There is also a kind of marble, called Brocatelle.

BRO'CCOLI, among gardeners, the shoot of a sort of cabbage. There are several sorts of it, the Roman, the Neapolitan, and the black; but the Roman is far the best, and is therefore the only sort now in use.

The seeds of this should be sown about the middle of May, in a loose moist soil, when the young plants have eight leaves: they are to be transplanted, and set three inches distant; and, when they have grown there till the middle of July, they will be fit to plant out for standing. They must be now set in some well-sheltered ground, but not under the drip of trees, and at a foot and an half distance from one another. The soil should be light, and, about the beginning of December, they will begin to shew their heads, which look somewhat like a cauliflower; from this time they will continue eatable to the end of March. When the heads divide, and begin to run up, they are to be cut, with about four inches of the stem to them; and, when these are cut off, about a month's time furnishes a fresh crop from the same stock. They are to be stripped of their outward skin, and boiled; and, when perfectly fine, they are very little inferior to asparagus. The best way to have them fine, is to get fresh seed every year from Italy; for they are very apt to degenerate. *Miller's Gard. Dict.*

BRO'KER *(Dict.)*—The Broker's profession is very necessary in commerce, and renders it more easy, especially in towns of great trade, there to have persons of a good understanding, well known and esteemed amongst the merchants, workmen, and tradesmen, to give them notice where they may meet with the merchandizes they may have occasion for, or with the materials proper for their several works, or for their manufactures, and to find for those who have manufactured any wares, or who would sell them, persons ready or willing to buy or barter them.

We may distinguish, as it were, two sorts of Brokers; the one who may be called simply Brokers of merchandizes, and the other Brokers of manufactures, workmen, and tradesmen.

Their functions are alike; that is to say, they all contrive to make people buy, sell, or barter, for the sake of their commission, or brokerage; but the object of their functions is, in some manner, different, the former facilitating between merchants the sale of the merchandizes which they have bought by wholesale, or which the foreign merchants bring to market; and the latter applying themselves only to procure to the manufacturers, workmen, and artificers, the materials proper for their several manufactories, or works; or to afford them opportunities and means for selling the stuffs, and other merchandizes, they have worked.

Stock BROKERS are those who are employed to buy and sell shares in the joint stock of a company, or corporation.

As the practice of stock-jobbing has been carried to such an excess, as became not only ruinous to a great number of private families, but even affected, or at least might soon affect, even the public credit of the nation, the legislature thought fit to put a stop to it, or, at least, to bring it within certain bounds, and under some regulation; and, therefore, the following act was passed:

By statute 7 George II. cap. 8. sect. 1. All contracts, upon which any premium shall be given for liberty to put upon, deliver, accept, or refuse, any public stock, or securities, and all wagers, puts, and refusals, relating to the present or future price of stocks, or securities, shall be void; and all premiums upon such contracts, or wagers, shall be restored to the person who shall pay the same, who shall be at liberty, within six months from the making such contracts, or laying such wager, to sue for the same, with double cost; and it shall be sufficient therein for the plaintiff to alledge, that the defendant is indebted to the plaintiff, or has received to the plaintiff's use the money, or premium, so paid, whereby the plaintiff's action accrued, according to the form of this statute, without setting forth the special matter.

Sect. 2. Persons who, by this act, shall be liable to be sued, shall also be obliged to answer, upon oath, such bill as shall be preferred in equity, for discovering any such contract, or wager, and the premium given.

Sect. 3. Provided that the plaintiffs, relators, or informers, in such bill, give security to answer cost.

Sect. 4. Every person who shall make any such contracts, upon which any premium shall be given, for liberty to put upon, deliver, accept, or refuse, any public stock, or securities, or any contracts in the nature of puts and refusals, or shall lay any such wager (except such who shall, bona fide, sue, and, with effect, prosecute, for the recovery of the premium paid by them; and except such who shall voluntarily, before suit commenced, repay, or tender such premium, as they shall have received; and also except such who shall discover such transactions in any court of equity) shall forfeit 500 l. and all persons negotiating, or writing, such contracts, shall likewise forfeit 500 l. which penalties may be recovered by action of debt, or information, in any of his majesty's courts of record at Westminster, one moiety to his majesty, and the other moiety to them who shall sue for the same.

Sect. 5. No money, or other consideration, shall be voluntarily given, or received, for compounding any difference for the not delivering, or receiving, any public stock, or securities; but all such contracts shall be specifically executed; and all persons, who shall voluntarily compound such difference, shall forfeit 100 l. one moiety to his majesty, and the other moiety to them who shall sue for the same.

Sect. 6. No person, who shall sell stock, to be delivered and paid for, on a certain day, and which shall be refused, or neglected to be paid for, shall be obliged to transfer the same; but it shall be lawful to such persons to sell such stock to any other, and to receive, or recover from the person, who first contracted for the same, the damage which shall be sustained.

Sect. 7. It shall be lawful for any person, who shall buy stock, to be accepted and paid for on a future day, and which shall be refused, or neglected to be transferred, to buy the like quantity of such stock of any other person, at the current market-price, and to recover and receive, from the person who first contracted to deliver the same, the damage sustained.

Sect. 8. All contracts which shall be made for the buying, or transferring, of stock, whereof the person, on whose behalf the contract shall be made to transfer the same, shall not, at the time of making such contract, be actually possessed in his own name, or in the name of trustees, shall be void; and every person on whose behalf, and with whose consent, any contract shall be made to sell stock, whereof such person shall not be actually possessed in his own name, or in the name of trustees, shall forfeit 500 l. and every broker, or agent, who shall negociate such contract, and shall know that the person on whose behalf such contract shall be made, is not possessed of such stock, shall forfeit 100 l.

Sect. 9. Every person, receiving brokerage in the buying or disposing of stocks, shall keep a Broker's book, in which he shall enter all contracts that he shall make, on the day of making such contract, with the names of the principal parties; and such Broker, who shall not keep such book, or shall wilfully omit to enter any such contract, shall forfeit 50 l.

This act was made perpetual, 10 George II. cap. 8.

Piece-BROKERS, a sort of petty dealers in drapery, who sell fragments or remnants of cloths, stuffs, silks, and the like, at under-price.

BRO'KERAGE, or brokage, the fee or commission paid to a broker for his trouble in negociating business between person and person.

BROKERAGE. Thus they call at Bourdeaux a duty which is raised on all sorts of merchandizes, of what nature soever they be, which are either imported, or exported, by sea, in that city; except, however, those merchandizes, on which new duties are laid; on these Brokerage is raised, when it is said in the decrees, edicts, or declarations, that those merchandizes shall pay no other duties, but those laid upon them in the said decrees, edicts, or declarations.

BRO'NTLÆ, among naturalists, a kind of figure stones, commonly hemispherical, and divided by five pointed zones.

The word is formed from the Greek βροντη, thunder, alluding to the popular tradition, that those stones fall in thunder-showers; whence they are also denominated thunder-stones, sometimes polar stones, fairy-stones, and also ombriæ, by naturalists.

BRO'NZE, a factitious metal, chiefly used for the casting of statues and figures.

The word is French, where it is used more extensively, so as to include all the compositions of brass or copper, as for guns, bells, pots, or the like.

It is formed from the Italian Bronze, which signifies the same. Copper medals are frequently called medals of Bronze.

The composition of Bronze is different; for the finest statues, the mixture is half copper and half brass, or latten. The Egyptians, whom some make the inventors of the art, used two-thirds brass, and one-third copper.

BRONZE also denotes a colour prepared by the colour-men of Paris, wherewith to imitate Bronze.

There are two sorts, the red Bronze, and the yellow or golden. The latter is made solely of copper-dust, the finest and brightest that can be had; in the former is added a little quantity of red oker, well pulverized. They are both applied with varnish. To prevent their turning greenish, the work must be dried over a chafing-dish, as soon as bronzed.

BROO'DING, the act of an hen, or other bird, sitting on a number of eggs, to keep them warm, till they hatch or produce young ones.

BROOM, a medicinal plant, growing plenteously on heathy grounds, and producing a yellow flower; reputed to be nephritic, hepatic, and splenetic; and, as such, used to bring away gravel, and against cachexies and dropsies.

It roots deep, and, shedding no leaves, is continually sucking the moisture from the earth. The best method of destroying it, is the burning the land, then plowing it deep, and manuring it very well with dung and ashes; the spreading on the land chalk or marle, or the manuring it with urine. If the ground be designed for pasture-land, it is best to cut it close to the ground in May, when the sap is strong in it. By this artifice, the roots are destroyed; whereas, in the common way of pulling up the young plants, some strings will be left, and the least of these will grow. Foddering of cattle upon broomy land is one very good way of destroying the Broom, their urine killing the roots, and their treading the land making it less proper for the roots of this plant; for the Broom is never observed to grow in trodden places. This troublesome and pernicious plant is not, however, without its use to the farmer; for, when well laid, it will make an excellent and lasting kind of thatch for barns.

BROOM-*Gall*, in natural history, a name given by authors to a remarkable species of galls found on the genista vulgaris, or common Broom.

BROWN, a dusky kind of a colour, inclining somewhat towards redness.

Dyers distinguish divers shades and gradations of Brown, a sad Brown, London Brown, clove Brown, purple Brown, walnut-tree Brown, &c.

Spanish Brown is a dull red colour, used by house-painters, chiefly for priming, as being cheap and easy to work.

BRUSH, an assemblage of hairs or hog's bristles, fastened in the holes of a wooden handle or board, pierced for that purpose, serving to cleanse divers bodies by rubbing therewith.

Sherman's BRUSH is made of wild boar's bristles, and serves to lay the wool or nap of cloths, after sheering it for the last time.

The manner of making Brushes, is by folding the hair or bristle in two, and bringing it, by means of a packthread, which is engaged in the fold, through the holes wherewith the wood is pierced all over, being afterwards fastened thereon with glue. When the holes are thus filled, they cut the ends of the hair, to make the surface even.

BRUSH, among painters, a large and coarse kind of pencil, made of hog's bristles, wherewith to lay the colours on their large pieces.

BRUSHES for painters are of divers shapes and sizes, some round, others flat; the latter chiefly used for drawing lines, and in imitating olive and walnut work.

Plaisterers have three kinds of implements wherewith they apply their plaister and white-wash on walls, viz. stock-brushes, round Brushes, and pencils. *Moxon, Mechan. Exerc.* See the article PLAISTERING.

Wire BRUSHES are used by silver-smiths and gilders, for scrubbing silver, copper, or brass pieces, in order to the gilding them.

BRUSH *Iron-ore* signifies a kind of ore full of striæ, resembling the hair of a brush.

BRUTE, an animal destitute of the faculty and use of reason.

The common opinion of the untaught and unprejudiced part of mankind seems to be, that the brutes have sense, imagination,

nation, memory, and passion, but that they are void of understanding and reason; that is, in the language of philosophers, they have the inferior faculties of the soul, but not the superior. Nor will the distinction appear groundless to those who attend to the difference between the objects of the mind, and its acts about those objects; as also to the difference between the confused and distinct comprehension of any thing. How great a difference therefore is there between the faculties of Brutes, and those of even a child, who can speak, reckon, and perform the operations of arithmetic? Some philosophers gravely tell us, that Brutes want speech to express themselves; and assign this as a cause of their seeming want of understanding. But will not a parrot, brought up in a nursery with children, learn to pronounce words sooner than they; but will he, therefore, also learn to express his thoughts, reckon, &c? Ought we, therefore, to say, that Brutes cannot speak? It is true, Brutes do many things, from some principle incomprehensible to us, although there are instances of a like principle in man; but it does not follow, that this principle is understanding and reason. A bee does not make honey, nor does an infant suck from reason. The like may be said of many other actions of Brutes, as building their nests, &c. What the true principle of such actions is, may, perhaps, be beyond the power of human faculties to comprehend. But, whatever it be, it is far from putting Brutes on a level with man. The difference is immense; and those who, in other respects, admit of insensible gradations from one order of beings to another, must own there is a vast chasm between man and the most perfect Brutes. Mr. *Buffon's Hist. Natur.*

BU'BALUS, *the buffalo*, a sort of wild bull, very common in many parts of Europe, and in the pope's territories, kept tame, for the sake of the milk of the female, of which the famous cheeses, called case de cavallo, are made. They are also commonly employed in the affairs of husbandry, and have, for this purpose, a brass or iron ring put through their noses, and, by means of a rope, or thong of leather, put through this, they are managed at pleasure; though, if ever so well tamed, they usually keep something of their native fierceness.

The buffalo is about the bigness of an English calf six months old, and pretty much like our English bull, excepting that it hath very short horns, and a bunch or rising on its back between the shoulders. See *plate* XIII. *fig.* 3. *Edwards's Hist. Birds.*

BU'BBLES (*Dict.*)—The black spots at the top of the water-bubble, and, in the middle of the object glasses, compressed together, are always surrounded by a multitude of concentric rings of all sorts of colours; and, as the colour in every ring is the same quite round its circumference, and different in different rings, so it is manifest (from the spherical figure both of the object-glasses and of the Bubbles of water, and from the uniform gravity of the particles of the water subsiding gradually on all sides from the top to the bottom) that the thicknesses, both of the plate of air between the glasses and of the water-bubble, are also the same in every part of the same ring, and different in different rings; which shews that the particular colour of any ring depends upon a particular thickness of the plate of air, or shell of water, where the incident light of the open air is reflected to the eye. Rings of colours do also appear by light transmitted through the water-bubble, and through the object-glasses, held between the eye and the light; but their colours are different from those that appear in the same places, by reflected light.

These are the general appearances of the rings in the open air; but, when homogeneal light is cast by a prism upon the object-glasses in a dark room, the colour of all the rings, seen by light reflected from the glasses, is the same as of the light thrown upon them; and in the intervals between the coloured rings other dark rings appear like the spot in the middle; through all which the incident light is transmitted, and forms other intermediate rings of the same colour upon a white paper held behind the glasses, as represented in *plate* XI. *fig.* 1. It is also to be observed, that the diameters, breadth, and intervals of rings of homogeneal lights, of different colours, are all different; those made by homogeneal red being the largest, and by homogeneal violet the least; and those of intermediate prismatic colours are of intermediate sizes. And from hence the origin of the different-coloured rings in the open air is manifest; namely, that the air between the glasses, according to its various thickness, is disposed in some places to reflect and in others to transmit the light of any one colour; and in the same place to reflect that of one colour where it transmits that of another. The appearances are the same when water is between the object-glasses, only the rings are smaller.

BUBBLES, a cant term, given to a kind of projects for raising money on imaginary grounds, much practised in France and England about the years 1719, 1720, and 1721.

The pretence of these schemes was the raising a capital for retrieving, setting on foot, or carrying on, some promising and useful branch of trade, manufacture, and machinery, or the like. To this end, proposals were made out, shewing the advantages to be derived from the undertaking, and inviting persons to be engaged in it. The sum necessary to manage the affair, together with the profits expected from it, were divided into shares, or subscriptions, to be purchased by any disposed to adventure therein.

BU'BO, in zoology, a name used by some for the owl in general, but, by the more accurate naturalists, appropriated to the great horn-owl, called also, in some places, the eagle-owl. Some authors have described three species of this bird; but they seem to be only varieties of the same species, according to the difference of age, sex, and other accidents.

BUCARDI'TES, *or bucardia*, in natural history, a name given by many authors to a stone, in some degree resembling the figure of an ox's heart.

It is usually of the substance of the coarser stones, and is no other than a quantity of the matter of such stones received, while moist, into the cavity of a large cockle; the cardo or hinge of this shell making a long and large dent in the formed mass, which gives it a heart-like shape.

BUCA'RDIUM, in natural history, a name given by authors to a kind of heart-shell, resembling an ox's heart in shape; it is of the genus of the cordiformes, or heart-shells, and differs from the other kind, in being of a more globular figure.

BU'CCINUM, *the trumpet-shell*, in natural history, the name of a large genus of shells, the characters of which are these; they are univalve shells of the form of a trumpet, according to old pictures, with a wide belly and a large broad and elongated mouth. They have a distinct and regular tail, usually long, though sometimes short; they have a crooked beak, and the clavicle is often elevated, though sometimes depressed and contabulated. See *Plate* V. *fig.* 11, 12, 13.

The family of the Buccina, when examined ever so strictly, is very large; but according to the general custom of authors, of confounding together several genera under the name, it is usually made to appear much larger then it really is. Lister has made it comprehend a vast number of shells, by confounding with it the families of the murex and purpura.

It is not indeed peculiar to this author to have confounded these genera; those who went before him have done the same: and Pliny has comprised the Buccinum, murex, and purpura under the general name ceryx.

To avoid the general confusion, which arises from not distinguishing the families of the Buccinum, murex, purpura, and vis, or screw-shell, it will be proper to observe that there are regular characters, which distinguish them all one from another; the characters are these:

The Buccinum differs from the purpura, in that it has a very long mouth of an oval figure, and has an elevated head; whereas the purpura has a round mouth, and a head somewhat flatted. The tail of the purpura is also usually furrowed, and is shorter than that of the Buccinum.

The Buccinum differs also from the murex in having a longer tail, by the smoothness and variety of colours of its coat, and by having a larger mouth less furnished with teeth; the murex having a smaller and longer shaped mouth, its surface covered with points or spires, and several teeth.

It is easier to distinguish the Buccinum from the screw-shell, as this is always more long and slender than the Buccinum; it has also a flat mouth and has rarely any tail. These are all very large families in nature, and it is highly necessary for the naturalists to be well acquainted with them. The most singular species of the Buccinum class is one that hath its mouth turned the contrary way to all other shells: this has been thence called by authors the unique and the sans pareil. Aldrovand is of opinion that the Buccina may be ranked among the bivalve shells; because they have an operculum, or shelly substance, fixed to the end of their body, which occasionally stops up the aperture of the mouth; but, if this were a sufficient reason, we should have many more genera to add to the bivalves, particularly the snails of several kinds.

The Buccina generate in warm months, and some species of them have been frequently remaining in pairs together, upon the rocks deserted by the tide on that occasion. These have been thence supposed to be of a different genus, and have been called buccina litoralia; they are usually found in copulation early in the morning.

BUCK, a male horned beast of venery or chace, whose female is denominated a doe.

A Buck the first year is called a fawn, the second a prickat, the third a sorel, the fourth a sore, the fifth a Buck of the first head, and the sixth a great Buck. *Cos. Gent. Recr.*

Buck, is also applied to the male of the hare and rabbit kind. Hares commonly go to Buck in January, February, and March, and sometimes all the warm months; sometimes they seek the Buck seven or eight miles from the place where they sit. *Cox. Libat.*

BUCKING, an operation performed on linen cloth and yarn, to render them somewhat white, by working them with lye made with ashes.

BUCKING *of cloth* is the first step or degree of whitening it.

To drive a buck of yarn, they first cover the bottom of the Bucking-tub with fine ashes of the ash-tree, then spread the yarn thereon, then cover it again with ashes, and thus stratum super stratum, till the yarn is all in, when they cover the whole with a Bucking-cloth, and lay on it more ashes and pour in warm water, till the tub be full, and let it stand all night

night. Next morning they let the lye run into another veſſel, and, as it waſtes, fill up the tub with warm water from a kettle, and, as this waſtes, fill it up with the lye that runs from the Bucking-tub; ſtill obſerving to make the lye hotter and hotter, till it boils. Thus are both the tub and kettle to be ſupplied for at leaſt four hours, which is called driving a buck of yarn. *Hought. Collect.*

BU'CKLE, in matters of trade, a little metalline machine, whereby to retain and keep faſt certain parts of the habit, as well as of the harneſs of horſes, &c.

Buckles are of divers ſorts, as ſhoe and garter Buckles; ſome round, others ſquare, or oval, or cut, each of which have their reſpective artificers by whom they are made.

The like may be ſaid of the great variety of Buckles belonging to the pack and hackney ſaddles, ſuch as ſets, black or oiled Buckles, ſanguine Buckles, crupper Buckles, breaſt-plate Buckles, and ſurcingle Buckles: and to theſe may be added divers other Buckles, made promiſcuouſly with the former, as the heſter Buckle, plain and knobbed, for the white bridles, and the open and plain crown Buckles for the black; and ſo the Poland Buckle, the peaſe Buckle, chaſed Buckles, Dutch and Iriſh Buckles, which are braſs, and made by the copperſmith. *Plot. Nat. Hiſt. Staffordſhire.*

BU'CKRAM, a ſort of coarſe cloth, made of hemp gummed, calendered, and dyed ſeveral colours.

Buckrams are ſold wholeſale by the dozen of ſmall pieces, or remnants, each about four ells long, and broad according to the pieces from which they were cut. Sometimes they uſe new pieces of linen cloth to make Buckrams of; but moſt commonly old ſheets, and old pieces of ſails. They make a great many at Paris, and they get, alſo, vaſt quantities from Normandy, particularly from Caen, Roan, and Alencon.

BU'CKTHORN, *rhamnus*, a hedge tree or buſh, whoſe branches are full of long ſtiff thorns, and yellowiſh green leaves about as big as the ſloe-tree, more neatly ſerrated about the edges. The flowers grow ſeveral together, being ſmall, four-leaved, and yellow, which are ſucceeded by little round black berries yielding, when ripe, a purpliſh bitter juice, and having three or four angular ſeeds. It grows in woods and hedges, and flowers in June, the berries being ripe about the latter end of September. See *Plate* IX. *fig.* 2. where *u* is the plant, *f* the flower, *g* the berry, *b* the ſeed.

The juice of the berries purges ſerous watery humours pretty briſkly, and is good againſt the dropſy, gout, jaundice, and ſcurvy, and very ſerviceable againſt the itch, and all manner of eruptions on the ſkin.

The berries of which are ordered by the College of Phyſicians for medicinal uſe; but particularly for making a ſyrup, which was formerly in great uſe; but of late the perſons who ſupply the markets, have gathered ſeveral other ſorts of berries, which they have either mixed with thoſe of the Buckthorn, or have wholly ſubſtituted them in their place. Theſe are the berries of the frangula, cornus fœmina, &c. which mixture hath ſpoiled the ſyrup, and rendered it leſs eſteemed. But whoever purchaſes the Buckthorn berries, may diſtinguiſh whether they are right or not, by opening them, and obſerving the number of ſeeds in each; for theſe have commonly four, whereas the frangula has but two, and the cornus fœmina but one; as alſo by bruiſing of the berries on white paper, the juice giving a green tincture.

By the chymical analyſis, the berries yield a great deal of acid phlegm and oil, and a little fixed ſalt and earth. They are purgative, and very good to remove ſerous humours in chronical diſeaſes; by which it relieves thoſe that have the gout, palſy, cachexy, ſciatica, and rheumatiſm. Take a drachm, or a drachm and a half of its berries, powdered and mixed with a little conſerve of orange flowers. They boil fifteen or twenty berries in common broth, adding half a drachm of cream of tartar; ſtrain it through a cloth, and give it the patient to drink; ſome mix with it two drachms of tincture of ſteel, or boil half an ounce of iron ruſt in a rag tied up in a knot, for the green ſickneſs. The moſt common uſe of theſe berries is to make a ſyrup of them. The doſe is from one ounce to two, and even to three, when neceſſary; but it is proper to eat ſome pottage after taking it. *Martyn's Tournefort.*

Syrup of BUCKTHORN-*berries. Syrupus de Spina Cervina.*

The College Diſpenſatory orders it to be thus made:

Take of the juice of freſh ripe Buckthorn berries one gallon, cinnamon, ginger, and nutmegs, each one ounce, the fineſt ſugar ſeven pounds; let the juice ſtand for ſeveral days to ſettle; then ſtrain it, and infuſe the ſpices in part of it; boil the reſt, and, towards the end of the time, add that part of it in which the ſpices were infuſed, being firſt ſtrained; let the whole be reduced by boiling to four pints, to which add the ſugar, and make a ſyrup of them.

The Edinburgh Diſpenſatory directs it in the following manner:

Take of the clarified juice of ripe Buckthorn berries, three quarts; brown ſugar four pounds; and with a gentle fire boil them to a ſyrup; and, while it is yet warm, mix therewith a drachm of the diſtilled oil of cloves, received upon a little ſugar.

To add the corrector here, in the form of a chymical oil, ſaves the trouble of ſteeping the ſpices ordered for that purpoſe in the London Diſpenſatory, and anſwers the end more certainly.

Sydenham obſerves, that ſyrup of Buckthorn alone evacuates water plentifully and little elſe, without diſturbing the blood, or rendering the urine high-coloured, as other purgatives generally do, and has only one bad quality, as occaſioning great thirſt during the operation. But if it be given, even in the greateſt doſe, to ſuch as are difficult to purge, it will neither give any motions, nor carry off enough of water.

Of Buckthorn berries are made three ſeveral ſorts of colours; being gathered green, and kept dry, they are called ſap-berries; which, being ſteeped in allum-water, give a fair yellow colour, uſed by painters, bookbinders, and leather-dreſſers; who alſo make a green colour, called ſap-green, taken from the berries when they are black. Theſe being bruiſed, and put into a braſs kettle, and there ſuffered to remain three or four days, with ſome beaten alum put to them, they are afterwards preſſed, and the liquor uſually put into bladders, and hung up till it be dry; this is afterwards diſſolved in water or wine, but canary is the beſt, to preſerve the colour from ſtarving. The third is of a purpliſh colour, made of the berries, ſuffered to grow upon the buſhes till the middle or end of November, when they are ready to fall of themſelves.

BUCK-WHEAT, *fagopyrum*, in botany, a genus of plants, whoſe characters are:—the flowers are ſpecious, growing in a ſpike, or branched from the wings of the leaves: the cup of the flower is divided into five parts, which reſemble the petals of a flower: the ſeeds are black, and three-cornered.

Buck-wheat is cultivated in many parts of England, and is a great improvement to dry barren lands. The beſt ſeaſon for ſowing the ſeed is in May: one buſhel will ſow an acre. The ground ſhould be plowed and dreſſed in the ſame manner as for barley; and, if the ſoil is not very lean, it will yield a very great increaſe, as fifty or ſixty buſhels upon an acre, and is excellent food for hogs, poultry, &c. The flour of it is very white, and makes a very good ſort of pancake, if mixed with a little wheat flour. The ſtraw is good fodder for cattle; and the grain, given to horſes amongſt their oats, will make them thrive; but it muſt be broken in a mill, otherwiſe it is apt to paſs through the cattle whole.

It is commonly late in the ſeaſon before it is ripe; but there is no great danger of the ſeeds failing, nor of ſuffering by wet after it is mown: it muſt lie ſeveral days to dry, that the ſtalks (which are hard) may wither before it is houſed.

Buck-wheat is ſometimes ſown very thick, and ſuffered to grow until it is near flowering, and is then plowed in, which makes a very good lay for wheat or rye: but ſome people eſteem it the better way to feed cattle with it, eſpecially milch-cows, which, they ſay, will cauſe them to give a great deal of milk, and make both the butter and cheeſe very good. This will alſo afford food for cattle in the drieſt time, when all other graſs is burnt up. *Miller's Gard. Dict.*

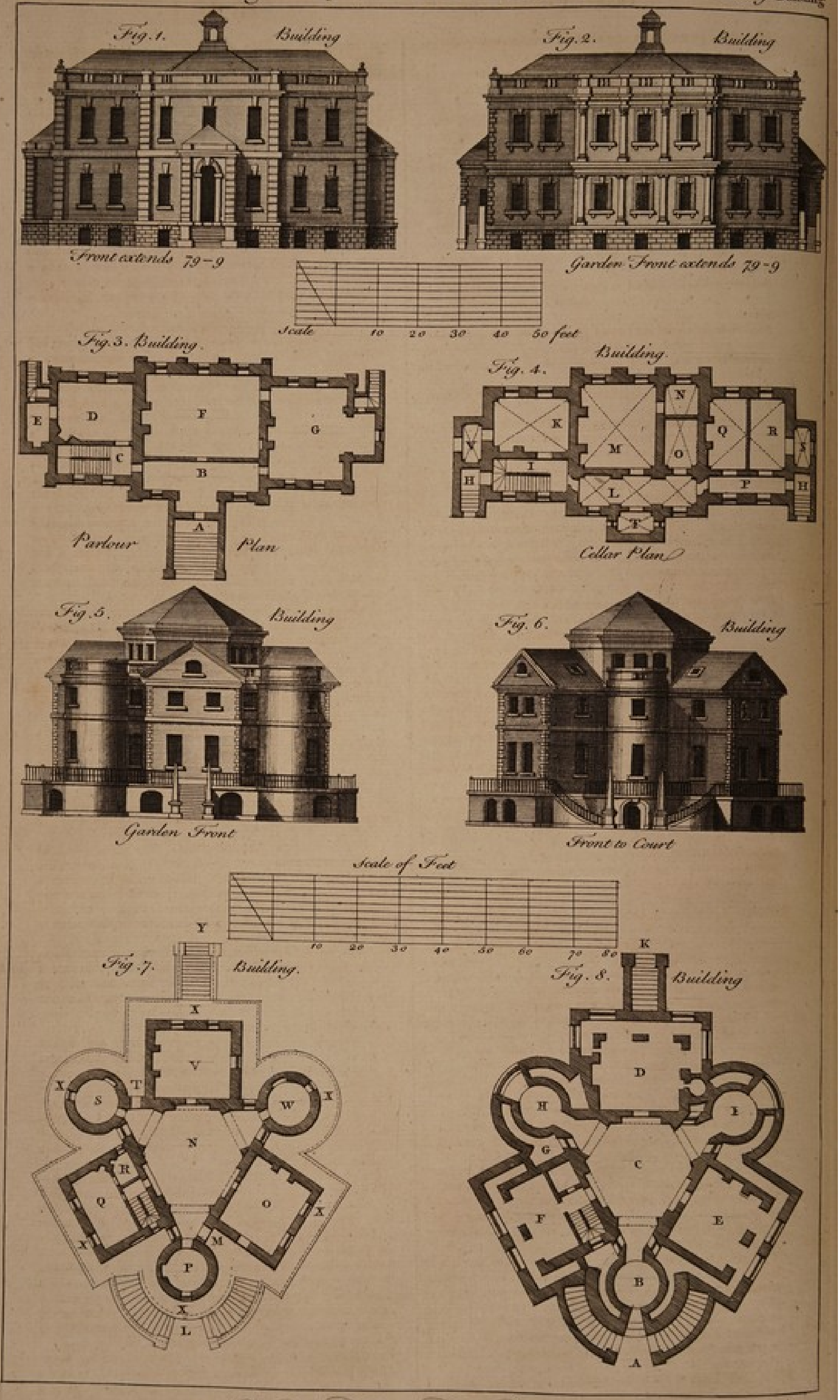
BU'DDLE, in minerology, a name given by the Engliſh dreſſers of the ores of metals to a ſort of frame made to receive the ore after its firſt ſeparation from its groſſeſt foulneſs.

The ore is firſt beaten to powder in wooden troughs, through which there runs a continual ſtream of water, which carries ſuch of it as is fine enough to paſs a grating, which is placed at one end of the trough; this falls into a long ſquare receiver of wood, called the launder; the heavieſt and pureſt of the ore, falling at the head of the launder, is taken out ſeparately, and requires little more care or trouble; but the other parts, which ſpread over the middle and lower end of the launder, is thrown into the Buddle, which is a long ſquare frame of boards, about four feet deep, ſix long, and three wide; in this there ſtands a man bare-footed, with a trambling ſhovel in his hand, to caſt up the ore about an inch thick, upon a ſquare board placed before him as high as his middle; this is termed the Buddle-head; and the man dexterouſly, with one edge of his ſhovel, cuts and divides it longways, in reſpect of himſelf, about half an inch aſunder, in theſe little cuts; the water, coming gently from an edge of an upper plain board, carries away the filth and lighter parts of the prepared ore firſt, and then the metalline part immediately after, all falling down into the Buddle, where, with his bare feet, he ſtrokes it and ſmooths it, that the water and other heterogeneous matter may the ſooner paſs off from it.

When the Buddle by this means grows full, the ore is taken out; that at the head part, being the fineſt and pureſt, is taken out ſeparate from the reſt, as from the launder. The reſt is again trampled in the ſame Buddle; but the head, or, as it is called, the forehead of this Buddle, and of the launder, are mixed together, and carried to another Buddle, and trampled as at firſt. The forehead of this laſt Buddle, that is, that part of the ore which has fallen at the head, is carried to what they call a drawing Buddle, whoſe difference from the reſt is only this, that it has no tye, but only a plain ſloping board, on which it is once more waſhed with the trambling ſhovel. Tin ore, when it is taken from this, is called black-tin, and this is found to be compleatly ready for the blowing-houſe. *Philoſ. Tranſ.* N°. 69.

BU'DDLING *of calamine*, denotes the operation of cleanſing it from

Printed for J. Hinton in Newgate Street.



Printed for J. Hinton in Newgate Street from filth, by washing and picking it, preparatory to the baking it in the oven. *Phil. Transf.* N°. 198.

BUDDLING-*dish*, a small shallow vessel, like the basons of a pair of scales, for the washing of ores of metals by the hand. *Shaw's Lett.*

BUG'LOSSUM, bugloss, in botany, a physical plant, which, from a long, thick, brown root, sends forth large, rough, hairy leaves, less prickly than borrage, half a foot long, narrow, and sharp-pointed. The stalks arise to the height of two or three feet; full of short stiff hairs, on which grow long narrow leaves, set on without foot-stalks. The flowers grow several together, at the top of the branches, in long rough calyces, of a single leaf, cut into five round partitions, of a purple colour at their first appearing, and turning to a bright blue as they stand, and are succeeded by four-cornered rough seeds.

Bugloss is usually planted in gardens, and flowers in June and July. The leaves, flowers, and sometimes the root, are used.

Bugloss is much of the nature of borrage, being accounted cordial, and good to exhilarate the spirits, and drive away melancholy; and is useful against hypochondriac and hysteric disorders.

The flowers are amongst the number of the four cordial flowers. *Miller's Bot. Off.*

The roots are very glutinous, and gives a deep tincture of red to blue paper; the flowers give it but very little, and the leaves hardly any at all: so that probably the sal ammoniac in this plant is involved in a glutinous juice, in which the earth and sulphur are predominant. The Bugloss moistens, cools, and gives great relief to melancholy persons; it is good to dissipate the defluxions of the breast, and an obstinate cough. The juice is drank from three ounces to six. The ptisan is taken by glass-fulls. The roots and leaves are used in cooling broths, and this plant cools no otherwise than by restoring the motion of the blood, which stagnates and heats the parts wherein its circulation is retarded. Bugloss flowers are used after the manner of tea. A conserve is made of the flowers. The syrup made with the juice of the leaves of Bugloss gives great relief to melancholy persons: this juice is employed in the simple Byzantine syrup, and the compound one of Mesue. It enters also as an ingredient in Fernelius's syrup of spleen-wort. *Martyn's Tournefort.*

BUGLOSSUM *Silvestre*, wild bugloss.—This is a much less plant than the garden kind, growing not above a foot high, with a small whitish root, which dies yearly: the leaves are long and narrow, but broader, and roundish-pointed at the end, rough and prickly, like borrage. The stalks are thick, succulent, and prickly, cloathed with narrow and sharp-pointed leaves, set on without foot-stalks. The flowers grow on the tops of the stalks, in shape like the flowers of garden bugloss, but less, and of a light blue colour; the seeds are also like the seeds of that. It grows by hedges and way-sides, and among the corn; and flowers in May.

This wild Bugloss is but seldom used, though it is said to have the same virtue with the garden, but in a lower degree, and, for want of that, may serve to supply its place. *Miller's Bot. Off.*

BU'GULA, bugle, in botany, a plant having a small stringy root, sending forth several stalks of different forms; some roundish, and lying along, and creeping on the ground, sending out fibrous roots from the joints; the others, which grow erect, and bear the flowers, are square, beset with but few leaves, standing in pairs opposite to one another; the lower on long foot-stalks, the upper on very short ones; they are oblong, somewhat crenated about the edges, an inch and half long, and an inch broad, of a dull green colour, and oftentimes with a dash of purple: The stalks are eight or nine inches high, having the flowers growing at the top, in loose spikes, whorle fashion, with two small brownish leaves under each whorle. They are of a blue colour, and labiated, but have the galea so small, that it is hardly discernible. When the flowers are past, they are succeeded by small longish seeds, in fine pointed calyces. It grows in woods and hedges, and flowers in May.

Bugle is a noted vulnerary plant, and used inwardly and outwardly for all kinds of bruises, wounds, and contusions, as likewise for sores and ulcers, for spitting of blood, and hæmorrhages from any part. It is also aperitive and diuretic, and good to open obstructions of the kidneys, and provoke urine. *Miller's Bot. Off.*

This plant is bitter, detersive, and gives a faint red colour to blue paper. It is employed in vulnerary potions, ptisans, and apozems; the dysentery, fluor albus, and diseases of the throat, ulcers and thrushes in the mouth. The clarified juice of Bugle has the same virtues; it is used in plaisters; Camerarius and Dodonæus prescribed it for obstructions of the liver. It contains some sal ammoniac involved in sulphur. *Martyn's Tournefort.*

BU'ILDING (*Dict.*)—In the distribution of lodging-rooms, in a building, it is a popular and ancient fault, especially among the Italians, to cast the partitions so, as, when the doors are all open, a man may see through the whole house; grounded on the ambition of shewing a stranger all the furniture at once: an intolerable hardship on all the chambers, except the inmost, where none can arrive but through all the rest, unless the walls be extreme thick for secret passages: nor will this serve the turn, without at least three doors to each chamber; a thing inexcusable, except in hot countries: besides its being a weakening to the Building, and the necessity it occasions of making as many common great rooms as there are stories, which devours a great deal of room, better employed in places of retreat; and must likewise be dark, as running through the middle of the house.

In the compartition, the architect will have occasion for frequent shifts; through which his own sagacity, more than any rules, must conduct him. Thus he will be frequently put to struggle with scarcity of ground; sometimes to damn one room for the benefit of the rest, as to hide a buttery under a stair-case, &c. at other times, to make those the most beautiful which are most in sight: and to leave the rest, like a painter, in the shadow, &c.

For the covering of the Building; this is the last in the execution, but the first in the intention: for who would build, but to shelter? In the covering, or roof, there are two extremes to be avoided, the making it too heavy or too light: the first will press too much on the underwork; the latter has a more secret inconvenience; for the cover is not only a bare defence, but a band or ligature to the whole Building, and therefore requires a reasonable weight. Indeed, of the two extremes, a house top-heavy is the worst. Care is likewise to be taken, the pressure be equal on each side; and Palladio wishes, that the whole burden might not be laid on the outward walls, but that the inner likewise bear their share.—The Italians are very curious in the proportion and gracefulness of the pent or slopiness of the roof; dividing the whole breadth into nine parts, whereof two serve for the height of the highest top or ridge from the lowest: but, in this point, regard must be had to the quality of the region; for, as Palladio insinuates, those climates which fear the falling of much snow, ought to have more inclining pentices than others.

The strength of a Building is sometimes much impaired by the erecting it, by reason of the master not having prepared either sufficient materials, or money, before he set about Building. For, when Buildings are erected by fits and pauses, by doing first one piece, and then another, the work dries, and sinks unequally; by which means the wall becomes full of chinks and crevices: and therefore this way of Building by fits is condemned by all authors.

As for beauty: let not the front look a-slant upon a stranger, but accost him right at his entrance. Uniformity and proportion are very pleasing to the eye. And it is observable, that free-stone, like a fair complexion, grows old, whilst bricks keep their beauty longest.

Let the offices keep their due distance from the mansion-house; those are too familiar which presume to be of the same pile with it.

The same may be said of stables and barns; without which, a house is like a city without works: it can never hold out long. It is not only very inconvenient, but rather a blemish than a beauty to a Building, to see the barns and stables too near the house; because cattle, poultry, and such-like, must be kept near them; which will be an annoyance to an house.

Gardens ought also to be disposed in their proper place. When God planted a garden eastward, he made to grow out of the ground every tree pleasant to the sight, and good for food. Sure (says Dr. Fuller) he knew better what was proper to a garden, than those who now-a-days only feed their eyes, and starve their taste and smell.

Mr. Worlidge advises, that the garden join to one, if not more sides of the house. For what can be more pleasant and beautiful, for the most part of the year, than to look out of the parlour and chamber-windows into gardens?

For beauty, says he, let there be also courts or yards, kept from cattle, poultry, &c. and planted with trees, to shade, defend, and refresh your house: and the walls also planted with vines, and other wall-fruit: all which will add pleasure and beauty to your habitation.

Thus much for the principal or essential part of a Building.—For the accessories, or ornaments, they are fetched from painting and sculpture. The chief things to be regarded in the first, are, that no room have too much, which will occasion a surfeit; except in galleries, or the like: that the best pieces be placed where there are the fewest lights: rooms with several windows are enemies to painters, nor can any pictures be seen in perfection, unless illumined, like nature, with a single light: that in the disposition regard be had to the posture of the painter in working, which is the most natural for the posture of the spectator; and that they be accommodated to the intentions of the room they are used in.

For sculpture it must be observed, that it be not too abundant; especially at the first approach of a Building, or at the entrance, where a Doric ornament is much preferable to a Corinthian one: that the niches, if they contain figures of white stone, be not coloured in their concavity too black, but rather dusky; the sight being displeased with too sudden departures from one extreme to another. That fine sculptures have

have the advantage of nearness, and coarser of distance; and that, in placing of figures aloft, they be reclined a little forwards: because, the visual ray, extended to the head of the figure, is longer than that reaching to its feet, which will of necessity make that part appear further off: so that, to reduce it to an erect posture, it must be made to stoop a little forward. M. le Clerc, however, will not allow of this resupination, but will have every part in its just perpendicular.

As to the stone and stucco, used in Buildings, which are fresh and white at first, and are commonly supposed to be discoloured with the air, moisture, smoak, &c. the true cause thereof is, that they become covered with a minute species of plants, which alter their colour. A sort of lichens yellowish, brownish, or greenish, which commonly grow on the barks of trees, do grow also on stones, mortar, plaister, and even on the slates of houses, being propagated by little light seeds, dispersed by the wind, rain, &c. The best preservative, known, is a coat of lime. *Build. Dict.*

Explanation of *Plate* X.

Fig. 1, 2, 3, 4, The cellar and parlour plans with the two elevations of a house, seventy-nine feet nine inches front, and are divided as follows.

Fig. 3. A, Front steps.

B, Hall or passage fourteen feet wide in the middle, and eight feet at each end.

C, Stairs eighteen feet by seven feet six inches.

D, Parlour eighteen feet by fourteen feet.

E, Closet nine feet by six feet.

F, Great drawing-room twenty-eight feet three inches by twenty feet.

G, Dining-room twenty-two feet by eighteen feet, with a recess for a side-board ten feet by eight feet.

This story is fourteen feet high in the clear, and that over it thirteen feet, which may be divided into three bed-chambers; the room over D must be equal to that below, next to which take eight feet four inches from the room over F, and divide it into two closets, which will be each nine feet nine inches by eight feet; that to the front (by making a door through the wall) will be a dressing closet for the room over D, and the other will be dark, which may open to the passage; then the room over F will be nineteen feet eleven inches by twenty feet, its chimney being cut off by the dressing closet; fix one at the back of that in the room over G, then take, from the garden front of the room over G, seven feet four inches, and divide it into two dressing closets, which will be each eight feet ten inches by seven feet: and the room over G will be eighteen feet by fourteen feet eight inches; the chimney may be fixed in the angle at the side of that which may be made in the dressing closet; the chimney for the room over G may be fixed in the angle of the Building.

N. B. The plan of the great room F is a diagonal proportion, its length being equal to the diagonal or hypothenuse of a square, whose side is equal to the width of the room.

The cellar plan, *fig.* 4.

Let the height of the lower offices be nine feet in the clear; the parlour floor is five feet six inches above the surface of the earth, from which, take one foot four inches for the thickness of the vaulted arch with joist and board, and four feet two inches remains, which is the height of its sofeta, above the surface, and shews that the floor of the offices must be sunk four feet ten inches below to make the clear of the story nine feet; the plan is divided as follows:

H H, Steps leading down to the offices.

I, Passage and stairs seventeen feet six inches by seven feet three inches.

K, House-keeper's room seventeen feet six inches by thirteen feet six inches.

L, Passage seven feet three inches wide.

M, Kitchen nineteen feet three inches by eighteen feet.

N, Larder eight feet six inches by eight feet.

O, Cellar ten feet eleven inches by eight feet.

P, Passage four feet wide.

Q, Butler's pantry seventeen feet two inches by eight feet seven inches.

R, Cellar ditto.

S, Ditto nine feet six inches by five feet six inches.

T, Ditto nine feet by five feet.

V, House-keepers ditto nine feet six inches by five feet.

CAUTION.

Observe, in the laying out groined vaults, to place the buttments as near as possible to push against each other, more especially when the spand is large, otherwise they will be in great danger of falling, let the workman do his part ever so well; for example, see the buttment between L and M, if that was a large spand, it must unavoidably push out the wall. I laid it down thus, as an example in executing the work: omit the pier L, and groin single from the buttments of the two angles in the kitchen M, &c. because where strength or conveniency is absolutely necessary (especially in the baser parts of a Building) nice regularity must give way.

Estimate to this Building.

This Building contains twenty-five square one-half, measuring but one of the sheds, and computing them both to be equal to so much of the other plan; for the same reason all the outside steps are throwed into the plans of the porch; the whole may be built in a moderate well finished manner, sixty-four pounds per square, which amounts to one-thousand six-hundred thirty-two pounds.

Fig. 5, 6, 7, 8, The ground and parlour plans of design for a Building formed by an equilateral triangle, whose sides B H I B, or P S W P, are forty-four feet, which are the extreme points of the angle, and are the centers of the circular closets, &c. the dimensions of the several rooms are as follows:

Fig. 8. A, Foot of steps, which leads up to the terras.

B, Porch or entrance into the lower offices, nine feet six inches diameter, and its floor two feet below the surface of the earth.

C, Servants hexagon hall, twenty-one feet six inches diameter, lighted by four windows from the terras.

D, Kitchen seventeen feet six inches by fifteen feet six inches in the clear of the walls, which bears the upper stories.

E, House-keeper's room ditto.

F, Cellar seventeen feet six inches by eight feet nine inches in the clear, between the stairs and wall which bears the upper stories.

G, Little cellar six feet six inches by six feet six inches.

H, Butler's pantry nine feet six inches diameter.

I, Larder ditto.

K, Steps to the garden.

N. B. The walls of this story are two feet six inches thick, and the void space between them two feet three inches.

Parlour plan. *Fig.* 7.

L, Foot of the steps.

M, Door of entrance from the terras.

N, Hexagon hall twenty-two feet diameter, two stories high.

O, Parlour eighteen feet by sixteen feet.

P, Closet ten feet diameter.

Q, Study eighteen feet by nine feet.

R, Closet seven feet by six feet.

S, Closet ten feet diameter.

T, Door to the terras.

V, Dining-room eighteen feet by sixteen feet.

W, Closet ten feet diameter.

XXXXXX, Terras five feet wide, inclosed by iron rails.

Y, Garden steps.

The terras is eight feet above the surface of the earth, from whence the floor of the hall rises six inches, and the floor of the offices is two feet below the surface; so the whole height from the office floors to the floor of the hall is ten feet six inches, from which deduct one foot for the thickness of the floor, and nine feet six inches remains for the height in the clear of the office story. The parlour story is fourteen feet high in the clear, and the story over it eight feet, and trussed galleries in the hall for a communication between the upper rooms; there are garrets in the roof, and a billiard room over the hall with a coved ceiling.

Estimate to this Building.

The whole plan, including steps and terras, contains forty-one square and one-half, and may be built one with the other in a good manner for thirty-five pounds per square, which amounts to one thousand four hundred and fifty-two pounds ten shillings. *Halfpenny's Architecture.*

BUL, in the Hebrew calendar, the eighth month of the ecclesiastical, and second of the civil year, since called Marshevan; it answers to our October, and is composed of nine and twenty days.

BULBOCASTA'NUM, *earth-nut*, in botany, the name of a genus of plants, the characters of which are these: the flower is umbelliferous, and of a rosaceous kind, being composed of several leaves, arranged in a circular form. The cup finally becomes a fruit, composed of two small seeds, which are sometimes smooth, sometimes striated on their gibbose sides, and smooth on their flat ones. To which it is to be added, that the roots are tuberous and fleshy.

Mr. Miller has enumerated six species of this plant, and Tournefort four.

They are all very hardy plants in respect to cold; so may easily be propagated by sowing of their seeds on a moist shady border, soon after they are ripe, (for, if they are kept out of the ground till spring, they seldom succeed so well as when they are sown in autumn.) When the plants appear in the spring, they must be carefully cleared from weeds; and, where they are too near, they should be thinned, so as to leave them three or four inches asunder; after this they will require no other culture, but to keep them clear from weeds, for they do not bear transplanting; so must be sown where they are to remain. The autumn following the roots will be fit for use, and will continue good all the winter, till they shoot up their stems in the spring for seed; after which time they are tough, and not fit for eating.

BU'LLET (*Dict.*)—Bullets shot into the water undergo a refraction; several experiments concerning which are given by Mr. Carre.

BULLETS are usually piled up in the form of a pyramid. See a representation of a pile of Bullets, *plate* XXXV. *fig.* 18. in the Dictionary.

BULLET-*moulds* consist of two concave hemispheres, with an handle whereby to hold them; and between the hemispheres is is a hole, called a gate, at which to pour in the melted metal. The chaps, or hemispheres of Bullet-moulds, are first punched, being blood-red-hot, with a round-ended punch, of the shape, and nearly of the size, of the intended Bullets. To cleanse the insides, they make use of a Bullet-bore.

BULLET-*bore* is a steel shank, having a globe at one end, wherewith to bore the inside of the mould clean, of the size intended. *Moxon, Mechan. Exerc.*

BU'LLION (*Dict.*)—When gold and silver are in their purity, they are so soft and flexible, that they cannot well be brought into any fashion for use, without being first reduced and hardened with an allay of some other baser metal.

To prevent the abuses which some might be tempted to commit, in the making of such allays, the legislators of civilized countries have ordained, that there shall be no more than a certain proportion of a baser metal to a particular quantity of pure gold or silver, in order to make them of the fineness of what is called the standard gold or silver of such peculiar state or nation.

According to the laws of England, all sorts of wrought plate, in general, ought to be made to the legal standard; and the price of our standard gold and silver is the common rule whereby to set value on their Bullion, whether the same be in ingots, bars, dust, or in foreign specie: whence it is easy to conceive, that the value of Bullion cannot be exactly known, without being assayed, that the exact quantity of pure metal therein contained may be determined; and, consequently, whether it be above or below the standard.

BU'NIAS, *navew gentle*, in botany.—The leaves of this plant, which lie on the ground, are long and large, deeply cut in, and in shape like a turnep-leaf, but less, and very little hairy. The stalks grow to be two or three feet high, beset with smaller leaves, smooth as well as the stalk, and little or nothing jagged, especially those which grow higher upon the branches, which are round and broad at bottom, and encompass the stalk, ending in a narrow point of a bluish-green colour. The flowers grow many together, on the tops of the stalks, made of four bright yellow leaves, and are succeeded by long cylindrical pods, containing small, round, black seed; the root is white, longer and slenderer than a turnep, but much like it in taste. It is sown in gardens, and flowers in April; the root is used in food, and the seed in physic.

The seed is commended by the antients as good against all kinds of poisons, and the bites of venomous creatures, to provoke urine, and the menses. Matthiolus extols it against all kinds of infectious distempers, to expel malignity, and chear the heart, as also to drive out the small pox and measles. *Miller's Bot. Off.*

BUPHTHA'LMUM, *ox-eye*, in botany, by some called cachlan, sends forth tender and somewhat slender stalks, with leaves like those of fennel, and yellow flowers, larger than those of the anthemis, and resembling an eye; whence it took its name. It grows in fields, and about cities and towns. The bruised flowers, with cerate, discuss œdematous tumors and hardnesses. They say, that Buphthalmum, drank after coming out of the bath, restores, after some time using it, a good complexion, to those who are discoloured with the yellow jaundice. *Dioscorides, lib.* 3. *cap.* 156.

Ox-eye is a plant that has a great many shrubby branches, whereon grow fine winged leaves, like yarrow, but shorter, stiffer, and somewhat white and hoary: each stalk is terminated by one pretty large corymbiferous flower, of a deep yellow colour, like a marigold, but that the middle thrum is larger in proportion, and the petala are much shorter and firmer. The root is small and fibrous. It grows wild in some parts of the north of England, and flowers in June or July. It is seldom or never used: but that which is called the ox-eye in the shops is the bellis major. *Miller's Bot. Off.*

BURLE'SQUE (*Dict.*)—Some who are fond of discovering traces of every thing in antiquity, ascribe the invention of Burlesque to Homer, whose Batrachomyomachia, say they, is only some parts of the Iliad and Odyssey travestied and turned into ridicule, by an application of the combats of kings and heroes to the battle of the frogs and mice: but it is not certain Homer was the author of this poem. Suidas gives the honour of it to Pigres, or Tigres, brother to the famous Artemisia; and, in an ancient MS. of this in the French king's library, the name of this Carian is wrote at the beginning of it. Stephen Nunnesius, and other learned moderns, are of opinion Homer was not the author of it. But antiquity decides in favour of Homer. Martial expressly ascribes it to him in this Epigram:

> Perlege Mæonio cantatas carmine ranas,
> Et frontem nugis solvere disce meis.

Statius is of the same opinion; and a basso relievo, representing Homer with two rats, done by Archelaus, which was dug up near Rome, in the gardens of the emperor Claudius, seems to confirm the opinion of the ancients on this head.

BU'RNING *of Land* (*Dict.*)—This is a very great means of improvement of lands, and is not only at this time used in many parts of this and other kingdoms, but it has been practised from the earliest times of husbandry that we have any account of. Virgil very expressly mentions, and greatly recommends it, and all the old writers of husbandry say much in its praise.

It does not take effect, however, in all sorts of ground. It is not proper for rich soils, nor for stony or chalky ones; nor is it a practice often to be repeated on any land, especially where the surface is shallow; nor must corn be sown too long upon the land afterwards; for Burning exhausts the good juices of the land, in some degree, as well as the bad ones. It is most profitably used to such lands as have lain a long time uncultivated, and over-run with rank weeds, such as sowre grass, fern, heath, furze, and the like. Some lands, when corn is sown upon them, run it up into straw, and make the ears but poor and light; these are, beyond all others, improved by Burning. The usual method of plowing up for this is with a breast-plough, which a man pushes before him, and cuts the turf off the surface, turning it over when he has cut it to about eighteen or twenty inches long. The common way is only to pare it about half an inch thick; but, if it be very full of weeds, with stubborn roots, it is better to go deeper.

If the season proves dry, the turf needs no more turning, but dries, as it lies. If it be wet, it is necessary to set it on edge, and keep it hollow till such time as the wind and air have sufficiently dried it. It is then to be piled up in little heaps, about the quantity of two wheel-barrows full in each heap; and, if there be much roots and a good head upon it, there needs no farther care but setting it on fire, and the whole heap will be reduced to ashes; but if it be earthy and too dead to burn out by itself, there must be a heap of furze or heath laid under every parcel.

When the heaps are reduced to ashes, they are left upon the place till some rain comes to wet them; otherwise, in the spreading, they would all blow away. When they are wetted, the farmer takes the opportunity of a calm day, and spreads them as equally as possible over the whole land, cutting away the earth a little under the heaps, to abate its over great fertility there. After this, the land is to be plowed but very shallow, and the corn is to be sown upon it only in half the quantity that it is upon other land, and the later this is sown the better. If it be wheat, the best time is the latter end of October; for, if sown sooner, it is apt to grow too rank. The beginning of May is the proper time for cutting the turf off from these lands, because there is then time sufficient to get the land in order for sowing at the proper season. The whole charge of cutting, carrying, and Burning the turf, is generally about twenty-four shillings an acre.

The turf is not to be burnt to white ashes, for this wastes a great part of its salt; it is only to be burnt so as to crumble all to pieces, and be in a condition to spread well upon the land; and it is better that the heaps of it should burn slowly and gradually than furiously.

Some farmers stub up furze, heath, and the like, and, covering heaps of them with the parings of the earth, set fire to them; others burn the stubble of the corn fields, and others the stalks of all sorts of weeds, and add half a peck of unslaked lime to every bushel of ashes. They cover the lime with the ashes, and leave the heaps in this manner till there comes some rain to slake the lime; and, after this, they spread the mixture carefully over the field. There is one great advantage attending this sort of manure, which is, that it does not breed weeds like the common way with dung, but only fills the ears of the corn, not running them up into stalk; but it is proper to add some dung to these lands at the time of plowing them up for a second or third of crop corn. *Mortimer's Husbandry.*

BU'RNISHER, which some also call polisher. An instrument to burnish with. It is made of the finest steel, and is of several figures, according to the matter that is to be burnished: it ought to be well smoothed with the file, and afterwards polished on the wheel, till it be as bright as a looking-glass. They temper it afterwards as strongly as they can; the harder and better polished it is, the better it serves for its several uses. To burnish gold, silver, and other metals, and gilded works, the Burnisher must be of pure steel, made round, sometimes with one, and sometimes with two handles; when it has but one, the other end is fastened with a moving ring to the working boards, on which the workman works. The Burnisher for gilt works is made of a wolf's or dog's tooth, or with a piece of blood-stone fastened to a wooden handle.

BURNISHER, is also a tool used by the engravers of copper-plates: it is an instrument of steel, about six inches long, on one side of the figure of a heart, the point of which is something long, made round, not very thick, and not sharp. At the other end it has a kind of a darts head of iron, with three angles, sharp on the three sides. They call it a grater. See ENGRAVING.

The lock-smiths have three sorts of Burnishers: some that are crooked, to polish the rings of the keys; some straight, to polish the iron; and some half-round, to tin over. Other artificers who work and polish iron, as the gun-smiths, sword-cutlers, &c. have also several Burnishers or polishers, some like those of the lock-smiths, others like those of the engravers, and some that are peculiar to themselves, but little differing from the others.

BU'RSA *Pastoris*, *shepherds-purse*, in botany, a plant whose lower leaves lie flat on the ground, in a round compass, three or four inches long, narrow, and cut into several gashes, a little hairy. The stalk is slender, about a foot high, branched towards the top, beset with a few whole leaves, which are sharp-pointed, and set close on, without foot-stalks. The flowers are small, white, and four-leaved, and are succeeded by three square seed-vessels, in the shape of a purse, containing a very small reddish seed. The root is whitish, woody, and full of fibres, of but little taste. It grows every-where among rubbish, banks, and walls, and flowers all the summer. *Miller's Bot. Off.*

It is of an herby taste, a little saltish, and detersive; the juice of its leaves gives a faint red colour to blue paper, which gives us reason to imagine, that, in this plant, the sal ammoniac, which is natural in the salt of the earth, predominates over the other principles; this sal ammoniac is dissolved in a considerable quantity of phlegm, and is tempered by a good deal of earth, and a little sulphur.

This plant does not yield much acid, by a chemical analysis; almost all that is extracted from it is salt, besides a small quantity of earth.

There are but few plants which yield more concrete volatile salt, fixed lixivial salt, and earth. These principles, mixed together, render the shepherds-purse proper to dissolve the blood, when it is thickened by foreign acids, which hinder it from passing, with its ordinary velocity, from the arteries into the veins; to which we may refer the greatest part of defluxions. Besides, the earth, which is in this plant, easily imbibes the serosities, which occasion a relaxation of the fibres; thus, by the consent of all authors, it is vulnerary and astringent; it is also believed to be febrifugous and lenitive. The juice of its leaves drank, from four ounces to six, is an excellent remedy in all losses of blood, and in defluxions attended with an inflammation. They boil a handful of it in lean broth, and employ it in ptisans, clysters, and cataplasms Its distilled water has little or no virtue; it is nothing but the phlegm separated from the other principles.

It is found almost all the year; for it propagates itself by seed towards the end of summer. *Martyn's Tournefort.*

BUSS, a small sea vessel used by us and the Dutch in the herring-fishery. They call it in Dutch haering-buys; these vessels are commonly from forty-eight to sixty tons burthen, and sometimes more. They have two small sheds or cabbins, one at the head, and the other at the stern: that at the head serves for a kitchen.

Each Buss has a master, an assistant, a mate, and seamen in proportion to the vessel's bigness. The master commands in chief, and, without his express order, the nets cannot be cast or taken up. The assistant has the command after him, and the mate next, whose duty it is to see the seamen manage the rigging in a proper manner; to mind those who draw in the nets, and those who kill, gut, and cure the herrings, as they are taken out of the sea. The seamen generally engage for a whole voyage in the lump.

The provisions which they take on board the Busses, consist commonly of bisket, oatmeal, and dried, or salt fish; the crew being content for the rest with what fresh fish they catch.

BU'TCHER, one who kills, cuts up, and sells meat, either in the shambles, where it should only be sold, or at particular shops in the market.

The practical part of this trade, or killing, may claim its rise with almost the beginning of time itself; and that of selling was also very early.

When Rome flourished, they were three collected companies under strict regulations, which bore even the modern distinction of beef-Butchers, hog-Butchers, and slaughter-men, with some little difference.

Ours now are divided into carcase-Butchers, who buy live goods at market, have them killed, and sell the carcases whole, ready for cutting up; some indeed halve and quarter them.

The next are the great retailers, who themselves buy their goods alive, kill them, and dispose them in joints, or pieces, for sale. Some of these chiefly sell beef, others only veal, others mutton and lamb, others pork, and many of them all sorts. There are, also, small retailers, who buy their meat of the carcase-Butchers, and sell it by piece-meal.

Hog-Butchers, are such as deal in swine only; and some of these are also called bacon-men, who cure hog-meat for bacon, which is a very considerable business in and about London; but, in the country, most people cure it themselves.

How necessary and populous the trade of a Butcher is, we see daily. The buying in live stock requires experience, which gives judgment; the killing part is very slavish, dirty, wet work; the shop-keeping part ought to be accompanied with a good deal of cleanliness, besides the art of setting off their meat.

They commonly have with an apprentice five or ten pounds, and give a journeyman ten or twelve pounds a year, and his board; but the slaughtermen are paid by the head; some of whom will earn four or five shillings in a day, or night, for they have no set hours of working.

They were a company in the city of London, before the year 1180; but not incorporated till 1605, in the reign of king James I. Livery fine forty shillings.

Their hall is in Pudding-lane, near the Monument; and their court-day on the first Wednesday of the month.

Arms. Azure, two axes saltier-ways, or, headed proper; between two bulls-heads couped argent, armed or, on a chief of the fourth a boar's-head erased gules, between two garbs of the fifth.

Motto. *Omnia subjecisti sub pedibus: oves et boves.* Thou hast brought all things under foot: sheep and oxen.

BU'TEO, in zoology; see BUZZARD.

BU'TTER (*Dict.*) — *A new way to make the best of* BUTTER *from St. Foyne.*

—The following essay is extracted from a letter, which has been sent us by a gentleman, who has contributed his assistance from the country, where he cultivates a large estate of his own, and communicates to others such improvements as he makes, with a generous openness of spirit and freedom, rarely to be met with among us. This seed of St. Foyne, being much larger than clover, must be sowed in a much greater quantity. Four bushels to an acre will be better than three, which is the least you can venture to sow; observe the directions given for clover, as to manuring while the turf is tender, and the earth is frozen; but, as to the time of letting it grow, that may, if you please, be five years, for so long it will continue in its prime perfection; and, running into a large knotty root, does so enrich the ground it grows on, that, after it has borne St. Foyne five years, it will afford three excellent crops of what corn you please, and so improve itself, by alternate burdens of grass and corn, till it arrives at the utmost perfection which land is capable of reaching. Nothing is so sweet, nothing so innocent, as this St. Foyne; but, above all, it is observed to increase milk, in quantity and quality, beyond any grass yet known in the whole world; and it is for this reason that I advise you to keep cows upon it, and make you a five-years dairy. But, when I say a dairy, imagine not that I mean such a dairy as is commonly kept in England. Would you know what kind of dairy? I will hasten to inform you, and conclude my letter with this particular. The worst acre of an hundred, which quantity of land is most suitable to this purpose, improved by this grass, will very well maintain four cows from the first of April to the end of November, and afford besides a sufficient store of hay, to make good part of their subsistence the four winter months following: you must buy then about four hundred milch-cows, but take care you chuse them with judgment. I have bought your largest sort of runts from Wales, for less than fifty shillings a cow, with a good calf by her side, which I always disposed of as soon as I could. You will observe, that I make too good an use of the milk to afford the calf his share of it: I generally keep these cows above twelve months, and then, selling them, sometimes for four pounds a-piece, I stock myself with such that are new milched. I observe this rule every year, and the trouble is sufficiently rewarded by the advantage it brings me; for, besides the profit I make by selling dearer than I buy, I avoid the inconvenience of having any thing to do with bulls, and the consequences; so that I always preserve my cows in their full milk, and find it no uncommon thing for one of these milch-cows to be milked twice a day, and afford a gallon and an half at a meal. Four hundred of these cows will cost a thousand pounds; and you will find, that, coming from a poor pasture to a rich, they will prosper and increase both in milk and size. In eight convenient places about your hundred acres let there be built eight thatched sheds, a little rising in the middle to carry off the water; the height may be ten feet, and the breadth thirty; each of these sheds should be a hundred and twenty-five feet long, and, under the highest part, directly in the middle, you must raise a slight partition, lathed and plaistered, which serves to support the ridge of the roof, while the two sides are sustained by square wooden posts, about eight feet high, and placed at proper distances. On either side of the partition wall let there be fixed a kind of rack, like those in stables, which is to run the whole length of the shed, and must be placed as high as a cow can reach her fodder from. The shed must next be divided into stalls, like those for stone-horses, and each stall will be about five feet broad; the length of these stalls must be exactly fitted to that of a cow, that a cross bar, being placed at the outward end, may keep the beast from running backwards: thus every shed will hold fifty cows, five and twenty on each side of the partition: to every one of these sheds you must appoint a man, whose business it will be to clear the place, and carry off the dung; as also to mow the St. Foyne every day, and give it to the cows in the rack before-mentioned: this man beginning at one end of his proportion of ground, and going gradually on to the other, the first place will always be fit to mow again by that time he has gone through his whole division. Your cows are thus fed at discretion, with neither too much nor too little; they are not pestered with the scorching heats, nor troubled with the stinging fly, which, in open pastures, often makes them whisk about, and trample down more grass than they eat. At each end of every shed you must build a slight room of brick, thirty feet square, and ten feet high, which is to be divided, cross-

cross-way of the shed, into two partitions, each fifteen feet broad, and thirty feet long; that, which joins the cow-house, must be paved with tiles, and is to serve for a dairy; the the other must be floored and windowed, and is to be a lodging-room for the dairy-maids. Every shed will require five maids, that is, to every ten cows one dairy-maid; fewer might serve, but it is better to exceed, than fall short, in this particular. Thus each dairy will have two or three maids belonging to it, whose lodging will be the room adjoining, and whose care is to extend to the shed on both sides the partition, to the five and twenty cows which are the nearest to their station. All along both sides of the partition, at about a foot above the ground, let there be fixed, close to the wall, a strong pipe of lead, a little less than an inch diameter; both which pipes, being somewhat raised exactly in the middle of the shed, must have a gentle and almost an invisible descent from that rising to the dairies, through the wall of which their nether ends are to be brought, and there wrought into one another, that whatever descends through them, into either of the dairies, may have issue but at one mouth. This mouth of the pipes must be made very small, and neatly fitted into the hollow end of a strong wooden axle-tree; which, whilst it is turning swiftly round the mouth of the pipe, may by no means strain it by the motion, but receive, into its own hollow, the milk which descends through the leaden pipes, without spilling any, and passes so far through a wheel, or vessel like a barrel, only much larger in its circumference. The axle-tree, which this vessel is to turn upon, is bored very full of round holes, through which it delivers the milk into the vessel, as fast as it receives it from the pipe.

The vessel must be capable of containing, at least, three times the quantity of milk, which it is designed to receive; and there must be six wings, or thin pieces of wood, glued on edge-ways to the wooden axle-tree, whose length and breadth must be so contrived, as to leave a free space of six inches at at either end of the axle-tree, and a foot between their edges length-ways, and the smooth inside of the vessel; in the most convenient part of which must be contrived a door, to open and shut down upon occasion, as closely as if there was none. This door will perform its work very neatly, if you line the inside and edges with some kind of cloth, which is commonly used in the pressing of cheese. The other solid end of the axle-tree must extend itself about five feet longer; and the whole length may be supported by square wooden posts, and turn in their tops, which are to be made hollow, and kept greased for that purpose. This end of the axle-tree is to be fastened into a wheel, exactly like those which are used in many places for roasting of meat. The diameter of this last wheel must be within six inches of the height of the dairy, and two or three large dogs, being put into it at a time, will turn it with extraordinary swiftness: the dogs are easily taught, and will at last take delight in the exercise. I have brought up a large buck to the practice of this labour, and it is wonderful to see the force with which he runs round an hour or two together, and turns a wheel of ten feet diameter; but you must make your wheel as light, as it can possibly hold together. I have but one thing more to say, and I finish this direction: pretty near that side of every stall in your shed, to which the maid must come to milk the cow that belongs to it, let a hole, as small as will serve the occasion, be contrived by your plumber, in the uppermost part of the leaden pipe, to shut and open with a little screw, which screw, for fear of losing it, may be fastened by a little iron chain to the body of the pipe. I have endeavoured, in the description of all this, to make my meaning as plain as possible; if you do not comprehend it at first, you will after two or three times reading and considering it.

May BUTTER, *butyrum majale*, is a medicine in some repute among good women for strains, aches, and wounds. It is made of butter churned at that time, and exposed to the sun during the whole month, till, by repeated fusions, it be brought to a whiteness. Helmont calls it magistery of grass. Quincey affirms it is no better than plain lard.

Butter of stone, a kind of mineral drug found on the highest mountains and hardest rocks of Siberia, being drawn by the sun's heat, in the way of transudation from the dry substance of the stones themselves, and adhering to the surface thereof like a sort of calx, which, having received its full coction, is scraped off by the inhabitants under the name of camine massa. The Russians ascribe many virtues to it. It is much used for the dysentery and venereal diseases; but its operation is so violent, however corrected by other ingredients, that none but the Russians dare use it.

Butter-bur, petasitis, an officinal plant, both in figure and virtues resembling master-wort; it is reputed an alexipharmic and detergent, and used in many compositions, especially of the first of those intentions.

BUTTERFLY, *papilio*, in zoology, a large class of insects, which derive their origin from caterpillars.

Metamorphosis of BUTTERFLIES.—There is something very surprising in the metamorphoses of these and several other insects. Towards the end of the summer, and sometimes sooner, the caterpillars, when satiated with verdure, and, having changed their skins several times, cease to eat, and employ themselves in building a retreat, wherein they are to quit the life and form of a caterpillar, to give birth to the form of the Butterfly they contain within them. A few days are sufficient to conduct some into a new state of existence. Others continue whole months and years in their sepulchres. There are some species which plunge themselves into a small depth in the earth, after they are satiated with their food. In that situation they begin their efforts, and rend their robe, which, with the head, the paws, and entrails, shrink back, like dried parchment; and there remains a substance that resembles a bean, or a kind of covering of a brown colour, with an oval form, the most pointed part of which terminates in several moving rings, whose dimensions are gradually diminished. This is called the chrysalis, and incloses the embryo of the Butterfly, with such fluids as are proper to nourish and complete its growth. When the creature has acquired its perfect form, and is invited by a genial warmth to quit the scene of its confinement, it bursts the large extremity of its inclosure, which always corresponds with its head, and is weak enough to be opened at the first effort.

Some caterpillars, instead of sinking themselves into the earth, prepare a lodgment under the protection of roofs, in the cavities of walls, and even in the heart of the wood. All of them have sufficient abilities to secure themselves a safe retreat, for the time they are to continue in the state of aurelia's.

There are others who suspend themselves, with great dexterity, to the roofs of houses, or the first stake that occurs in their way, and they proceed in the following manner: the caterpillar extracts, from her own substance, a glutinous fluid, which lengthens, and acquires a due consistency, in proportion as she advances her head from one place to another: and when she has glued, and interlaced, several threads on some smooth place, to which she intends to fix herself, she insinuates her hinder paws into a complication of the tissue, by means of the minute claws in which they terminate. In this manner she accomplishes her first fastening; after which she rears her head, and fixes a new thread on the lateral wood that corresponds with her fifth ring, and then, with a gentle deflection of her head, she draws this thread in the form of a bow, around her back, and then fastens it to the opposite side. She frequently repeats these motions, in order to conduct the thread from the left to the right, and from the right to the left. When this second band, which sustains the animal above the middle of her body, has been sufficiently doubled and fortified, she rests upon it, and then agitates her body, till it is entirely covered with sweat. She then bursts her skin, which gradually shrinks to the side where her paws are implicated in the wood. These paws are, likewise, dissipated like the rest of her spoils; but all this is not sufficient to disengage the chrysalis; because, instead of the paws, by which it was detained, the extremity of it has shot out little points, whose heads terminate like that of a mushroom, or nails; and, as they are extended beyond the threads, they are sufficient, with the band that traverses the back, to fasten it, till the proper season, when the papilio is to be discharged from her confinement.

Some caterpillars involve their bodies in a texture of thread and glue, and then roll themselves over a bed of sand, by which means they collect an incrustation of small grains, and build themselves, in this manner, a monument of stone.

There are others who build in wood, and crumble into small particles the substance of a willow, or some other plant to which they have habituated themselves. They afterwards pulverize the whole, and form it, with an intermixture of glue, into a paste, in which they wrap themselves up. This composition dries over the chrysalis it surrounds, and which assumes much the same figure, so that it resembles a mummy, which corresponds with the body it incloses, and which serves it as a defence. If you press them a little, they will discover some signs of life, though their outward appearance indicates no such thing.

The caterpillars we are most acquainted with, are found in great numbers upon elms, apple-trees, and bushes. The papilio that proceeds from these, chuses some beautiful leaf, on which she fixes her eggs in autumn, and soon after dies, glued and extended on her beloved family. The sun, whose rays have still some power, warms her eggs, out of which, before the winter-season, a multitude of little caterpillars spring, who, without ever having seen their mother, and without the least model and instructions, immediately, with a kind of emulation, betake themselves to spinning, and, with their threads, industriously weave themselves beds, and a spacious habitation; where they shelter themselves from the severity of the season, distributed into different apartments, without eating, and frequently without stirring abroad. There is only one little opening at the bottom of this mansion, through which the family, sometimes, takes the air, towards noon, in a fine sunshine, and sometimes in the night, when the weather is settled. When you would open their retreat, you must employ a little strength to break the tissue that forms it, which is, generally, as firm as parchment, and not to be penetrated by rain, wind, or cold. There you will find the whole family reposing on a soft and thick down, and surrounded with several folds of the web they have spun, which

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at once supplies them with their quilts, their curtains, and their tent.

How is it possible to be unaffected with this little miracle of nature! Open one of these aurelia's, and it will seem to present you with nothing but a kind of putrefaction, containing the elements of a better state of existence, and composing the nutrimental juices which contribute to the growth of a more perfect animal. The time for its enlargement, at last, arrives, and the creature then forces its way through the prison that contained it. The head disengages itself through the aperture, the horns lengthen, the legs and wings are extended, and, at last, the Butterfly takes its flight through the air, retaining no similitude of its former condition. The caterpillar, which is changed into a nymph, and the Butterfly that proceeds from it, are two animals entirely different.

The first was altogether terrestrial, and crawled heavily along the ground. The second is agility itself, and is so far from limiting its motions to the earth, that, in some measure, it disdains to repose on its lap. The first was all shaggy, and frequently of an hideous aspect; the other is arrayed in colours of the most beautiful glow. The former, stupidly, confines itself to a gross food; whereas this ranges from flower to flower, regales itself with honey and dews, and perpetually varies its pleasure. This new animal enjoys all nature in full liberty, and is, itself, one of her amiable embellishments.

The arrangement of Butterflies into genera and classes are, in a great measure, taken from these several parts, and from the great uses which they make of them. The general distinction is, that which divides them into the day and night kinds: we have, among the birds, some few that fly abroad only by night; but these bear only a small proportion in number to the day-fliers: on the contrary, the number of Butterflies which we see fluttering about the fields and gardens, are scarce so many as those which fly abroad only by night. We often meet with this, even in our houses, flying about the candles, and the hedges swarm with them: in the day-time we find them hid under the leaves of plants, and often, as it were, in a torpid state. In this condition they remain till evening, but they are so cunning in hiding themselves at this time, that it is difficult to see one even in places where there are great numbers. The way to discover them, is to beat and disturb the bushes, or shake the branches of trees in places where they are suspected to be, and they will often be driven out in swarms. In this case they never fly far, but settle again on the first tree or bush they come to; and, in summer, if any one goes out into the fields or gardens, with a candle, in a calm and still night, there will numbers of different kinds of them, almost immediately, gather about it. These are called, by naturalists, night Butterflies, phalènæ, and moths.

The several kinds of Butterflies, that have those various inclinations, have also external characters by which they may be distinguished; all those which have buttoned antennæ, or club antennæ, are of the diurnal kind, and are never seen flying about candles in the night. There are other forms of the antennæ also, which are peculiar to the day Butterflies; and the night ones are distinguished by their having the plumose, the prismatic, or the conic ones.

Those which fly about our candles are always of one of these three kinds. It is not, indeed, to be wholly affirmed, that no one of these kinds is ever seen flying by day-light, since, in woods and thickets, we often see them fluttering about without having been disturbed; but all that are thus caught flying are males, and are that time seeking after the females, to couple with them, these being all fixed immoveably under the leaves and on the branches of trees.

The common kinds that we see fly about from flower to flower, are all of the day kind: a few species of the phalenæ sometimes flutter about the thistle flowers, and seem to suck them; but these are seldom seen; and among the moths, or night kinds, as we call them, there are a great many that never fly about by night any more than by day, and, indeed, make no use of their wings at all.

It is also a singular observation, that the moths which fly about our candles, whether in the house, or abroad in the gardens, are all males; the females never do it. The male of a glow-worm flies in the same manner at the candle, thinking it the light of his female; and it is possible, that the female moths may, in the night, yield a light that affects the eyes of the male of the same species, though it be insensible to our view.

The great general distinctions of the Butterflies into day and night kinds being made, it is necessary to have recourse to numbers of other sub-distinctions, in order to arrange them in any method; and these can, by no means, be taken from them in their prior state of caterpillars, many of them being in that state alike in all their general characters, though of different genera in their flying state.

As the antennæ serve for distinctions of the Butterflies into classes, so do their trunks into genera; but these are only capable of distinguishing a few, the flat and the round being their principal distinction. Mr. Reaumur has observed, that the day Butterflies have all these trunks, but that many of the night kinds want them. The wings, however, give the greatest variety of generical characters among these animals. The shape of these, and the manner in which these creatures carry them, when walking, and at rest, serve as great and essential distinctions.

Class 1. contains those Butterflies whose antennæ are terminated by buttons, and whose wings, when at rest, are placed in a perpendicular direction to the thing the creature sits upon, the under edges of which embrace the lower part of the body, and whose six legs are all employed in sustaining the body, and in walking. The black-spotted white Butterfly, produced from the beautiful cabbage caterpillar, is one of the Butterflies of this class.

Class 2. contains the Butterflies of the same characters with the former in all respects, except that they use only four of their legs in sustaining the body, and in walking. The two anterior legs in the flies of this class are held in a bent posture, and are furnished with a downy part at their ends, and seem to serve as a sort of arms. These Butterflies, in general, are produced from the prickly caterpillars. The solitary nettle kind gives us an instance in its Butterfly.

Class 3. contains those Butterflies which agree in all respects with the former, except that their two anterior legs, which they use as arms, and never in walking, are not terminated by downy ends, but are fashioned like the other legs, at the extremity, only so small, that it requires a microscope to distinguish them. There is an instance of this class in a common grey and yellow Butterfly, that is found in pastures among the grass in June, July, and August.

Class 4. contains those Butterflies which have buttoned antennæ, as the others, and which carry their wings, when at rest, in a perpendicular direction to the thing they sit upon; but, as the former have the inferior edge of their wings bent round the upper part of their body, so in these the inferior edge is bent upwards in both pair of wings, and embraces and covers the upper part of the body. However obvious this distinction may be, there is another yet more plain in this, that all of this class have one of the jags of the wing so far extended beyond the rest of the verge, that it forms a kind of tail; and they are called the tailed Butterflies. These use all their six legs in walking.

Class 5. contains those Butterflies which have six real legs, which they use as such, and their horns terminated by buttons as the others; but whose wings, when they repose, are not elevated perpendicularly to the thing they sit on, as in the four preceding classes, but are held in an horizontal direction, or, at the utmost, never meet in an angle over the back. We have an instance of this class in a Butterfly bred from a smooth caterpillar of the marshmallow.

Class 6. contains those Butterflies which have club antennæ, that is, such antennæ as gradually increase in thickness from their origin to their extremity. These are that class of Butterflies which are always upon the wing, and buz about flowers without ever settling upon them. They dart their trunks into the flower while they sustain themselves in the air, and have a way of holding themselves in poise, like a kite or other bird of prey; but, when they are busy about the flowers, they have their wings in continual motion, and make a humming noise, like the humble-bees.

Class 7. In the last class are comprehended those Butterflies whose antennæ are long at their origin, smaller afterwards, and finally terminated by an oval head; and which differ from the club antennæ in having no pencils of hairs at the end. This class is not very numerous, and the most frequent instance we have of it is in a painted kind, which we frequently find on blades of grass, in meadows, in July. This flies little in the day time, but is usually found fixed to a plant, as the moths are. *Reamur's Hist. Insect.*

BUTTERFLY-*shell*, in natural history, the English name for a beautiful species of the volutæ. See *plate* VI. *fig.* 32.

The volutæ are the most beautiful shells of the whole body of sea productions. See VOLUTA.

BUTTON.—The form and use of a Button are too familiar to need a description. The matter whereof they are made is various; as metal, thread, silk, mohair, &c.

Method of making common BUTTONS.—Common Buttons are usually made of mohair; some indeed are made with silk, and others with thread; but the latter are a very inferior sort. In order to make a Button, the mohair must be previously wound on a bobbin. The mould is then fixed to the board by means of a bodkin thrust through the hole in the middle of it; and the workman wraps the mohair round the mould in three, four, or six columns, according to the nature of the button.

Wrought BUTTONS.—The first part of the process, in making these Buttons, is the same as the preceding; viz. the mould is covered with mohair in three, four, or six columns as before; after which they are stitched by various kinds of stitches, so as to represent different figures.

Horse-hair BUTTONS.—The moulds of these Buttons are covered with a kind of stuff composed of silk and hair; the warp being Belladine silk, and the shoot horse-hair. This stuff is wove with two selvedges in the same manner, and in the same loom, as ribbands; for the method of which see ribband WEAVING. The stuff is cut into square pieces proportionable to the size of the Button; these pieces are wrapped round the moulds, and their selvedges stitched together, which forms the under part of the Button.

Cleansing of BUTTONS.— A Button is not finished when it comes from the maker's hand; the superfluous hairs and hubs of silk must be taken off, and the Button rendered glossy and beautiful, which they perform in the following manner:

A quantity of Buttons are put into a kind of iron sieve, called by workmen a singing-box. Then a little spirit of wine being poured into a shallow iron dish, and set on fire, the workman moves and shakes the singing-box, containing the Buttons, briskly over the flame of the spirit, by which means all the hairs, hubs of silk, &c. are burnt off, without damaging the bottom. Great care must be taken that the Buttons in the singing-box be kept constantly in motion; for, if they are suffered to rest over the flame, they will immediately burn.

When all the loose hairs, &c. are burnt off by the flame, the Buttons are taken out of the singing-box, and put, with a proper quantity of crumbs of bread, into a leather bag, about three feet long, of a conical shape, the apex or small end being closed up. The operator then takes one end of the bag in one hand, and the other in the other, and shakes them briskly, and with a particular jerk; by which means they are rendered very glossy and fit for use.

Gold-twist BUTTONS.— The mould of these Buttons is first covered with silk in the same manner as common Buttons. The mould being overlaid with silk, it is covered with a thin plate of gold or silver, and then wrought over in different forms with purle and gemp. The former is a kind of thread composed of silk and gold wire twisted together: and the latter capillary tubes of gold or silver, about a tenth of an inch long. These are joined together by means of a needle filled with silk, thrust through their apertures, in the same manner as beads or bugles.

The manner of making metal BUTTONS.— The metal to be used is first cast into a small ingot, and then flatted into thin plates, or leaves, of the thickness intended, at the flatting mill; after which, it is cut into little round pieces of a diameter proportionable to the wooden mould they are to cover: this cutting is performed with a sharp punch, on a leaden block or table.— Each piece of metal thus cut, and taken off from the plate, is reduced to the form of a Button, by beating it successively in several spherical cavities, with a round piece of iron in form of a puncheon; still beginning with the flattest cavity, and proceeding to the more spherical, till the plate have got all the relievo required: and, the better to manage so thin a plate, they form ten, twelve, or even twenty-four, to the cavities at once; and also neal the metal to make it more ductile.

The inside thus formed, they give an impression to the outside, with the same iron puncheon in a kind of mould, like the minter's coins engraven en creux, or indentedly, and fastened to a block or bench, by means of the same kind of press used in coining. The cavity of this mould, wherein the impression is to be made, is of a diameter and depth suitable to the sort of Button to be struck in it; each kind requiring a particular mould. Between the puncheon and the plate is placed some lead, called by workmen a hob, which contributes to the better taking off all the strokes of the engraving; the lead, by reason of its softness, easily giving way to the parts that have relievo; and as easily insinuating itself into the trace, or engraving of the indentures.

The plate, thus prepared, makes the upper part or shell of the Button.— The lower part is formed of another plate, made after the same manner, but flatter, and without any impression. To this last is soldered a little eye made of wire of the same metal, for the Button to be fastened by.

The two plates are soldered together, with soft solder: and then turned in a lathe.— Ordinarily, indeed, they content themselves to cover the naked mould with the shell; and in this case, for the fastening, they pass a thread or gut a-cross through the middle of the mould; and the cavity between the top of the mould and the cap they fill with cement, in order to render the Button firm and solid; for the cement, entering all the cavities formed by the relievo of the other side, sustains it, prevents its flattening, and preserves its bosse or design.

Button-MOULD; see the article *Button*-MOULD.

BUTTON, among gardeners, denotes a flower or cluster of leaves not yet expanded.

Buttons are a kind of ova, out of which arise either leaves alone, or intermixed with flowers. Leaf Buttons are smaller and more pointed than flower Buttons, which are bigger and rounder. Among trees which bear kernel fruit, each Button produces several flowers; and, among stone fruit-trees, each Button yields but one flower.

BUTTON, *in fencing*, signifies the end or tip of a foil, being made roundish, and usually covered with leather, to prevent making contusions in the body.

BUTTON, *in building*, denotes a slight fastening for a door or window, made to turn on a nail.

BUTTON *of the reins of a bridle*, is a ring of leather with the reins put through it, running all along the length of the reins.

BUTTON *Antennæ*, a name given by naturalists to those antennæ or horns, as they are called, of butterflies, which are slender and terminated at the top by a sort of Button, in form of an olive, or part of one.

BY'SSUS, or BYSSUM, βύσσος, a fine sort of thready matter produced in India, Egypt, and about Elis in Achaia, of which the richest apparel was intirely made, especially that wore by the priests both Jewish and Egyptian.

Authors usually distinguish two sorts of Byssus, that of Elis, and that of Judea, which was the finest. Of this latter were the priestly ornaments made. Bonfrerius notes, that there must have been two sorts of Byssus, one finer than the ordinary, by reason there are two Hebrew words used in scripture to denote Byssus, one of which is always used in speaking of the habit of the priests, and the other that of the Levites.

BYSSUS, in botany, a word used to express a genus of mosses the most imperfect of the whole class of vegetables. The characters of this genus are: the mosses of it are composed of simple and uniform parts, and always appear in form of excrescences, either of a woolly or of a dusty matter. It seems properly a genus of vegetables of a middle kind, between the mushrooms and the mosses, but most approaching to the latter, in that the several species of it are of a longer duration, and want that fleshy texture which distinguishes the fungus class, and in that they never produce heads, nor have any thing of the figure or texture of fungi.

BU'ZZARD, *buteo*, a bird of the long-winged hawk kind, of the size of a pheasant, or small pullet. Its head is large and flat, and its beak short, crooked, and of a bluish black, and covered above with a yellow skin down to the nostrils. Its back and wings are of a reddish or yellowish brown, tending to black, or, as some call it, a rusty black, sometimes variegated with white spots near the shoulders. Its breast and belly are of a yellowish white, but on the breast there are several oblong rusty-coloured spots. Its thighs are covered with yellowish white feathers, with transverse streaks of a ferrugineous colour; between its eyes and nostrils there are several black bristles. The tail is not forked; the legs are short, thick, strong, scaly, and of a yellowish colour. It feeds on moles, field mice, and other such animals; sometimes on small birds, and sometimes will seize on rabbits. In want of better food, it will also sometimes live on beetles, worms, and the like. Its eggs are white, more or less sprinkled with irregular red spots. In age, or by some other accidents, the head and back in this species are sometimes found grey. *Ray's Ornithology.*

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CAABA, a square stone edifice in the temple of Mecca, supposed to have been built by Abraham and his son Ishmael; being the part principally reverenced by the Mahometans, and to which they always direct themselves in prayer.

The word is Arabic, Caaba, and caabah, a denomination which some will have given to this building, on account of its height, which surpasses that of the other buildings in Mecca; but others, with more probability, derive the name from the quadrangular form of this structure.

The length of the Caaba is about twenty-four cubits, its breadth twenty-three, and height twenty-seven cubits; the door, which is on the east side, being four cubits from the ground, and the floor level with the bottom of the door. In the corner next this door, is the famous black stone, which is set in silver, and exceedingly respected by the Mahometans. The pilgrims kiss it with great devotion, and it is by some called the right hand of God on earth. It is fabled to be one of the precious stones of Paradise, which fell down to the earth with Adam, and, being taken up again at the deluge, was brought back by the angel Gabriel to Abraham, when he was building the Caaba. It was at first whiter than milk, but grew black long ago; some say by the touch of a menstruous woman, others by the sins of mankind, others by the numerous kisses of the devotees. On the north side of the Caaba, within a semicircular inclosure, lies the white stone, said to be the sepulchre of Ishmael, which receives the rain water that falls off the Caaba, by a spout formerly of wood, but now of gold. The Caaba has a double roof, supported within by three octangular pillars of aloes wood, between which, on a bar of iron, hang some silver lamps. The outside is covered with rich black damask, adorned with an embroidered border of gold, which is changed every year, and was formerly sent by the caliphs, afterwards by the sultans of Egypt, but now provided by the Turkish emperors. At a small distance from the Caaba, on the east side is the station or place of Abraham, where there is another stone wherein they pretend to shew the footsteps of that patriarch, supposed to have been made when he stood on it in building the Caaba, where it served him for a scaffold, with this peculiar advantage, that it rose and fell of itself, as he had occasion.

CAAMI'NI, in botany, a name given by the Spaniards and others to the finest sort of the Paraguay tea. It is the leaves of a shrub which grows on the mountains of Maracaya, and is used in Chili and Peru as the tea is with us. The mountains, where the trees which produce this valuable leaf grow naturally, are far from the inhabited parts of Paraguay; but the people of the place know so well the value and use of it, that they constantly furnish themselves with great quantities of it from the spot. They used to go out on these expeditions many thousands together, and their country is left to the insults of their enemies the mean time, and many of them perish with the fatigue.

To remedy these inconveniences, they have of late planted the trees about their habitations; but the leaves of these cultivated trees have not the fine flavour or the virtues of the wild ones.

The king of Spain has permitted the Indians of Paraguay to bring to the town of Santfoy twelve thousand arobes of the leaves of this tree every year; but they are not able to procure so much of the wild leaves annually; about half the quantity is the utmost they bring of this; the other half is made up of the leaves of the trees in their own plantations, and this sells at a lower price, and is called pabos. The arobe is about twenty-five pounds weight; the general price is four piastres for the arobe, and the money is always divided equally among the people of the colony. *Observ. sur les Coutumes de l'Amerique.*

CAB, or KAB, a Hebrew measure of capacity, equal to the sixth part of the seah, or an eighteenth of the epha.

The Cab of wine contained two English pints; the Cab of corn 2 5/6 pints, corn measure.

CA'BALA *Vein*, in natural history, a name given by our Sussex miners to one kind of the iron ore commonly wrought in that country. It is a stony ore, of a brownish colour, with a blush of red, which is more or less conspicuous in different parts of the same masses.

CA'BBAGE, *brassica*, in botany, a genus of plants, whose characters are: the flower consists of four leaves, and is of the cruciform kind; the pistil which arises from the cup, becomes at length a long cylindrical pod, divided into two cells, which are filled with roundish seeds, by an intermediate membrane. Tournefort has enumerated twenty-five, and Mr. Miller twenty-two species of Cabbage.

All the common sorts of Cabbages are largely cultivated about London. The common white, red, flat, and long-sided ones, are chiefly for winter use. The seeds of these sorts must therefore be sown in the middle of March, in beds of good fresh earth; and in April, when the young plants will have about eight leaves a piece, they are to be prickled out into shady borders, about three inches square; and, about the middle of May, they must be transplanted to the places where they are to remain: and this is commonly between cauliflowers or artichokes, at about two feet distance in the rows. They must be watered at times, and the earth must be houghed up about their roots, and kept clear from weeds.

These Cabbages will be fit for use soon after Michaelmas, and will continue till February, if not destroyed by bad weather; to prevent which, the gardeners about London pull up their Cabbages about November, and trench the ground in ridges, laying their Cabbages against the ridges, as close as possible on one side, burying their stems in the ground; and in this manner they let them remain till after Christmas, when they cut them for market.

The Russian Cabbage is small, and not much cultivated now. It is to be raised as the others, but may be planted nearer, as not so large. It is fit for use in July.

The early Battersea and sugar loaf Cabbages are sown for summer use, and are commonly called Michaelmas Cabbages. The season for sowing these is the beginning of July, in an open spot of ground. It is common to sow spinage in the same beds with these, houghing it up from about their stalks in spring; in May and June these begin to turn their leaves for cabbaging, and may be brought to it much sooner then naturally they would, by tying them about with an ozier band.

The Savoy Cabbages are for winter use, and are to be sown about the beginning of April; they are to be treated as the common Cabbage, and planted out at two feet distance, in an open place.

The bore-cole may be cultivated in the same manner, but must be planted only at one foot distance; these are not fit to cut till the frosts have nipped them.

The method of getting good Cabbage seed is this: chuse out some fair plants in October, pull them up, and hang them up three days, with the root upward, in a shady place; then plant them under a warm hedge, burying the whole stalk and half the Cabbage in the earth; cover them with culm, if the winter be severe, and in spring they will shoot out many branches. When these begin to pod, the ends of the upper ones should be cut off, to give strength to the other pods. The seed must be preserved from the birds, by planting some lime twigs about the plants, where the catching one or two will intimidate the rest. When ripe, it must be threshed out, and kept for use. *Miller's Gard. Dict.*

The Cabbage removes, as it is said, the consequences of hard drinking; and it has been well known to be a custom among many at this time, as well as among the antient Egyptians of old, to eat raw or boiled Cabbage, as a preservative against the effects of wine. This seems to have sprung from the opinion of the great antipathy of the plants to one another; it having been affirmed, that the vine and Cabbage will by no means grow together; and some of the moderns have endeavoured to account for this, from the nature of these two plants, by saying, that they are both so fond of nutritive juice, as greedily to suck up all the juices of the earth, and by that means, when planted near, to starve one another. But we have no reason to have recourse to these suppositions, since there is not the least truth in the observation, but the vine and Cabbage grow as well together as any two plants in the world. *Ephemerid. German.*

CA'BBALA (*Dict.*)—This oral tradition has obtained so much credit among Christians that some have put its authority on a level with holy writ; amongst these is the famous Johannes Picus, whom a zealous attachment to the Romish religion carried beyond his reason. He imagined the cabbalistical books he had purchased, at no small expence, authentic, thought them the work of Esdras, and that they contained the doctrine of the ancient Jewish church. He thought he saw

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in them the myftery of the Trinity, the incarnation, the redemption of mankind, the paffion, death, and refurrection of Jefus Chrift, purgatory, baptifm, the abolition of the old covenant, and, in fhort, all the opinions maintained and received by the Romifh church: but his notions were exploded, his thefes were fuppreffed, and thirteen of his propofitions condemned as heretical. The original of the Cabbala is very obfcure. Some tell us the angel Raziel, the inftructor of Adam, gave him the Cabbala, a book containing the celeftial fciences, which on his expulfion from paradife he took away from him, but, moved by the intreaties of Adam, Raziel returned to him again. Others fay Adam did not receive this book till after his fall. They tell us that Adam, on his humble fupplication to God for comfort in his unhappy ftate, received this book from Raziel to which they attribute all the pretended power of magic. They add that this book was handed down from father to fon, and at laft fell into the hands of Solomon, whom it taught to build the temple by the means of the worm Zamir, without the help of any inftrument of iron. Ifaac Ben Abraham publifhed a book to prove this, but the book was condemned to the flames by the Jews of his own tribe.

The learned are fo much divided in their opinions concerning the origin of the Cabbala, that it is almoft impoffible to determine any thing certainly about it. Morus and Van Helmont are the firft who have wrote on this fubject, with defign of clearing up the point: but in this they have fucceeded very ill, having afcribed falfe principles to the Cabbala, which is proved by Wachterus, in Judaifm detected, page 2. To avoid falling into the fame error we fhall extract, what we advance on this fubject, from thofe authors who have wrote with the moft perfpicuity and order on it. R. Ifaac Lorica and R. Abraham Irira among the moderns are moft eminent. The firft wrote the Drufchim, which contains a metaphyfical introduction to the Cabbala; the fecond wrote a book intitled Schaar Hafcamaim, that is the Gate of the Heavens; thefe books are wrote with much clearnefs, and explain the foundation of the cabbaliftical philofophy, which depends on the following principles.

1. From nothing nothing can be produced; and on this one principle depends the whole of the cabbaliftical philofophy. The cabbaliftical philofophers were no ftrangers to the term creation, but they underftood the word in a very different light from the Chriftian notion, which is, that God from nothing created all things. They did not borrow this principle from the Jewifh church but the heathen philofophers, who, looked upon it equally abfurd to affert any exiftence was produced from nothing, as to fay a thing is and is not. Spinofa has urged this argument ftrongly in favour of his opinion; Epicurus among the ancients advanced this doctrine againft Heraclitus and the Stoics. But the fuppofition of a pre-exiftent omnipotent caufe at once deftroys the force of it.

2. In confequence of the firft, no fubftance can have proceeded from nothing.

3. Even matter, therefore, could not have proceeded from nothing.

4. Matter, becaufe of the vilenefs of its nature, owes not its original to itfelf. The reafon Irira advances, in fupport of this principle, is, that matter in itfelf is without form, and is only one degree removed from non-exiftence.

5. From whence it follows, that there is not in nature any fuch thing as matter properly fo called.

The philofophical reafon the cabbalifts bring to maintain this principle is, the intention of the efficient caufe to make a work like unto himfelf; now, the firft caufe being a fpiritual fubftance, the productions muft have been fpiritual rather than corporeal fubftances; becaufe the former moft refemble the nature of the efficient caufe. This reafon they infift on very ftrenuoufly, and argue, that it is as great an abfurdity to fay God created material fubftances, which are different from his own nature and effence, as to fay God created darknefs, fin, and death; for, fay they, matter is nothing but a privation of fpirit, as darknefs of light, fin of fanctity, and death of life.

6. From whence it follows that whatever exifts is fpirit.

7. This fpirit is uncreated, eternal, intellectual, fenfible, having in itfelf the principle of motion, infinite, independent, and neceffarily felf-exiftent.

8. This fpirit is confequently the enfoph or infinite God.

9. It follows therefore, that whatever exifts, muft be an emanation from this infinite fpirit. As the cabbalifts did not admit of a creation in fuch a manner as the Chriftians receive the doctrine of it, fo they were obliged either to admit of a pre-exifting matter, or maintain that the univerfe proceeded from God by way of emanation: the firft opinion they dared not embrace, becaufe it was contrary to their tenets to admit of a material caufe exclufive of God, and therefore fell into the doctrine of emanations, which they received from the orientals who were taught it by Zoroafter, as appears from cabbaliftical writers.

10. The nearer things are in their emanation from the divine fource of all, fo much are they more noble and divine; the more diftant they are, fo much lefs do they partake of the divine nature and perfection.

11. The world is diftinct from God as the effect from its caufe, not as a tranfient but a permanent effect. The world, therefore, being an emanation from God, is to be confidered as God himfelf, who, being incomprehenfible in his effence, has chofen to manifeft himfelf in his emanations.

Thefe are the principal doctrines of the Cabbala, from whence they have deduced a multitude of extravagant whims, which we do not think it neceffary to trouble our reader with.

CA'BINET, a piece of joiner's workmanfhip. It is a kind of prefs or cheft, with feveral doors and drawers, to lock up the moft precious things, or only to ferve as an ornament in chambers, galleries, or other apartments.

There are common Cabinets of oak, or of chefnut; varnifhed Cabinets of China and Japan; Cabinets of inlaid work; fome of ebony, and other fcarce and precious woods.

The Cabinets of Germany were formerly in great repute in France, where they were very much efteemed, on account of feveral mechanical rarities and curiofities, which they were filled with in the infide. They are very much valued in foreign countries, and the Dutch carry fome ftill into the Eaft; but they are almoft intirely out of date in France, as well as the Cabinets of ebony, which came from Venice.

Cabinet, in a garden, is a conveniency which differs from an arbour, in this, that an arbour or fummer-houfe is of a great length, and arched over head, in the form of a gallery; but a Cabinet is either fquare, circular, or in cants, making a kind of falon to be fet at the ends or in the middle of a long arbour.

Cabinet *of natural hiftory*, a building containing all the curiofities of nature, digefted in a proper manner.

Such a building might indeed be called, with more propriety, a mufæum or repofitory; Cabinet here, therefore, muft be underftood in a larger fenfe than the common acceptation of the word, as herein are exhibited to our view the animal, vegetable, and mineral kingdoms at once: in fhort, an epitome of nature.

It is not certain whether the ancients ever formed any collections of this kind, or erected any ftructures for the reception and difpofition of them. But it is not improbable, that Ariftotle, fupported by the generofity and magnificence of Alexander the Great, built fomething of this kind, at leaft with regard to animals; becaufe the obfervations he has left us, are undoubtedly the refult of anatomical obfervations, and the remarks he has made on the various fpecies of animals fhew our knowledge, even fince the revival of letters, to be vaftly inferior to his, in this refpect.

The knowledge of natural hiftory improves, as collections of this kind are made more perfect; and our own age has firft fet on foot eftablifhments that deferve the name of Cabinets of natural hiftory.

That in the garden of the king of France is reckoned one of the richeft in Europe; a fketch of it may not be difagreeable. In the animal kingdom are feen human fkeletons of all ages, a numerous collection of bones remarkable for fiffures, fractures, deformities, and difeafes. Several preparations of anatomy injected and dried: feparate parts preferved in fpirits. Some fine pieces of anatomy reprefented in wax, wood, &c. Some pieces of mummies and ftony concretions extracted from human bodies, a large quantity of habiliments, arms, and inftruments ufed by the favages, &c. brought from America and other parts of the world.

Among the quadrupeds a great number of fkeletons and other pieces of ofteology, parts of the beafts preferved in fpirits, fome fkins ftuffed to refemble the life, &c.

Fine fkeletons of the largeft and moft uncommon birds, others preferved in fpirits, others ftuffed, &c.

A numerous collection of fea and river fifh dried, others preferved in fpirits.

A vaft number of different fpecies of lizards, ferpents, &c. collected in all parts of the world.

A very great feries of fhell and cruftaceous animals, &c.

And laftly a prodigious number of infects both of land and water; amongft others, a papilionaceous feries almoft complete, and a vaft collection of falfe marine plants of all fpecies.

In the vegetable kingdom are complete herbals furnifhed by Meff. Tournefort and Vaillant with numerous feries of roots, barks of trees, feeds, and fruits of plants; a collection of gums, refins, balms, and other juices of vegetables almoft complete.

In the mineral kingdom are collections of earths, common and figured ftones, petrifications, incruftations, ftalactites; a fine feries of pebbles, fine ftones, rough and polifhed, ranged in plates and vafes, &c. precious ftones, cryftals, all forts of falts and bitumens, mineral and foffile fubftances; a collection of the minerals found in France and all the parts of Europe, efpecially in the northern parts of the world, and principally America.

All thefe collections are ranged in a methodical order, and diftributed in a manner moft proper for the ftudy of natural hiftory. Every individual is marked with its proper title. The whole is placed under glaffes with tickets, or difpofed in the moft convenient manner for obfervation.

To form a Cabinet of natural hiftory, it is not enough to collect

lect without choice, and heap together all the objects we meet with in natural history, without taste or order; we must know how to distinguish what ought to be rejected, what admitted. Order and relative distribution constitute the principal beauty of these collections, the ends of which are instruction and entertainment; and, without the merit of order and distribution, of what use is a great collection? What will it signify, whom will it improve, to amass in sumptuous buildings, at great pains and expence, a multitude of productions, which are presented to us in confusion, and without any regard to the nature of the things themselves, or the principles of natural philosophy? I should be apt to say to such naturalists as these, Send back to the sea your shells; restore to the earth its roots, seeds, and plants; cleanse your apartments of this heap of dead bodies, of birds, fishes, and insects: if you only make a chaos wherein I see nothing distinct, you know not how to display the riches of nature; let men of so low a genius hew the stone, but leave to others the direction of the structure.

M. d'Aubenton, who is demonstrator and keeper of the king of France's cabinet, has given some excellent directions for the distribution and arrangement of such collections.

The disposition most proper for the study of natural history, says he, is a methodical order, which distributes whatever it contains into classes, genera and species. Thus the animal, vegetable, and mineral kingdoms will have their separate apartments. The same order should subsist between the genera and the species. The individuals of the same species should be placed near, under, and round about it, never distant from it. Thus you will see the species in their genera, and the genera in their classes. Such an arrangement as this must tend greatly to the improvement of natural history; every thing becomes instructive; at one cast of the eye, we not only have a real knowledge of the object we apply ourselves to, but discover also the affinity it has with those that surround it. The resemblances indicate the genius, the differences mark the species. By following nature thus in all the variety of her productions, we pass insensibly from one kingdom to another; the gradations prepare us, by little and little, for the great change, which is not sensible in the whole, but by comparing the two extremes.

England may be complimented on the possession of Sir Hans Sloane's collection, and there is no room to doubt but it will be disposed in the most elegant and methodical manner; because the noble and learned personages, concerned in that affair, are most eminent for capacity and genius.

CABINET, is sometimes particularly used for a place at the end of a gallery, wherein are preserved the paintings of the best masters, conveniently ranged, and accompanied with busts, and figures of marble and bronze, with other curiosities.

CA'BLE (*Dict.*)—In the manufacture of Cables, after the ropes are made, they use sticks, which they pass first between the ropes, of which they make the strands, and afterwards between the strands, of which they make the Cable; to the end that they may all twist the better, and be more regularly wound together: and also to prevent them from twining, or entangling, they hang to the end of each strand, and of each rope, a weight of lead, or stone.

When the Cable is made, and twisted as it ought to be, they untwist three or four turns, that the rest may better remain in their proper position.

Cables that are too much twisted, burst very easily; and, when they are spun off, that is to say, not sufficiently twisted, they break.

The number of threads, of which a Cable ought to be composed, is always proportionable to its length and thickness; and it is by the number of threads that compose it, and make its diameter and circumference, that one may judge of its weight, and, consequently, make an estimate of its value, which is an expeditious way of computing the worth of cordage. See ROPE-*making*.

CA'BLING, in architecture, the figure of a staff, or reed, either plain or carved, in resemblance of a rope, or a rush, wherewith a third part of the flutings of a column are sometimes filled up; hence called cabled flutings.

CABO'CHED, in heraldry; a deer's, leopard's, or bull's head, is said to be Caboched, when it is borne full-faced, without any part of the neck. *Coats, Dict. Herald.*

CA'CAO (*Dict.*)—See *Plate* IX. *fig.* 4. where *n* is a young shoot of this tree, *o* its flower, *p* ripe fruit, *q* ripe fruit open, *r* kernel, *s* kernel open, *t* kernel dissected.

In order to cultivate this plant in Europe, by way of curiosity, it will be necessary to have the nuts planted into boxes of earth (in the countries where they grow) soon after they are ripe; because, if the nuts are sent over, they will lose their growing quality before they arrive. These boxes should be placed in a shady situation, and must be frequently watered, in order to forward the vegetation of the nuts. In about a fortnight after the nuts are planted, the plants will begin to appear above ground; when they should carefully be watered in dry weather, and protected from the violent heat of the sun, which is very injurious to these plants, especially while they are young: they should also be kept very clear from weeds, which, if suffered to grow in the boxes, will soon overbear the plants, and destroy them. When the plants are grown strong enough to transport, they should be shipped, and placed where they may be screened from strong winds, salt water, and the violent heat of the sun. During their passage, they must be frequently refreshed with water; but it must not be given them in great quantities, lest it rot the tender fibres of their roots, which will destroy the plants; and, when they come into a cool latitude, they must be carefully protected from the cold, when they will not require so frequently to be watered; for, in a moderate degree of heat, if they have gentle waterings twice a week, it will be sufficient.

When the plants arrive in England, they should be carefully taken out of the boxes, and each transplanted into a separate pot, filled with light rich earth, and plunged into a moderate hot-bed of tanners bark; being careful to cover the glasses in the heat of the day, to screen the plants from the sun: they must also be frequently watered; but it must be done with caution, not to rot their roots. In this hot-bed the plants may remain till Michaelmas, when they must be removed into the bark-stove, and plunged into the tan, in the warmest part of the stove. During the winter season, the plants must be frequently refreshed with water; but it must be given to them in small quantities: yet in summer they will require a more plentiful share. These plants are too tender to live in the open air in this country, even in the hottest season of the year, therefore must constantly remain in the bark-stove; observing, in very warm weather, to let in a large share of fresh air to them, and in winter to keep them very warm. As the plants increase in bulk, they should be shifted into larger pots, in doing of which, there must be particular care taken not to tear or bruise their roots, which often kills the plants; nor must they be placed in pots too large, because that is a slow but sure death to them. The leaves of these plants must be frequently washed, to clear them from filth; which they are subject to contract by remaining constantly in the house; and this becomes an harbour for small insects, which will infest the plants, and destroy them, if they are not timely washed off. If these rules are duly observed, the plants will thrive very well, and may produce flowers in this climate; but it will be very difficult to obtain fruit from them; for, being of a very tender nature, they are subject to many accidents in a cold country.

CACAO *preserved*, or *sweet-meats of Cacao*. They are made in the Antilles, are excellent, and far excel all the sweet-meats made in Europe.

The Cacao which one would preserve, must be gathered some time before it be quite ripe; the maturity of this fruit is known by its pods beginning to turn yellow; they must be chosen, therefore, some days before they begin to take that colour.

The nuts, which are then delicate and tender, are put to soak in fresh clear water, which must be changed every morning and every night during five or six days; after which they lard them with very thin bits of lemon-peel and cinnamon; then they make a syrup of the finest sugar, but very thin, wherein they put the nuts: after it is taken from the fire, and sufficiently clarified, they leave them in that syrup 24 hours. When they are taken out of it, and well dried, they make another syrup, but thicker, in which they leave them again a whole day. Lastly, after they have thus passed them through five or six syrups, they make another, of a greater consistency than the former, wherein they put musk, ambergrise, or other perfumes, people like them; and in this last syrup the nuts are kept for use.

When they would have them dry, they take them out of the last syrup; and, having drained them well, they plunge them into another syrup, very strong of sugar, and well clarified, and put them immediately into a stove, where they are candied.

F. Labat, from whom this account is taken, observes, that this sort of sweet-meats requires a great deal of care, and consumes a prodigious quantity of sugar: he adds, that the confectioners of the French islands seldom make any, and cannot undertake it, or make it as it should be, under a crown the pound. *Labat Nouveaux Voyages aux Isles de l'Amerique.*

CACHE'XIA (*Dict.*)—Dr. James, for the illustration of the subject, has endeavoured to explain how a Cachexy may be, and generally is produced.

Suppose, says he, a person, of any constitution whatever, has his stomach and organs of digestion impaired by any accident; and that this person takes one or more hearty meals of any aliment which is superior to the force of the digestive organs; and that, moreover, he uses little or no exercise: upon this occasion it is not likely, that the aliment should be digested and assimilated, so as to produce good blood; but, in proportion as the aliment is more or less dissolved, the partially dissolved portions will stagnate in the first, or more remote series of vessels, that is, in the larger or smaller vessels; and will cause various disorders, according to the uses and importance of the parts which they obstruct.

Suppose the aliment so little dissolved, that the largest particles which the lacteals can possibly admit, are by these conveyed to the receptacle of the chyle, and from thence to the mass of blood; with which, circulating till they arrive at the lungs, they either pass not at all, or with difficulty, through the minute vessels of that organ, on account of their bulk; hence difficulty of breathing and palpitations arise: and, as the blood should be farther elaborated, and receive its red colour in the lungs, this

this impediment will, in some degree, prevent them both: hence the blood will be pale, and the particles of which it consists, will not be so perfectly mixed and united together, as to form a fluid adapted to the exigencies of the animal œconomy. For this reason, the watery particles readily separate from the rest, and loiter, or stagnate, in different parts, where they cause soft tumors, as under the eyes, and in the parts remote from the heart. As these large particles must, moreover, stagnate in the glands, and obstruct them, the secretions of their respective fluids must be impaired. For this reason, many of the aqueous particles, which should either be separated for expulsion, or applied to particular uses, are retained in the mass of blood; the bile, also, a fluid of the utmost importance in digestion, as well as the pancreatic juice, becomes defective, inert, and languid; and all the solids are farther relaxed, and, amongst them, the organs of digestion; whence every subsequent meal lays a new foundation for an increase of the disorder, and all its symptoms.

I must add, that, when women have acquired such a habit, the watery particles of the blood loiter, or stagnate; and the other particles are too large to pass through the minute uterine vessels, and form the catamenia.

From what has been said, the reasons are evident, why the eating chalk, cinders, dirt, unfermented, farinaceous vegetables, as oatmeal, and other indigestable substances, induce a chlorosis.

I cannot conceive it possible to adapt a method of cure to such a disorder as has been described, more likely to succeed, than that which consists in supplying the organs of digestion with aliments the most easy of digestion, and which approach the nearest to the nature of the sound and healthful juices; in due and prudent evacuations of the first organs of digestion; in corroborating these organs, and supplying the deficiencies of bile, by aromatics, bitters, and, at last, by steel; in directing proper exercise; and in expelling the matter stagnating in the glands, and other parts, by the proper emunctories, when once sufficiently resolved, in the manner specified above. *James, Dict. Med.*

Juncter, in his Conspic. Med. has given us the following method of cure: the general method must be by correction of the vitiated humours; a reseration of the viscera; an evacuation of the humors, when thus prepared for it; and, finally, a restitution of the due tone to the solids.

For the first fortnight, the patient should be treated with resolvents and digestives; such as *tartarum vitriolatum*, and absorbents saturated with acids; as crabs-eyes with lemon-juice; and with aperient decoctions of the woods of guaiacum and sassafras; as the roots of pimpernel, and the like; and, either during this time, or afterwards, evacuants are to be given; such as sena, jalap, and dwarf-elder. When the improper treatment of a fever has been the occasion of the malady, the mild alexipharmics are to be given at times; and, when an obstruction of the menses is in the case, the time they are to be expected is to be carefully regarded, and emmenagogues and baths for the feet are to be ordered at those periods. When obstructions of the hæmorrhoidal discharges are the cause, then, after the first fortnight, leaches should be applied to the hæmorrhoidal veins; and, if the disease has arisen from long continued hæmorrhages, then analeptics are to be trusted to, with very gentle correctives, for fear of exciting new commotions in the blood; and, in these cases, bleeding in the arm is sometimes found necessary.

CACHU'NDE, the name of a medicine highly celebrated among the Chinese and Indians; but, as the describers of aromatics, and the later authors, has made no mention of it, Zacutus Lusitanus gives us the following method of preparing it, which, he says, was with great difficulty obtained of celebrated physicians, who had the health of the East-Indian viceroys, and other princes, for many years, committed to their care.

Take, says he, of the terra cimlia, or any other proper earth, two pounds; of amber, one pound; of musk and ambergrise, each, three ounces; of the best aloes-wood, by the Portuguese called calambac, ten ounces; of prepared pearls, three ounces; of prepared rubies, emeralds, granats, jacinths, each four ounces; of red sanders, four pounds; of yellow sanders, three ounces; of mastich, sweet flag, galangal, cinnamon, aloes washed with juice of roses, the best rhubarb, Indian mirobalans, Belloni mirobalans, wormwood, red coral, and Armenian bole, each two ounces; and of calcined ivory, three pounds and a half. The ingredients to be pounded must be reduced to a very fine powder; and, after having sprinkled them with ordoriferous wines and balsams, and water distilled from the flowers of the cinnamon-tree, they must be dried in a shade, and mixed up with a sufficient quantity of the finest white sugar; then, with a mucilage of gum tragacanth and gum arabic, the whole is to be reduced to a very tenacious, viscid mass, which is of a pretty red colour.

Of this mass various figures are formed, which the merchants convey to several parts of the world, but principally to Lisbon, the most celebrated emporium of the whole earth. The Indian princes, and the grandees of China, use this antidote in the following manner: in the day-time they keep a small portion of it, about the bulk of a lentil, in their mouths; from this portion, a sweet and fragrant liquor gradually and insensibly drops from the fauces to the stomach, and gives the breath so agreeable a flavour, that all who come near them are sensible of it. This medicine is truly worthy to be used by kings and grandees, for the preservation of the natural heat; for it preserves and defends the body from corruption, prevents the bad consequences of a pestilential air, removes melancholy and flatulencies, and wonderfully relieves those who labour under melancholy disorders. It removes palpitations of the heart, cures the cardialgia, the apoplexy, and the epilepsy. It refreshes the animal and vital spirits, invigorates all the faculties, strengthens the stomach, and resists poisons of every kind. It corroborates the brain, and is the most sovereign remedy in the world against a stinking breath. It proves an incentive to venery, for which intention it is much used by both sexes in the Indies. In short, it is a truly royal medicine; for it protracts life, puts death at a distance, and is consequently sold at a high price. Whoever use it, cannot help admiring the happy effects produced by it. *Zacutus Lusitanus de Medicor. Princip. Hist. Lib.* 1. *Observat.* 37.

CADE'NE, one of the sorts of carpets which the Europeans import from the Levant; they are the worst sort of all, and are sold by the piece from one to two piasters per carpet.

CÆCI'LIA, in zoology, the name of the slow-worm, or blind-worm, called by the Greeks typhlinus. It is a small species of serpent, which has such extremely small eyes, that it has been usually supposed to have none at all. It is distinguished from all our snakes by its smallness, and by the shape of its tail, which runs out a great way beyond the anus, and yet is blunt, and considerably thick at the end. The colours vary much in the different sexes, and probably often also in the same sex; the common colour is a dusky greenish yellow on the back, the sides are variegated with streaks of black and white: it resembles the viper in its manner of producing its young, which are put forth alive.

CÆ'MENT-*Pots*, in assaying, are vessels made for the cementation of metals with salts, and the ingredients of the strong acid menstrua, where the force of those menstrua, and a strong fire, are required together.

The pots are cylindrical vessels, made of potters clay, with tiles adapted to them, and may be conveniently turned by the potters. The size of these vessels must be proportioned to the quantity of cæment to be put in them. It is not prudent, however, to make them of more than eight or ten inches broad, because, when they are larger, the fire acts but difficultly and unequally upon them, especially on that part of the matter near the center.

It is to be observed, in making these vessels also, that all kinds of clay contract and take up a smaller space in the drying and baking; the purer clay will contract one tenth part of their diameter, but, the more sand, or other dry powder, there is in the mixture, the less it contracts. If a vessel, therefore, of any determinate size is to be made of clay without any admixture, it must be made one tenth larger than the expected size; if of clay with these admixtures, experience alone can shew what must be the excess in size, when moist. *Cramer, Art. Ass.*

CÆRU'LEUS, in zoology, a name given by authors to a bird of the thrush or black-bird kind, and somewhat resembling that species of black-bird commonly called the solitary sparrow. It loves rocks and old buildings, and is thence called by some petrocossyphus, or the stone black-bird; and, from its colours, is called by the Germans blauvogel; it is of the size of a starling; its breast, back, and neck, are of a very fine deep blue; it lives among the mountains; it sings very sweetly, and in winter loses its fine blue colour, and becomes black.

CÆSALPI'NA, in botany, a plant so called by father Plumier, who discovered it in America, in honour to Andreas Cæsalpinus, who was an eminent botanist, and one of the first writers on a method of classing plants.

The characters are: it hath a flower of an anomalous figure, consisting of one leaf, which is divided into four unequal parts; the upper part is large, and hollowed like a spoon. From the bottom of the flower arises the pointal, amongst many incurved stamina, which afterwards becomes a pod, including oblong seeds.

CA'FFA, cotton cloths, painted with several colours, and of divers designs. They are manufactured in the East-Indies, and sold at Bengal. The length and breadth are not the same in all the pieces.

CAFFA'RD. They give the name of Caffard-damasks to several sorts of stuffs, in some of which the warp is of silk, or ferret, and the woof of thread; in others, both the warp and the woof are of thread, and some are intirely of wool.

CAFFI'LA, a company of merchants, or travellers, or rather a company composed of both, who join together, in order to go with more security through the dominions of the Grand Mogul, and through other countries on the continent of the East-Indies.

CAFFILA, signifies, also, in the several ports which the Portuguese still hold on the coast of the kingdom of Guzerat, or Cambaya, a small fleet of merchant-ships, which sail from those ports to Surat, or come back from thence, under the convoy of a man of war, which the king of Portugal keeps there for that purpose.

CAGE, an inclosure made with wire, wicker, or other matter interwoven latticewise, for the detention of wild beasts or birds.

CAGE, in carpentry, signifies an outwork of timber, inclosing another within it.

CAJOU, *Cashew*, or *Cassu*, an American fruit, shaped like a pear, having the large end next the stalk, and, at the small end, a nut, in shape and size, resembling a hare's kidney, which is the seed of the plant.

The Cajou is the fruit of the acajou, a tree frequent in Jamaica and the Caribbee Islands. The nut or seed, called in English the cashew-nut, and sometimes the apple-bean, bears a near affinity in figure, as well as in virtues, to the anacardium, or Malacca bean, of which some make it a species, under the denomination of anacardium occidentale.

Clusius describes the Cajou as resembling a goose egg, both for size and figure, of a yellow colour, and sweet; full of a liquor like that of a citron: both the fruit and nut are eaten in Jamaica with great pleasure; as the former grows bigger, the nut diminishes. Between the rind and shell of the latter is a spongy substance full of a caustic oil, used against tetters, but which must be discharged by roasting the nut in embers, before the kernel is eaten. The thin ash-coloured skin wherewith the kernel is covered, is used as an exciter to venery.

CALABA, Indian mastich-tree in botany, a genus of trees, whose characters are: it has a rosaceous flower, consisting of several petals which are placed in a circular order; from whose flower-cup arises the pointal, which afterwards becomes a spherical fleshy fruit, including a nut of the same form.

This tree grows to a great magnitude in the warm parts of America, where it is a native. From the trunk and branches there issues out a clear gum, somewhat like the mastich, from whence it received its name, the gum being used in those countries as mastich.

At present, this tree is pretty rare in England, it being so tender as not to bear the open air; so that it must be preserved in stoves, with the most tender exotic plants. It is propagated by the nuts, which are frequently brought from America; these should be planted in small pots filled with fresh light earth; and plunged into an hot bed of tanners bark, observing to water the pots frequently, to forward the vegetation of the nuts, which, having hard shells, are pretty long before they break their covers, unless they have a good share of heat and moisture. When the plants are come up about two inches high, they should be carefully transplanted, each into a separate small pot, filled with fresh light earth, and plunged into a moderate hot-bed of tanners-bark, observing to water and shade them until they have taken new root; after which time they should have air admitted to them, in proportion to the heat of the weather, and the bed in which they are placed; and they must be frequently watered in warm weather. In this bed they may remain during the summer-season; but at Michaelmas they should be removed into the bark-stove, and placed in a warm situation. During the winter-season these plants will require water pretty often; but it should not be given to them in large quantities, especially in cold weather, lest it rot the fibres of their roots. As the plants advance, they must be shifted into larger pots, and treated in the same manner as directed for the coffee-tree, with which management this plant will thrive very well; and, as the leaves of these plants are long, strong, and of a shining green colour, they make a pretty appearance in the stove, with other tender exotic plants. *Miller's Gard. Dict.*

CALABASH, in commerce, a light kind of vessel made of the shell of a gourd, emptied and dried, serving for a case to put divers kinds of goods in, as pitch, rosin, and the like.

The word, is in Spanish, calabaça, which signifies the same.

The Indians also, both in the north and south sea, put the pearls they have fished in Calabashes, and the Negroes on the coast of Africa do the same by their gold dust.

CALAE, CALAEM, or CALAEMUM, denotes a species of Indian tin, which by force of fire is transmutable into ceruss, like that made of our lead.

CALAMBAC, or CALAMBA, a resinous or fragrant wood brought from the East-Indies. It is usually called lignum aloes, or aloes wood.

There are three kinds of this wood, distinguished by the names of Calambac, common lignum aloes, and calambour.

1. The Calambac, or finest aloes wood, is the most resinous of all the woods we are acquainted with. It is of a light spongy texture, very porous, and its pores so filled up with a soft and fragrant resin, that the whole may be pressed and dented by the fingers like wax, or moulded about by chewing in the mouth in the manner of mastich. This kind laid on the fire melts in great part like resin, and burns away in a few moments with a bright flame and perfumed smell. Its scent, while in the mass, is very agreeable. This is so variable in its colour, that some have divided it into three kinds; the one variegated with black and purple, the second with the same black, but with yellowish instead of purple, and the third yellow alone like the yolk of an egg. This last is the least scented of the three; these differences however are very trivial; the substance being in them all the very same in every respect except the colour, and that often altering very considerably in the keeping. This is brought from Cochin China.

2. The lignum aloes vulgare is the second in value. This is of a more dense and compact texture, and consequently less resinous than the other: There is some of it however that is spongy, and has the holes filled up with the right resinous matter, and all of it, when good, has veins of the same resin in it. We meet with it in small fragments, which have been cut and split from larger. These are of a tolerable dense texture in the more solid pieces, and of a dusky brown colour, variegated with resinous blackish veins. It is in this state very heavy, and less fragrant than in those pieces which shew a multitude of little holes filled up with the same blackish matter that forms the veins in others. The woody part of these last pieces is somewhat darker than the others, and is not unfrequently purplish, or even blackish. The smell of the common aloes wood is very agreeable, but not so strongly perfumed as the former. Its taste is somewhat bitter and acrid, but very aromatic. Laid on the fire, or held on a hot iron, it does not melt away like the Calambac; but it exsudates a large quantity of a fine fragrant resin, which smells extremely sweet, while it burns. This wood is also brought from Cochin China, sometimes also from Sumatra. It is but rarely found in our shops however, and the former, or Calambac, scarce ever at all. It bears so large a price upon the spot, that nobody ventures to bring it away.

3. The calambour, or, as some write it calambouc, a word approaching much nearer to Calambac, than the substances expressed by them do to one another. This is the wood that is most common in our shops, though it has of all the others least title to be so, as it has the least virtue, and contains the least resin of any. It is a light and friable wood, of a dusky and often mottled colour, between a dusky green black and a deep brown. It is less firm and solid than most of the officinal woods. Its smell is fragrant and agreeable, but much less sweet than that of either of the others; and its taste bitterish, but not so much acrid or aromatic as the others. We meet with this very frequent and in large logs, and these sometimes intire, sometimes only the heart of the tree, the cortical part being separated. This is brought from the island of Timor, and some other places, and is the aloes wood used by the cabinet-makers and inlayers, but is very improperly used under the name of lignum aloes in the shops.

The Indians use the Calambac, by way of incense, burning small pieces of it in the temples of their gods; and sometimes their great people burn it in their houses in times of feasting. It is esteemed a cordial, taken internally, and they sometimes give it in disorders of the stomach and bowels, and to destroy worms. It has also the credit of being a great thing for preserving and strengthening the memory. A very fragrant oil may be procured from it by distillation, which is recommended in paralytic cases, from five to fifteen drops. It is at present however but little used, and would scarce be met with any where in the shops, but that it is an ingredient in some of the old compositions.

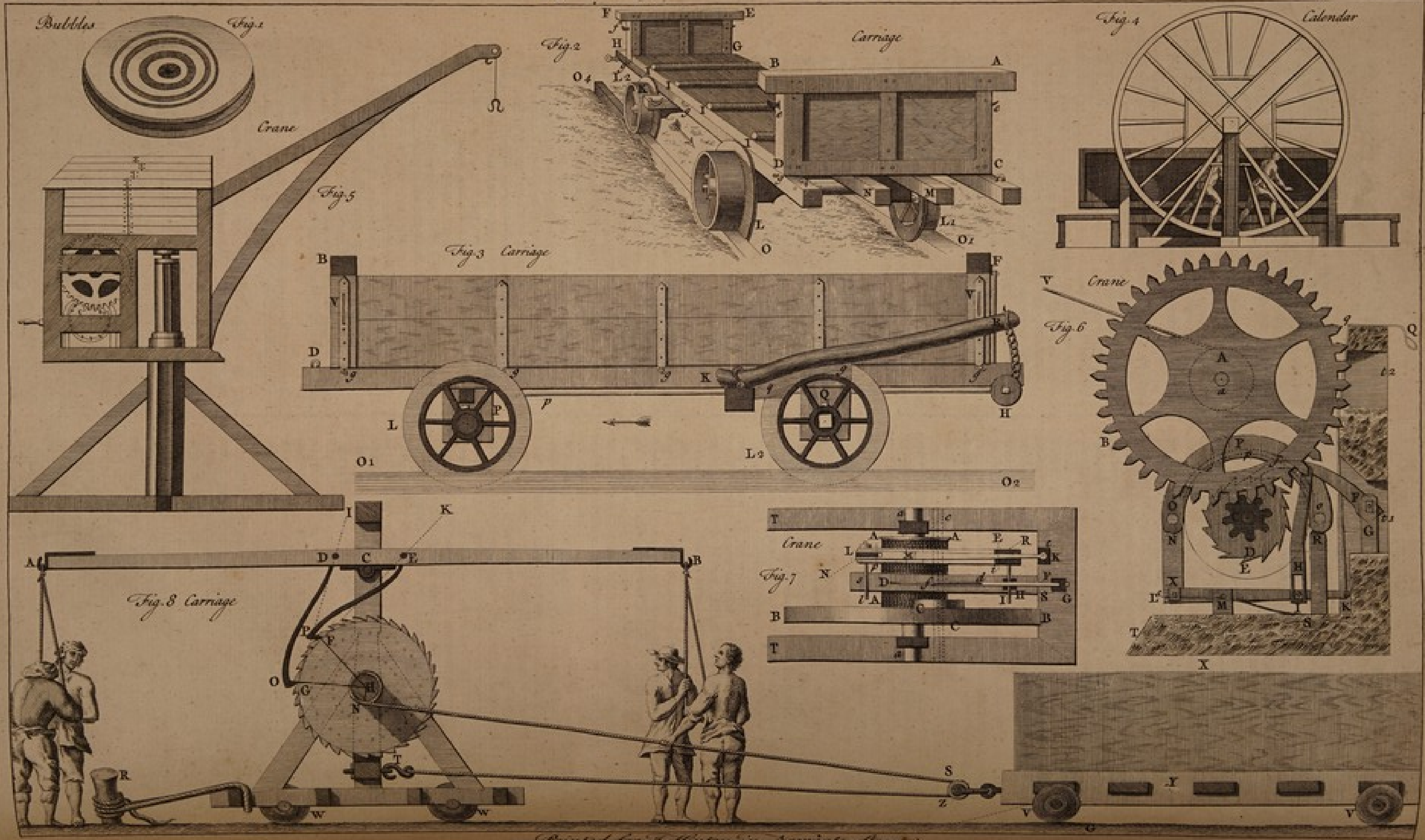
We are told in the Philosophical Transactions, that the tree, while growing, abounds with a milky juice of so acrid and caustic a nature, that, if it gets into the eyes, it will occasion blindness, and, if it only fall on any part of the skin, it will raise blisters. If this be a fact, perhaps, there would be required some caution in the internal use of the true resinous wood of this name; but, as to the common one we meet with, there does not seem to be much to be dreaded from that.

CALAMANCO, a woollen stuff manufactured in Brabant, in Flanders, particularly at Antwerp, Lisle, Tournay, Turcoin, Roubaix, and Lannoy. There are, also, a great many made in England. In France, they are of different breadths; some of $\frac{1}{12}$, others of $\frac{2}{3}$, of $\frac{7}{12}$, of $\frac{1}{2}$, or of $\frac{5}{12}$, of an ell, all Paris measure. As for the length of the pieces, there is nothing settled; the weavers make them longer or shorter, according as they please, or as they are commissioned by the merchants. This stuff has a fine gloss upon it, and is checkered in the warp, whence the checks appear only on the right side. It is commonly wove wholly of wool; there are some however, wherein the warp is mixed with silk, and others with goat's hair. There are Calamancoes of all colours, and diversly wrought; some are quite plain; others have broad stripes, adorned with flowers; some with plain broad stripes; some with narrow stripes; and others watered. This, also, is no inconsiderable branch of the woollen manufacture of England, both for home wear and foreign exportation. See WOOLLEN *Manufacture*.

CALAMITIS, is used for a species of artificial cadmia found adhering to the sticks, ladles, and other utensils wherewith they stir the copper when in fusion in the furnace.

CALAMITA *Alba*, in natural history, the name of an earth dug in Spain and Italy, of a hard texture, a white colour, and styptic taste; they pretend that this attracts flesh in the same manner as the magnet does iron, and thence call it magnes carneus.

CALAMUS *Scriptorius*, or *Arundo Scriptoria*. The ancients wrote on parchment or Ægyptian paper, with a reed made in the shape of a pen, and thence called Calamus scriptorius. We mention parchment or Ægyptian paper, because our paper is of modern invention. The Arabians, Persians, Turks, Greeks, and



Printed for J. Hinton in Newgate Street.

and Armenians use it even at this day; and, though the Greek be a much finer character than ours, write it with great dispatch and elegance.

CALA'SH, or CALESH, a small light kind of chariot, or chair, with very low wheels, used chiefly for taking the air in parks and gardens.

In the Philosophical Transactions, we have a description of a new sort of Calash, going on two wheels, not hung on traces, yet easier than the common coaches, over which it has this further advantage, that, whereas a common coach will overturn, if one wheel go on a surface a foot and a half higher than that of the other, this will admit of a difference of above 3 feet, without danger of overturning. Add, that it would turn over and over, that is, after being turned so as that the spokes are parallel to the horizon, and one wheel flat over the head of him that rides in it, and the other flat under him, it will turn once more, by which the wheels are placed in statu quo, without any disorder to the horse, or rider.

CALCA'NEUM (*Dict.*) The body of the os calcis has six sides, one posterior, one anterior, one superior, one inferior, and two lateral.

The posterior side is broad, unequally convex, and, as it were, divided into two portions; one superior, small, and polished; the other inferior, much larger, unequal, and rough, which, in children, is an epiphysis, and may be named the tuberosity of the os calcis. The lower part of it is bent downward, and terminates in two turbercles, or obtuse points, which belong rather to the inferior than to the posterior side of the bone.

The upper side may be divided into two parts, one posterior and unequal, having a small depression; the other anterior, convex, and cartilaginous, proportioned to the great inferior cavity of the astragalus. This side is turned obliquely forward, and by this obliquity becomes part of the foreside, the remaining part of which is lost in the anterior apophysis.

The lower side is narrow, and behind it lie the two tubercles, of which the internal is the biggest. They both serve for the insertion of the aponeurosis in the soal of the foot, but principally the biggest.

The two lateral sides are continued over the anterior apophysis. The external is gently convex and unequal, covered only by the common integuments and ligaments. The internal is hollowed and depressed.

The great or interior apophysis lies in the same direction with the body, being a continuation thereof. It has five sides or remarkable parts, and, were it not for the body, it would have a sixth.

The upper side has an irregular and unequal depression, which, together with that in the apophysis of the astragalus, forms a considerable fossula. At its anterior extremity, there is a small cartilaginous surface, answering to one of those in the apophysis of the astragalus.

The anterior side of the apophysis is broad, oblique, cartilaginous, partly convex, and partly concave, and articulated with a little surface of the os cuboides. This is the foreside of the whole os calcis, when considered without any division.

The outside of the apophysis is very rough, being a continuation of the outer side of the body, with a tubercle or eminence at the place where these two sides meet, which, however, is not found in all subjects. On the lower part of this tubercle, is a cartilaginous surface, for the passage of the tendon of the peronæus longus: sometimes we see only some small vestiges of this eminence, and often none at all. We sometimes meet with another small cartilaginous surface lower down, and more forward, near the anterior extremity of the apophysis, for the passage of the same tendon. The lower side is a tuberosity, continued from the side of the body, and designed for the insertion of muscles.

The lateral apophysis is almost common to the body, and to the great anterior apophysis, and increases the cavity on the inside of the os calcis. On its upper part, it has a very smooth cartilaginous surface, articulated with one of the inferior surfaces of the astragalus. This apophysis is very low down, and its inferior part is smooth for the passage of tendons.

The os calcis has four cartilages, of which three are superior, one large, and two small, for its triple articulation with the astragalus; the fourth is anterior, for the os cuboides. To these must be added a small thin cartilage, of a kind of ligamentary substance, under the tubercle on the outside of this bone. *Winslow's Anat.*

Factitious CALCE'DONY, in chemistry.—As the agate jasper, and Calcedony have a great affinity, the same process may serve to imitate these three kinds of precious stones. Dissolve one ounce of silver in aqua-fortis. Then take of lime, pewter, cinnabar, bole armeni, crocus martis, crude antimony, minium, orpiment, white arsenic, and æs ustum, of each half an ounce: reduce these ingredients to a fine powder, and pour a sufficient quantity of aqua-fortis upon it, drop by drop, very softly, for it will make a considerable effervescence; when the effervescence is over, pour more aqua-fortis on it, and put the vessel in a digestion of a moderate heat: after a few days draw off the aqua-fortis by distillation, and the powder will remain of a greenish red, which must be reduced by levigation to an impalpable powder. Then to twelve ounces of crystal fritte add two ounces of this powder, at four different times, one half ounce each time; stir this mixture carefully, while in fusion, over a proper heat. At the end of twenty-four hours the operation will be performed.

CALDA'RIUM, in the antient baths, denoted a brazen vessel or cistern, placed in the hypocaustum full of hot water, to be drawn thence into the piscina or bath, to give it the necessary degree of heat.

CA'LENDAR, in mechanics (*Dict.*)—The Calendar is composed of two thick cylinders, or rollers, of very hard and polished wood, round which, the stuffs which are to be calendered are rolled very smooth.

These rollers are placed cross-ways, between two very thick boards, of polished wood, which are longer than they are broad; some call them tables.

The undermost board, which serves as a base for the whole machine, is fixed, and placed level, on a solid foundation of brick-work. The uppermost board is moveable, though loaded with large stones, cemented together, weighing twenty-thousand pounds, or more.

A cable wound round the tree, or axis, of a large wheel, something like that of a crane to raise stones, and tied with strong rings to this uppermost board, serves to move it, sometimes one way, sometimes another, according as the men that walk in the wheel set it a going. It is this alternate motion, together with the prodigious weight of the uppermost board of the Calendar, that renders the stuffs smooth and glossy, or gives them the waves, by making the cylinders, on which they are put, roll with great force over the undermost board.

When they would put a roller from under the Calendar, to put on another, they only incline the undermost board of the machine. See a section of the Calendar *plate* XI, *fig.* 4.

The dressing alone, with the many turns they make the stuffs and linens undergo in the Calendar, gives the waves, or waters them, as the workmen call it. It is a mistake to think (as some, and those not a few, modern authors, have asserted) that they use rollers with a shallow indenture, or ingraving, cut into them.

There is at Paris a very extraordinary Calendar, called, by way of eminence, the royal Calendar. It was made by the order of the late Monsieur Colbert, minister and secretary of state, and superintendant of the arts and manufactures of that kingdom.

The undermost table of this Calendar is a block of very well polished marble, and the uppermost is lined underneath with a copper-plate, all of a piece, and extremely well polished, wherein it differs from the other Calendars, whose tables, or boards, are commonly of wood only.

There are some Calendars without wheels, which are moved by a horse, tied to a wooden bar, which turns sometimes to the right, and sometimes to the left, a great pole, placed upright, at the top of which, about a kind of drum, is wound a cable, the two ends of which, being fastened to the two ends of the uppermost board of the Calendar, set it a going. The Calendars moved by horses are not reckoned so good as those with wheels, the latter having a more uniform and certain motion.

At Paris, none but the principal master-dyers have the liberty of keeping Calendars at their own houses; at Amiens, and other places, every one may have them who pleases.

Astronomical CALENDAR, an instrument engraved upon copper-plates, printed on paper, and pasted on board, with a brass slider which carries a hair, and shews, by inspection, the sun's meridian altitude, right ascension, declination, rising, setting, amplitude, &c. to a greater exactness than our common globes will shew.

Reformed or *corrected* CALENDAR, that which, setting aside all apparatus of golden numbers, epacts, and dominical letters, determines the equinox with the paschal full moon, and the moveable feasts depending thereon, by astronomical computation, according to the Rudolphine tables.

This Calendar was introduced among the protestant states of Germany, in the year 1700, when eleven days were at once thrown out of the month of February: so that, in 1700, February had but eighteen days: by this means, the corrected stile agrees with the Gregorian. This alteration in the form of the year they admitted for a time, in expectation that, the real quantity of the tropical year being at length more accurately determined by observation, the Romanists would agree with them, on some more convenient intercalation.

Construction of a CALENDAR, or *Almanack*. 1°. Compute the sun's and moon's place for each day of the year, or take them from Ephemerides. 2°. Find the dominical letter, and, by means thereof, distribute the Calendar into weeks. 3°. Compute the time of Easter, and thence fix the other moveable feasts. 4°. Add the immoveable feasts, with the names of the martyrs. 5°. To every day add the sun's and moon's place, with the rising and setting of each luminary; the length of day and night; the crepuscula, and the aspects of the planets. 6°. Add, in proper places, the chief places of the moon; and the sun's entrance into the cardinal points; i. e. the solstices and equinoxes; together with the rising and the setting, especially heliacal, of the planets, and chief fixed stars. Means for each whereof will be found under the proper heads. The duration of the crepuscula, or the end of the evening, and beginning of the morning twilight, together with the sun's rising and

and setting, and the length of days, may be transferred from the Calendars of one year into those of another: the differences in the several years being too small to be of any consideration in civil life.

Hence, it appears, that the construction of a Calendar has nothing in it of mystery, or difficulty, if tables of the heavenly motions be at hand.

Gelalean CALENDAR, is a correction of the Persian Calendar, made by order of Sultan Gelaleddan, in the 467th year of the Hegira, and in the 1389th of the Christian æra.

CA'LENDS (*Dict.*) — To find the day of the Calends answering to any day of the month we are in, see how many days there are yet remaining of the month, and to that number add two; for example, suppose it the twenty-fourth of June, it is then the eighth of the Calends of July, for June contains thirty days; twenty-four taken from thirty, there remains six, to which two being added makes the sum eight.

The Calends of January were the most considerable, being particularly consecrated to Juno, and the god Janus. On this day, the magistrates entered upon their offices, and feasts were kept every-where, and presents exchanged between them, in token of friendship; for they believed, if they diverted themselves well in the beginning, they should pass the whole year so.

On the Calends of March, they took their leases, &c. in regard the year, as fixed by Romulus, commenced on that day: Hence, the Calends of March was a fatal day to debtors, because their leases expired on that day, which made Horace call them tristes calendas.

The Roman writers themselves were at a loss for the reason of this absurd and whimsical manner of computing the days of the month; yet, it is still kept up in the Roman Chancery, and, by some authors, out of a vain affectation of learning, prefering it to the common more natural and easy manner.

CA'LENTER, a name given by the Persians to their treasurer, and receiver of the rents of their provinces. He oversees the king's revenues, receives and gives an account to the council, or by the king's order to the cham, who is governor of the province.

CALF, *vitulus*, in zoology. There are two ways of breeding Calves that are intended to be reared; the one is to let the Calf run with its dam all the year round: this is the method in the cheap breeding countries, and is generally allowed to make the best cattle. The other way is to take them from the dam after they have sucked about a fortnight; they are then to be taught to drink fleet milk, which is to be made but just warm for them, it being very dangerous to give it them too hot.

The best time of weaning Calves is from January to May; they should have milk for twelve weeks after, and, a fortnight before that is left off, water should be mixed with the milk in larger and larger quantities. When the Calf has fed on milk about a month, little whisps of hay should be placed all about him in cleft sticks to induce him to eat. In the beginning of April, they should be turned out to grass; only, for a few days, they should be taken in for the night, and have milk and water given them; the same may also be given them in a pail, sometimes in the field, till they are so able to feed themselves that they do not regard it. The grass they are turned into must not be too rank, but short and sweet, that they may like it, and yet get it with some labour.

Calves should be always weaned at grass, for, if it be done with hay and water, they often grow big-bellied on it, and are apt to rot. When those among the males are selected, which are to be kept as bulls, the rest should be gelded for oxen: the sooner the better. Twenty days old is a very good time, or any thing between that age and ten days. About London, almost all the Calves are fatted for the butcher. The reason of this is, that there is a good market for them, and the lands here are not so profitable to breed upon as in cheaper countries. The way to make the Calves fat and fine is, the keeping them very clean, giving them fresh litter every day, and hanging a large chalk-stone in some corner where they can easily get at it to lick it, but where it is out of the way of being fouled by their dung and urine. The coops are to be so placed as not to have too much sun upon them, and so high above the ground that the urine may run off. They also bleed them once when they are a month old, and a second time before they kill them; this is a great addition to the beauty and whiteness of their flesh; the bleeding is by some repeated much oftener, but this is sufficient.

Calves are very apt to be loose in their bowels; this wastes and very much injures them. The remedy is, to give them chalk scraped into milk, pouring it down with a horn; if this does not succeed, they give them bole armenic in large doses, and use the cold bath every morning. If a cow will not let a strange Calf suck her, the common method is to rub both her nose and the Calf's with a little brandy: this generally reconciles them after a few smellings. *Mortimer's Husbandry.*

CALF'S *skins*, in the leather manufacture, are prepared and dressed by the tanners, skinners, and curriers, who sell them for the use of the shoe-makers, sadlers, bookbinders, and other artificers, who employ them in their several manufactures.

Calf-skins, dressed in sumac, denote the skin of this animal curried black on the hair side, and dyed of an orange colour on the flesh side, by means of sumac, chiefly used in the making of belts.

The English Calf-skin is much valued abroad, and the commerce thereof very considerable in France and other countries; where divers attempts have been made to imitate it, but hitherto in vain. Mr. Colbert, to whom France owes a great number of arts and establishments of this kind, set on foot a company of undertakers in 1665, who set up a manufactory of this kind, under the denomination of bonnets tanneurs; but, after an hundred thousand livres sunk in the undertaking, they were forced to desist.

CA'LIBER, or CALIPER-*rule*, is an instrument, wherein a right line is so divided, as that, the first part being equal to the diameter of an iron or leaden ball of one pound weight, the other parts are to the first, as the diameters of balls of two, three, four, &c. pounds are to the diameter of a ball of one pound. The Caliber is used by engineers, from the weight of the ball given, to determine its diameter, or Caliber; or vice versa.

The Caliber, in general, consists of two thin pieces of brass, six inches long, joined by a rivet, so as to move quite round each other; the head, or one end of the piece, is cut circular; and one half of its circumference is divided into every second degree. On the other half are divisions, from one to ten; each, again, subdivided into four: the use of which divisions and subdivisions is, that, when the diameter of a bullet, &c. not exceeding ten inches, is taken, the diameter of the semicircle will, among the divisions, give the length of that diameter taken between the points of the Calibers, in inches and fourth parts.

The degrees on the head serve to take the quantity of an angle; the method of which is obvious. If the angle be inward, apply the outward edges to the planes that form the angle; the degrees, cut by the diameter of the semicircle, shew the quantity of the angle sought. For an outward angle, open the branches till the points be outwards, and, applying the streight edges to the planes that form the angle, the degrees cut by the diameter of the semi-circle shew the angle required, reckoning from 180, towards the right-hand.

On one branch of the Calibers, on the same side, are, first, six inches; and each of these subdivided into ten parts. Secondly, a scale of unequal divisions, beginning at two, and ending at ten; each subdivided into four parts. Thirdly, two other scales of lines, shewing, when the diameter of the bore of a piece is taken with the points of the Calibers outwards, the name of the piece, whether iron or brass; i. e. the weight of the bullet it carries; or that it is such or such a pounder from one to forty-two pounds.

On the other branch of the Calibers, on the same side, is a line of cords to about three inches radius; and a line of lines on both branches, as on the sector; with a table of the names of the several pieces of ordnance. On the same face is a hand graved, and a right line drawn from the finger towards the center of the rivet: shewing, by its cutting certain divisions made on the circle, the weight of iron shot, when the diameter is taken with the points of the Calibers. Lastly, on the circle, or head on the same side, are graved several geometrical figures inscribed in each other, with numbers; as a cube, whose side is supposed one foot; a pyramid on the same base and altitude, and the proportions of their weight, &c. a sphere inscribed in a cube; a cylinder, cone, circle, square, &c.

CALIBER, also signifies an instrument, or rule, used by carpenters, and bricklayers, to see whether their work be well squared. It is nothing but a piece of board, notched, or cut triangularly in the middle.

CALIBER. The gunsmiths use several sorts of tools to which they give that name, some of which are of wood, and others of steel.

The Calibers of wood are properly models, after which they cause to be cut, out of walnut-tree, ash-tree, or maple-tree wood, the stocks on which they mount guns or pistols, or other fire-arms. They are nothing but very thin pieces of wood, cut in the figure of the gun, pistol, &c. that is to be mounted upon them: so that there are as many of those Calibers as there are several sorts of fire-arms, as fusees, muskets, pistols, &c.

The steel Calibers in the gunsmith's business are of two sorts, some double, and the others simple. The simple one is a kind of file, without either a handle or a tail, with holes of several diameters bored into it, at some distance from each other. They serve to make and fine the lower parts of screws. The double Caliber differs from the simple one in this only, that it is composed of two files, placed the one over the other, and joined or fastened together with a screw at each end, by means of which they are put closer to, or further from each other, at pleasure. The undermost handle has a handle also of steel, a little incurvated within: these last Calibers serve to turn, as it were, by a turning-wheel, the nuts, or knobs, of the plates that are put between them.

CALI'CO, or CALLICO, a kind of linen manufacture, made of cotton, chiefly in the East-Indies. There is a great trade in the province of Bengal in this commodity, which is transported in prodigious quantities into Persia, Turkey, Arabia, Muscovy,

PLATE XII.

Engraved for the SUPPLEMENT.

Facing Calico-printing

Printed for J. Hinton in Newgate Street.

Muscovy, and all over Europe. Some of them are painted with flowers of various colours; and the women in the Indies make veils and scarfs of them, and, of some, coverlets for beds, and handkerchiefs. They make another sort of this manufacture, which they never dye, and hath a stripe of gold and silver quite through the piece; and at each end, from the breadth of one inch to twelve or fifteen, they fix a tissue of gold, silver, and silk, intermixed with flowers; both sides are alike. They make, also, other sorts of cotton cloths at Brampour, because there is no other province in all the Indies which has greater quantities of cotton.

At Seconge they are said to make the best sorts of Calicoes; in all other parts the colours are neither so lively nor lasting, but wear out with often washing; whereas those made at Seconge grow the fairer, the more you wash them. This is said to arise from a peculiar virtue of the river that runs by the city, when the rain falls; for the workmen, having made such prints upon their cottons as the foreign merchants give them, by several patterns, dip them into the river often, and that so fixes the colours, that they will always hold. There is also made at Seconge a sort of Calico, so fine, that, when a man puts it on, his skin shall appear as plainly through it as if he was quite naked; but the merchants are not permitted to transport it, for the governor is obliged to send it all to the Great Mogul's seraglio, and the principal lords of the court, to make the sultanesses and noblemen's wives shifts and garments for hot weather.

The city of Baroche, also, is very famous for trade, on account of the river, which has a peculiar quality to whiten their Calicoes, and which are, therefore, brought from all parts of the Mogul's territories thither for that end.

This manufacture is brought into this nation by the East-India company, which is re-exported by private merchants to other parts of Europe and America.

CALICO-*printing*, the art of staining Calicoes, &c. of various colours.

Method of printing CALICOES.—Before the operation of printing is performed, the cloth is carried to the printing-house in order to be properly prepared, which is done in the following manner: It is first laid to soak in water, and then well washed, and beat out; after which, it is put into a copper of water, rendered a little acid, by a proper quantity of spirit of vitriol, or juice of lemons; in this menstruum it is kept in a midding degree of heat (but not suffered to boil) till it has sufficiently imbibed the acid particles of the menstruum. It is then taken out, and well washed; and, in order to free it entirely from the acid, it is scalded in a menstruum composed of water and cow-dung; and then cleared again by washing, beating, &c. After which, it is thoroughly dried, and calendared.

The intention of this previous preparation, is to free the cloth from the alkaline particles it has acquired in the making, &c. for it is absolutely necessary, that the cloth should be entirely free from all alkaline or acid particles.

The pattern intended to be printed on the Calico, is drawn in water-colours on paper, and then cut on blocks, either of pear-tree or holley. But it must be observed, that no more of the pattern is cut on one block, than is of one colour. That is, if there are three different reds in the pattern, only that part of the drawing is cut on the block which is of the same colour. Whence it follows, that, as many different colours as there are in the pattern, so many different blocks will be necessary to print it. The colours used are black, two purples, and three reds; for, withregard to the yellows, blues, and greens, they are pencilled in.

The Calico is printed on a table about six feet long, and two feet broad, covered with a woollen blanket, on which the cloth is spread. On the left side of the table stands a shallow tub, containing the colour to be used; in this tub is a float or sieve, composed of a broad ashen hoop, and the bottom a sheepskin, upon which is a piece of superfine broad-cloth. The colour in which this sieve floats, is well stiffened with gum arabic or seneca, to prevent its splashing.

The sieve being furnished by a boy with a proper quantity of colour, the printer dips his block into it, with his right hand, and places it on the cloth, striking it with an oval mallet of lignum vitæ, with his left hand.

When he has printed the whole piece with one colour, it is printed over again in the same manner with another block, on which the parts of the pattern to be printed of another colour are cut. And in the same manner the whole is printed with the several colours intended.

In the printing-house there is a large fire to set the colours, to prevent their running.

After printing, it is carried to the stove-room, and hardened, but not suffered to be quite dry; and then put into a dye of madder, in which it is kept till the dye just begins to boil. After it is taken from the dye, it is well washed, beat, &c. and then put into a copper of water mixed with bran. It is then carried back to the printing-house, in order to have the blues, yellows, and greens, pencilled in. After which it is again washed, and sent to the whitsters to be bleached. For the method of which, see the article BLEACHING, in the Dictionary.

Explanation of *Plate* XII, representing part of the inside of a Calico printing-house.

1 1, Two tables covered with blankets on which the Calico is printed.

a a, The Calico on the tables.

2 2, Two printers at work; the first of which is going to dip his print in the colour, and the second has just placed his print on the Calico.

3 3, Tubs containing the colour.

4 4, Blocks on which the pattern is cut.

5 5, Stools that support the tubs of colour.

6 6, Boys which stir the colour in the tubs, and keep a proper quantity in them.

7, Blocks, or prints, placed on a shelf in the printing-room; one of which, marked *b*, is placed with its face outward.

8 8, Pieces of Calico printed and hung up to set the colour.

9 9, Women pencilling the yellow, and blue colours.

The colours with which the Calico is printed, except those which are pencilled in, are all composed of madder-dye, and a proper quantity of a fixed alkaline salt; this mixture turns black upon the Calico, but, when put into the copper of madder dye, turns of a beautiful red or purple colour; and, the greater quantity of alkaline salt there is in the mixture, the deeper the colour is after it comes out of the dye. Hence we see the reason why the cloth must be deprived of all its alkaline or acid particles; for the madder-dye will not strike on any part of the cloth but where it is previously prepared by the salt: and, the ground being intended to be white, it is necessary that none of the alkaline menstruum touch it; and, with regard to the slight tinge which the ground of the cloth receives from the madder-dye, it is entirely discharged in the bleaching.

The beautiful yellow colour which is pencilled in, is extracted from iron by stale small beer, and the blues from indigo and turnsole by the help of urine. With regard to the green, it is compounded of the blue and yellow; the parts intended to be green being first covered with a blue, and afterwards with a yellow.

It appears highly probable that the Indians, for making the fine, bright, and durable colours wherewith their Calicoes and chinches are stained, use metalline solutions; for, some stained Calicoes having been kept for forty or fifty years, the bright colours have been observed to eat out the cloth, exactly in the same manner as the corrosive and acid spirits, which dissolves metals, are found to do: whence, to imitate their richest and noblest colours, we are directed to use proper metalline solutions.

But it would be a farther step towards perfection, not only in this art, but also in the art of painting, to prepare the finest colours without employing either acid or alkaline salts; which usually subject colours to change, or else are apt to prey upon the cloth or canvas, as we see in verdigrease, the blue and green crystals of copper, &c. Whence we are directed, 1, to search for menstruums that are neither acid, alkaline, or saline; 2, for such metalline calxes, precipitates, or powders as will not lose their colours by being well washed, to get out their salts; 3, to prepare certain metalline matters by calcination, or the bare assistance of the fire; and, 4, to look out for native colours, wherein no saline matter abounds.

It may be worth the trying, whether certain metals are not soluble by triture, with the purest oils employed in painting, and such as contain neither acid nor alkaline salts; or whether mere water, the white of eggs, saliva, gum-water, &c. may not, by the same means, be made to dissolve them; so as that the metalline particles may be left behind upon Calicoes, cloths &c. when the aqueous or mucilaginous matter is dried, or washed away from them. But no great effect can be rationally expected in such attempts, unless the triture be long continued, and mills, or other well adapted engines, be used for the purpose: for we find, in all instances, that metals must be reduced to very fine particles before they will tinge or colour.

CA'LIN, a kind of metal, finer than lead, but inferior to tin. It is very common in China, Cochinchina, Japan, Siam, &c. It is commonly used in the East-Indies for covering the roofs of houses, as we do lead in Europe; they likewise make of it several pieces of furniture. The tea boxes which comes from China are made of Calin. They also make coffee-pots of it, some of which are even brought into Europe.

It is a mixture of tin and lead, and some other mineral, as zink, &c. rather than a metal of a new kind.

CA'LVINISTS, those who follow the opinions of John Calvin, one of the principal reformers of the church, in the 16th century.

Calvin was born at Noyon, in Picardy, in the year 1509: he first studied the civil law; afterwards retiring to Basil, he turned his thoughts to the study of divinity, and published there his Institutions, which he dedicated to Francis I. He was made professor of divinity at Geneva, in the year 1536. The year following, he prevailed with the people to subscribe a confession of faith, and to renounce the Pope's authority: but, carrying the matter a little farther than was agreeable to the

the government, he was obliged to retire from Geneva; upon which he set up a French church at Strasburgh in Germany, and was himself the first minister of it: but, the town of Geneva inviting him to return, he came back thither in September 1541. The first thing he did, was to settle a form of discipline and consistorial jurisdiction, with a power to inflict censures, even to excommunication; and he gained himself many enemies, by his inflexible severity, in maintaining the rights and jurisdiction of his consistory: he was a person of great parts, indefatigable industry, and considerable learning. He died in the 56th year of his age, in 1564.

The principal opinions of the Calvinists are drawn from the writings of Calvin, contained in the forty articles of their Christian faith, which they presented to the French king, in their catechisms and ecclesiastical discipline.

The Calvinists are great advocates for the absoluteness of God's decrees; and hold, that election and reprobation depend on the mere will of God, without any regard to the merit or demerit of mankind; that he affords to the elect an irremissible grace, a faith which they cannot lose, which takes away the freedom of will, and necessitates all their actions to virtue.

In short, they believe that God foreknew a determinate number whom he pitched upon to be the persons in whom he would manifest his glory; that, having thus foreknown them, he predestinated them to be holy; in order to which he gives them an irresistible grace, which makes it impossible for them to be otherwise.

This last is the principal point in which Calvin's heterodoxy differed from that of Luther, who always believed the real presence in the sacrament.

The Calvinists reduce the number of the sacraments to two; reject evangelical councils, and monastic vows; defend imputative righteousness, and dispute against the received notion of justification.

CA'LUMET, among travellers, a mystic kind of pipe used by the American savages as the ensign of peace, and for religious fumigation.

The Calumet is a sort of tobacco pipe, made of red, black, or white marble. The shank is decorated with rounds of feathers and locks of hair, or porcupines quills: in it they smoke in honour of the sun.

The Calumet is the symbol and security of traffic; by it they pronounce life and death, peace and war: they also ascribed to it a power of raising the souls of the dead.

CALX *antimonii*, a name given in the late London Dispensatory to the preparation of antimony, called before antimonium diaphoreticum. This is made by mixing antimony with three times its weight of nitre, throwing it into a hot crucible; and, when removed from the fire, washing it both from its salts and from such parts as have not been well calcined; the washing is to be continued till the water come away tasteless, and the finer part is separated for use by pouring off the water turbid, and leaving the coarse particles behind, taking only the sediment of this water. *Pemberton's Lond. Dispens.*

CALX *vivа*, quick-lime, that on which no water has been cast since burning, in opposition to Calx extincta, that slaked by the effusion of water.

CA'MERA *lucida*, a contrivance of Dr. Hooke, for making the image of any thing appear on a wall in a light room, either by day or night.

Opposite to the place or wall, where the appearance is to be, make a hole of at least a foot in diameter, or if there be a high window with a casement of this dimension in it, this will do much better without such hole, or casement opened. At a convenient distance to prevent its being perceived by the company in the room, place the object or picture intended to be represented, but in an inverted situation. If the picture be transparent, reflect the sun's rays by means of a looking-glass, so that they may pass through it towards the place of representation; and, to prevent any rays from passing aside it, let the picture be encompassed with some board, or cloth. If the object be a statue, or a living creature, it must be much enlightened by casting the sun's rays on it, either by reflection, refraction, or both. Between this object and the place of representation put a broad convex glass ground to such a convexity as that it may represent the object distinctly in such place. The nearer this is situate to the object, the more will the image be magnified on the wall, and the further the less; such diversity depending on the difference of the spheres of the glasses. If the object cannot be conveniently inverted, there must be two large glasses of proper spheres, situate at suitable distances, easily found by trial, to make the representations erect. This whole apparatus of object, glasses, &c. with the persons employed in the management of them, are to be placed without the window or hole, so that they may not be perceived by the spectators in the room, and the operation itself will be easily performed. *Philosophical Trans.* N°. 38.

CA'MLET, or as some spell it CAMBLET, a plain stuff, composed of a warp and woof, and which is manufactured on a loom with two treddles, as linens and stamines are.

The Camlets are either longer or shorter, broader or narrower, according to their several kinds and qualities, and the places where they are manufactured. There are Camlets of all sorts: some of goats hair, both in the warp and woof; and others, in which the warp is of hair, and the woof half hair and half silk; others again, wherein both the warp and woof are of wool; and, lastly, some of which the warp is of wool, and the woof of thread.

Some are dyed in thread; that is to say, that the materials both of the warp and of the woof were dyed before they were wove, or wrought on the loom: others are dyed in the piece; others are marbled, or mixed; some are striped, some waved, or watered, and some figured.

Camlets are proper for several uses, according to their different kinds and qualities. Some serve to make garments, both of men and women, some for bed curtains, and other houshold furniture.

Figured Camlets are those of a single colour, on which have been stamped, or imprinted, various figures, flowers, foliages, &c. This is performed with hot irons, which are a kind of moulds, that are passed under a press at the same time with the stuff. The figured Camlets come only from Amiens and Flanders. The trade of them was formerly pretty considerable; at present there are but few of them sold, which serve commonly for church ornaments, or for making some houshold furniture.

Waved Camlets are those on which a kind of waves have been impressed, as on tabbies, by making them pass several times under the calendar.

Water Camlets are such, which, being taken from the loom, undergo a certain preparation with water, after which they are put into the hot press, that renders them smooth and glossy.

CAMP (*Dict.*— The origin of Camps is of a very great antiquity; we read of them among the Hebrews, who observed a strict discipline, and an outward decency and purity; insomuch that they were not allowed to ease nature, within the limits of the Camp; this promoted cleanness, and contributed to the preservation of their health.

The Greeks had also their Camps, as we read in Homer, fortified with gates and ditches; though not so particularly described, as to be able from thence to give the reader a clear idea thereof. Among the Greeks, the Lacedemonians were reckoned the most dexterous at encampments: these made their Camps of a round figure, looking upon that as the most perfect and defensible form of any other. We are not however to imagine that they thought this form so essential to a Camp, as never to be dispensed with, when the circumstance of the place required it. Greek writers furnish us with almost as many different encampments, as historical relations, and the Latins likewise; it seldom happening that the circumstances of these are the same. Thus a general, when he is about to encamp, has always new occasion to exercise his genius, and it is the part of a skilful officer to contrive such new encampments as are suitable to time and place, and other circumstances. The Lacedemonians, indeed, are said to have been prescribed a constant method of building towers and encamping, by their lawgiver, who thought a spherical figure the best fitted for defence, which was contrary to the custom of the Romans, whose Camps were quadrangular: but all forms of that sort were rejected by Lycurgus, the angles being neither fit for service or defensible, unless guarded by a river, mountain, wall, or some such fortification. It is further observable of the Lacedemonians, that they frequently moved their Camps, being accustomed vigorously to prosecute all their enterprizes, impatient of delays.

When the Greeks were in danger of having their Camp attacked, it was usual to fortify it with a trench and rampire, or wall, on the sides whereof they erected turrets, not unlike those upon the walls of cities, out of which they annoyed their enemies with missive weapons. Homer has described their works, *Iliad*, η. 136.

The manner of living in Camps depended upon the disposition of their generals, some of which allowed their soldiers in all sorts of excess and debauchery; others obliged them to the strictest rules of temperance and sobriety; a remarkable instance whereof we have in Philip of Macedon, who, as Polynæus report, condemned two of his soldiers to banishment for no other offence, than because he had found them with a singing-woman in his Camp. But the Grecian discipline was not always so severe and rigid, for their lawgiver allowed them greater liberty in the Camp than at other times, to invite them to serve with delight in the war; for, whilst they were in the field, their exercises were more moderate than at home, their fare not so hard, nor so strict a hand kept over them by their governors; so that they were the only people in the world to whom war gave repose. *Xenophon de Repub. Laced. Potter's Græc. Ant. Mountfaucon's Ant.*

The Camps of the Romans were generally of an exact square form, or else oblong; though this, without doubt, was often accommodated to the situation of the place. Frontinus says, that Pyrrhus king of Epirus taught the Romans first to encamp; for, upon having defeated him and forced his Camp, they considered the form of it, and from thence modeled their own. But this is a mistake; for, when Pyrrhus first saw the Roman Camp, he was astonished at the form and disposition of of it, and said thus to Megaces: 'Hæc Barbarorum Castra non Barbara videntur. The Camps of the Barbarians have no Barbarian face.' In short, the art of encamping was known at Rome in the time of their kings; for they then fortified their Camps with towers and palisadoes. Indeed, in the infancy of Rome, Camps were not very common, nor can it be supposed they should, when the regal dominion was so small, hardly extending itself beyond the territory of the city.

When the war was carried on at any considerable distance, their Camps were often made of freestone, as appears from Trajan's column. These Camps, thus built, were often the origin of cities, but especially the Camps called stativa, which were a sort of standing Camps, where armies lay for some time, or where they passed the winter, and which, for that reason, were called stativa hiberna. Of this sort there were many upon the Rhine, to hinder the passage of the Germans into Gaul. Besides these stativa hiberna, there were also stativa æstiva, in which they passed the summer under tents. Within these Camps they pitched their tents, some whereof were made of gold and silk; some were of a square form, and others round, terminating at the top in a cone. *Mountfaucon's Ant.*

The Turks, and some other nations of Asia, who generally make war in plain, open countries, surround their Camp with an inclosure formed by their waggons, baggage, &c.

The present practice of European nations is very different from this: they make the safety of a Camp consist in such a disposition as may render it most easy for the horse and foot to be drawn out with the greatest expedition, to face and fight the enemy.

Therefore, as the order of battle, fixed on by the general, ought to be looked on as the best disposition in which an army can engage, it follows, that an army ought to encamp in such a manner, as to be best able to form themselves in such a manner, upon occasion, if the ground permits.

The order of battle, therefore, absolutely determines the form of the encampment; which is agreeable to the remark of the marquis de Santa-Crux on this subject, viz. An army ought to encamp according to the order of its march, and march according to the order in which it is to fight.

As troops engage by battalions and squadrons, the tents must be erected in the same order, and the soldiers ranged in the Camp in the same manner they are in line of battle.

From whence it follows, that the extent of the particular Camps of the several battalions and squadrons, from right to left, must be equal to the front which these troops take up in the line of battle; and that there must be the same spaces between their respective Camps, as was observed in their march.

By this disposition, the extent of the front of every Camp, from right to left, is equal to the front of the line of battle; and, an army being thus drawn up in line of battle, every battalion and squadron may pitch their tents behind them; after which, the troops may either go into the Camp, or march out, and engage in a moment, as it were, at the word of command.

If the front of the Camp be longer than the line of battle, the troops, in forming themselves at the head of the Camp, must leave great spaces between each other, if they would cover it; if, on the contrary, the front of the Camp be shorter than the line of battle, the troops will not have room to form themselves at the distances ordered by the general. To avoid both these inconveniencies, the front of the Camp must be proportional to the line of battle.

There is no certain rule laid down either by custom or authors, who have wrote on the military art, relating to the distances to be observed between the parts of an army; as between battalion and battalion, squadron and squadron, &c.

M. de Bombelles observes, that this cannot be determined exactly, because the extent of the Camp of every battalion in front depends on the space wherein the general would have his army encamp. Yet he imagines, in ordinary ground, one hundred and twenty paces may be allowed for the front of a battalion, including its interval; ninety paces he allows for the encampment; and, consequently, thirty remain for the interval.

Other authors do not make intervals between battalions, but allow thirty paces between regiment and regiment; but they do not support this method by any good reason, and it seems only their intention to divide an army by regiments. Though this division appears most agreeable to the present custom, yet it must not be looked on as general, not having been always observed. M. Rozand, lieutenant-colonel and engineer in the troops of Bavaria, who published a very good treatise of Fortification in 1733, asserts, that he had always seen forty or fifty paces allowed for a squadron to encamp, and as much for the space, or interval; that he has even seen one hundred paces allowed for the front of the Camp of every battalion, and as much for its interval. This practice, which is agreeable to the principles before laid down, may be looked on as an invariable rule, if the general chuses to give battle with intervals equal to the fronts of the different troops of his army. But, however, he determines, his order of battle in the Camp of every respective corps and its interval must be proportional to the front.

It follows from the principles laid down, with regard to the extent, or front of the Camp, that there ought to be, before every corps, battalion, and squadron, an open ground for forming the army in order of battle.

Wherefore, if we are obliged to encamp in disadvantageous posts, the first thing we are to attend to, is to lay out the ground in such a manner, that the troops may have an easy communication, and move without any obstacle.

The order of battle being commonly a right line, on the side next the enemy, and the same line, too, if the ground permit, the colours and standards are placed in it. This is the principal line; or, to express ourselves in terms of military fortification, this is the master-line of the Camp, on which all the rest depend.

After having explained the principles in which the front of a Camp is formed, let us proceed to speak of its depth. This is determined by the depth of the Camps of the battalions and squadrons, which we may reckon at twenty-four fathoms.

The second line must have the same space before it as the first, quite clear, to draw the troops up in line of battle.

The distance from the head of the Camp, or first line, to the second, is commonly three or four hundred paces, sometimes five hundred, if the ground be spacious enough; but the distance never should be less than two hundred paces; because, otherwise, the rear of the Camp of the first line would interfere with the front of the Camp of the second line.

In case of an attack, it is extremely beneficial to have a large space of clear ground before the Camp; because the troops of the second line may march out through their intervals, and have opportunity of forming themselves behind those of the first, in order to support them; and this is an advantage which ought never to be neglected, when it can be procured.

It sometimes happens, an intrenchment is made before the front of a camp; in this case, there should be no obstacle to the communication of the troops between the Camp and the intrenchments.

In countries such as Hungary, and the provinces bordering upon the Danube, where the Germans make war upon the Turks, the officers in general make use of tents: but, in Flanders, Italy, &c. which are often the seat of war, there are many villages and houses, wherein the principal officers, as lieutenant-generals, and field-marshals, have quarters. The quarter-masters of the army appoint each a house in the villages contained within the extent of the Camp. Brigadiers even may lodge in a house, according to military law, if there be one at the rear of their brigade; but inferior officers, as colonels, and all below them, must encamp at the rear of their respective corps.

Care is always taken to lodge or dispose the general officers on the side of the army which they command: that is, those who command the right, on the right; those who command the left, on the left; and those who command the center, on the center. *M. le Blond's Essay on Encampment.*

Where the grounds are equally dry, those Camps are always most healthful, which are pitched on the banks of large rivers; because, in the hot season, situations of this kind have a stream of fresh air from the water, serving to carry off the moist and putrid exhalations. On the other hand, next to marshes, the worst encampments are on low grounds, close beset with trees; for then the air is not only moist and hurtful in itself, but, by stagnating, becomes more susceptible of corruption. However, let the situation be ever so good, Camps are frequently rendered infectious by the putrid effluvia of rotten straw, and the privies of the army; more especially, if the bloody-flux prevails; in which case, the best method of preventing a general infection, is, to leave the ground, with the privies, foul straw, and other filth of the Camp, behind. This is to be frequently done, if consistent with the military operations; but, when these render it improper to change the ground often, the privies should be made deeper than usual, and once a day a thick layer of earth thrown into them, till the pits are near full, and then they are to be well covered, and supplied by others. It may also be a proper caution, to order the pits to be made either in the front or rear, as the then stationary winds may best carry off their effluvia from the Camp. Moreover, it will be necessary to change the straw frequently, as being not only apt to rot, but to retain the infectious steams of the sick. But, if fresh straw cannot be procured, more care must be taken in airing the tents, as well as the straw. *Pringle, Observ. on the Diseases of the Army.*

CAMPAIGN (*Dict.*)—The beginning of every Campaign is considerably more unhealthy than if the men were to remain in quarters. After the first fortnight or three weeks encampment, the sickness decreases daily; the most infirm being by that time in the hospitals, the rest more hardened, and the weather growing daily warmer. This healthy state continues through the summer, unless the men get wet cloaths, or wet beds; in which case a greater or lesser degree of the dysentery will appear, in proportion to the preceding heats. But the most sickly part of the Campaign begins about the middle or end of August, whilst the days are still hot, but the nights are cool and damp, with fogs and dews: then, if not sooner, the dysentery prevails; and, though its violence be over by the beginning of October, yet the remitting fever, gaining

ground,

ground, continues throughout the rest of the Campaign, and never intirely ceases, even in winter quarters, till the frost begin.

At the beginning of a Campaign, the sickness is so uniform, that the number may be nearly predicted; but, for the rest of the season, as the diseases are then of a contagious nature, and depend so much upon the heat of summer, it is impossible to foresee how many may fall sick from the beginning to the end of autumn. It is also observed, that the last fortnight of a Campaign, if protracted till the beginning of November, is attended with more sickness than the first two months of the encampment; so that it is better to take the field a fortnight sooner, in order to return into winter quarters so much the earlier.

As to winter expeditions, though severe in appearance, they are attended with little sickness, if the men have strong shoes, good quarters, fuel, and provisions.

Long marches in summer are not without danger, unless made in the night, or so early in the morning, as to be over before the heat of the day. *Pringle, Observ. on the Diseases of the Army.*

CAMPA'NULA, *bell-flower*, in botany, a genus of plants whose characters are: the flower consists of one leaf; is shaped like a bell, and is, before blown, of a pentagonal figure; and, when fully opened, is cut into five segments at the top: the seed-vessel is, for the most part, divided into three cells, each having an hole at the bottom, by which the seed is emitted.

Boerhaave has enumerated thirty-four, Tournfort eighty-seven, and Miller thirty species of this plant.

This plant is propagated either by sowing the seeds in March, in a bed of light undunged soil, or by parting the roots; the latter method, being the most expeditious, is commonly practised; for every plant, taken from the roots in September or March, will grow, if rightly managed.

The peach-leaved bell-flowers may be raised from seeds, in the same manner, or be increased, by parting their roots in Autumn, which is the most expeditious method.

The Canterbury bells are biennial, seldom lasting longer than the second year: these, therefore, are only raised by sowing their seeds; the best season for which is in the beginning of April; and in June the plants will be fit to transplant.

The Canary Campanula is one of the most beautiful plants of the green-house, it producing its flowers in the depth of winter; and continues them through the months of December, January, and February. This plant is propagated by parting its roots, the season for which is in June, when the stems are quite decayed; and, in doing of it, great care should be taken not to break or bruise their roots, which would endanger their decaying. The soil in which these roots should be planted, must be one third fresh earth, a third part sand, and the rest lime-rubbish: this should be well mixed and screened, and, if laid together half a year before it is used, that it may incorporate, it will be the better.

When you plant the roots, give them a little water to settle the earth about them; but, afterwards, let your waterings be very sparingly done, and but seldom repeated, until their stems begin to advance; after which, they must have it a little freely: for want of this caution, many of these, and other flowers-roots, which are kept in pots, are destroyed; for it is impossible to suppose, that a root, which is entirely at rest, and destitute of leaves, should be capable of discharging any quantity of moisture: therefore let this caution be constantly observed. The stems of the flower will begin to appear in August; and, if the roots are strong, will rise to eight or nine feet in height; and in November, or sooner, will begin to shew its beautiful flame-coloured flowers. When these stems begin to advance, we should remove the plants into shelter, to guard them from morning frosts, or great rains; and, as the weather grows colder, they must be removed into a good green-house, where they should have as much free air as possible, in open, mild weather. This plant will require the same proportion of heat as is allotted for the ficoides, and will thrive in the same house, better than amongst orange-trees, &c.

CANA'DIAN, *Philosophy*. We are indebted, for what we know of the savages of Canada, to the baron de Hontan, who resided amongst them near ten years. He tells us, that in some conversations with them, which he relates on the subject of religion, he did not always get the better in the dispute. It is, indeed, surprising, a Huron should use all the subtilty of logic, to combat the Christian religion, and be as perfect in every trick of the schools, as if he had studied Scotus. It has been suspected, the baron had a mind to throw a ridicule on the religion he had been brought up in, and has put arguments in the mouth of a savage, he dared not make use of himself.

Those who have neither seen nor read any authentic account of these savages, have conceited they were covered with hair; lived in the woods, like wild beasts; had no society, and bore but the figure of man: whereas these savages have really no hair on their bodies, excepting on their head and eyebrows, which many take pains to pull off: if accidentally a hair grows any where else, they are careful to pluck it out, even by the roots. They are born as white as Europeans, but their going naked, daubing themselves with oil, and painting themselves with different colours, which the sun at last imprints on their skin, spoils their complexion; they are large men, superior in stature to us; their features are regular; their nose aquiline; are in general well-shaped; and it is a rarity to see any among them lame, blind, or deformed.

At first sight, a man would scarce entertain a favourable opinion of these savages: they have a fierce look; a rough deportment; and, in meeting each other, they are so silent, and shew so little emotion, that it would be difficult for an European, ignorant of their customs, to believe this their manner of civility, and the ceremony in fashion among them. They make a great jest of our compliments, using but few outward demonstrations of kindness; but are, however, good, affable, and exercise to strangers, and the unhappy, a charitable hospitality, that may shame all the nations of Europe; and an evenness of mind, which is neither altered by prosperity nor adversity. This is in a great measure owing to their want of those vicious resentments, which luxury and abundance have introduced among us.

The following are principal points of their religion and philosophy.

1. All the savages maintain there is a God; his existence they prove by the formation of the universe, which manifests the almighty power of its author; from whence it follows, say they, that man is not the work of chance, but of a principle superior in wisdom and knowledge, which they call the great mind. This great mind contains all, appears in all, acts in all, and gives motion to all things. In short, all we see, all we conceive, is this God, who subsists, without bounds, and without body, ought not to be represented by any figure whatever, and therefore they adore him in all his works. This is so true, that, when they see any thing remarkably fine, curious, or surprising, especially the sun and stars, they break out in this exclamation: Oh! great mind, we see thee every-where!

2. They say the soul is immortal, because, if it were not, all men would be equally happy in this life; for God, being infinitely perfect and wise, could not have created some for happiness, and others for misery; they maintain, that God, for certain reasons, above our comprehension, wills, that a certain number of beings should suffer in this world, that he may recompense them in the next; and therefore cannot bear to hear Christians say, such a one was unhappy, because he was killed, or burnt; asserting that what we call unhappiness, is only in our own ideas; because nothing is done, but by the will of this infinitely perfect being, whose conduct can neither be uncertain nor capricious.

3. The supreme mind has given men reason to enable them to discern good from evil, and to follow the rules of justice and wisdom.

4. Tranquillity of the soul is highly pleasing to the supreme mind; that, on the contrary, he detests the tumult of the passions, which makes men wicked.

5. Life is a sleep, death an awakening, which gives us intelligence of things visible and invisible.

6. The reason of man not being capable of lifting itself up to the knowledge of things above the earth, it is needless and troublesome to dive into invisible things.

7. After death, our souls go into a certain place, in which we cannot tell whether the good are happy, or evil unhappy; because we know not whether our ideas of happiness and misery coincide with those of the supreme spirit or mind.

CA'NAL, (*Dict.*)—An artificial Canal is a place dug to receive the waters of the sea, one or more rivers, &c. Rivers not only contribute to the natural riches of the country, by watering the soil through which they pass, but make a kind of artificial riches in every province through which they flow, by rendering the convenience of merchandizes easy. The more their course is extended in any state, and the more they communicate with each other, so much more the parts of that state are connected together, and mutually disposed to enrich each other. If nature has not done every thing to the highest perfection for man, man is to improve nature to the best advantage; and the Dutch, or, if we may credit travellers, the Chinese, who possess a country of prodigiously larger extent, have shewn how far human industry may go in making Canals and rivers navigable; and their labours have been sufficiently recompensed.

But the benefit of Canals was apprehended in very early ages of the world. Herodotus relates, that the Cnidians, a people of Cacia, in Asia minor, undertook to cut the isthmus, which almost joins Cnidos to the continent, but that they were diverted by an oracle. Several kings of Ægypt have attempted to make a communication between the Red-sea and the Mediterranean. Cleopatra had the same design. Solyman II, emperor of the Turks, employed five thousand men to no purpose, in the same attempt. The Greeks and Romans projected a Canal cross the isthmus of Corinth, which joins Morea and Achaia, to make a communication between the Ionian sea and the Archipelago. King Demetrius, Julius Cæsar, Caligula, and Nero, made vain attempts at the same thing. Under the reign of Nero, Lucius Verus, one of the generals of the Roman army in Gaul, undertook to join the Sone and the Moselle, by a Canal, to make a communication between the Mediterranean sea and German ocean, by the Rhone, the Sone, the

the Moselle, and the Rhine; which he could not execute. Charlemagne formed a design of uniting the Danube and the Rhine, by making a communication between the Ocean and the Black-sea, by a Canal from the river Almutz, which discharges itself into the Danube, to the river Reditz. He employed a vast number of hands, but different obstacles, which succeeded each other, made him lay aside this project. Bernard proposes, in his treatise on the Junction of the Seas, a communication between the sea of Provence and the ocean towards the coasts of Normandy, by uniting the Ouche to the Armanson, and so to go through France by the Rhone, the Sone, the Ouche, the Armanson, the Yonne, and the Seine.

There are several great Canals in France; as that of Briare, begun under Henry IV. and finished under Lewis XIII. by the care of cardinal Richlieu, which made a communication between the Loire and the Seine, by the Loing. It is eleven leagues in length, from Briare to Montargis. It enters the Loire below Briare, and, at Cepoi, ends in the Loing. The waters of this Canal are kept up by forty-two sluices: these serve to carry up and down rafts of wood, and boats made of a proper length and depth for this navigation; a certain toll is paid at every sluice, to defray the expence of keeping the Canal in order, and to reimburse the proprietors.

The Canal of Orleans was undertaken in 1675, for the communication of the Seine and Loire; it has twenty sluices; Philip of Orleans, regent of France, finished it in the minority of Lewis XV. It bears the name of a town through which it does not pass; beginning at Combleuse, a mile and a half from Orleans.

The project of the Canal of Picardy, for joining the rivers Somme and Oise, was carried into execution under the ministry of the cardinals Richlieu and Mazarin; and finished under the administration of M. de Colbert.

But one of the greatest and most stupendous works of this kind is the Canal of Languedoc, which forms a junction of two seas. This great and useful plan was proposed in the reigns of Francis I, Henry IV, and Lewis XIII; but not begun till the reign of Lewis XIV, wherein it was finished. It begins with a reservoir of four thousand paces in circumference, and eighty feet deep, which receives the waters of the black mountain; these descend to Nauroufe, in a basin four hundred yards long, and two hundred yards broad, lined with free-stone. Here is the point of separation, where the waters distribute themselves to the right and left, in a Canal sixty-four leagues long, into which many lesser rivers discharge themselves; and this is kept up from one space to another by one hundred and four sluices. The eight sluices, in the neighbourhood of Besiers, make a very fine shew; they form a cascade three hundred yards long, with an inclination of twenty-two yards.

This Canal is conducted in several places by aqueducts and bridges of an incredible height, which admit other rivers under their arches. In others, its way is cut through a rock, sometimes above, sometimes under ground, for the length of one thousand paces. It joins the Garonne at one end, near Toulouse; the other, crossing the Aude twice, passes between Agde and Besiers, and ends in the great lake which extends to Port Cette.

This Canal may stand in competition with the greatest attempts of the Romans; it was projected in 1666; Francis Requet demonstrated the practicability of it by many experiments made on the spot, and finished it before his death, which happened in 1680.

We have but one remarkable Canal, and that made by other people, and suffered to decay by ourselves. By this I mean that ancient Canal from the river Nyne, a little below Peterborough, to the river Witham, three miles below Lincoln, called by the modern inhabitants Caudike; which may be ranked among the monuments of the Roman grandeur, though it is now most of it filled up. It was forty miles long; and, so far as appears from the ruins, must have been very broad and deep; some authors take it for a Danish work. Morton will have it made under the emperor Domitian. Urns and medals have been discovered on the banks of this Canal, which seem to confirm that opinion. *Morton, Nat. Hist. Northampt.*

The great Canal of China is one of the wonders of art, made about eight hundred years ago; it runs from north to south quite cross the empire, beginning at the city of Canton. By it all kinds of foreign merchandize, entered at that city, are carried directly to Pekin, a distance of eight hundred and twenty-five miles. Its breadth and depth are sufficient to carry barks of considerable burthen, which are managed by sails and masts, as well as towed by hand. On this Canal the emperor is said to employ ten thousand ships, abating one for a reason very peculiar. It passes through, or by, forty-one large cities; there are in it seventy-five vast locks and sluices, to keep up the water, and pass the barks and ships where the ground will not admit of a sufficient depth of channel, besides several thousand draw and other bridges.

F. Magaillaine assures us, there is a passage from one end of China to the other, the space of six hundred French leagues, always, either by Canals or rivers, except a single day's journey by land, necessary to cross a mountain; an advantage which this Jesuit, who made the voyage himself, observes, is not to be found in any other state of the universe.

CANA'RY-*birds*, a species of singing-birds, greenish in colour, formerly brought only from the Canary-islands, but of late chiefly from Germany and Switzerland; which last, called also German birds, are preferred to the former.

Canary-birds are distinguished by different names, at different times and ages: such as are about three years old, are called runts; those above two are named eriffs; those of the first year, under the care of the old ones, are termed branchers; those that are new-flown, and cannot feed themselves, pushers; and those brought up by hand, nestlings.

Canary-birds are various in their notes, some having a sweet song, others a lavish note, others a long song, which is best, as having greatest variety of notes. Some prefer those that whisk and chew like a tit-lark; others are for those which begin like a sky-lark, continuing their song with a long yet sweet note; others chuse those which begin their song with the sky-lark, and then run on the notes of the nightingale; others, again, prefer a loud note and lavish, regarding little more than the noise.

CA'NCER (*Dict.*)—*To prevent* CANCERS. When there is danger of an approaching Cancer, the acrimony of the blood is, if possible, to be corrected by the use of both internal and external remedies, and a strict regimen in regard to diet is to be observed. Broths and soups, made of the flesh of young animals, and with proper herbs boiled in them, as scorzonera, and the others of that tribe, are very beneficial in these cases; the most wholesome drink is either fair water, or a decoction of China-root, or sarsaparilla, or the like; and, when the pains are violent from the schirrus, which is now threatening to become a Cancer, white poppy-seeds may be added in considerable quantities to the decoction; and it may be sweetened with a proper quantity of syrup of diacodium. Two or three times a day also should be taken a dose of Gascoin's powder, salt of wormwood, native cinnabar, crude, and diaphoretic antimony, adding to each dose, as there shall be occasion, half a grain of laudanum, to assuage the violence of the pain: great benefit is also sometimes received in this case, by taking either the powder or juice of millepedes, with sperma ceti.

Purges also of the mercurial kind do great service, as do also bleeding and cupping frequently in the spring and autumn. A thin plate of lead, well impregnated with quicksilver, may also be very conveniently worn on the part, and with great advantage; for this method cannot but weaken the sense of pain, and may often prevent a Cancer.

If the application of the plate of lead shall prove insufficient, plaisters and ointments, composed of such ingredients as are known to assuage pains, may also be applied; the following are of this kind, and are frequently found of service: take, of the unguentum diapompholygos, two ounces; of opium, half a scruple; mix these into an ointment, and frequently rub the part affected with it; or take, of an amalgama of quicksilver and lead, two ounces; mix this with a sufficient quantity of ointment of roses, or any the like unguent; then spread a part of it on a linen rag, and apply it in the manner of a plaister to the part; or take, litharge vinegar, an ounce; expressed oil of henbane-seeds, poppy-seeds, and the infused oil of roses, of each two ounces; mix them, by a long and continued stirring together, into an ointment, adding, toward the end of the operation, purified opium, from six to ten grains, as the urgency of the symptoms may require: this is to be spread in like manner on linen rags, and applied at times to the part.

If the daubings of these ointments is disliked, a refrigerant plaister may be used in their stead; such is the lead plaister of Mynsycht, the plaister of red lead, or pompholyx, or the excellent plaister made by the following prescription: take of the fresh and depurated juices of henbane, garden poppy, and water hemlock, of each four ounces; boil these to a thickness over a gentle fire, adding, toward the end of the boiling, eight ounces of white wax, and one ounce of oil of roses, and make the whole into a plaister; or take, sugar of lead, of ceruse, the amalgamation of quicksilver and lead, and of the expressed oil of henbane-seed, and infused oil of roses, of each two ounces; make these into a plaister. If the pains are very violent, a small quantity of opium may be added to either of these plaisters. *Heister's Surgery.*

CANCER, in the military art, denotes a long, ponderous beam, used for beating down walls, not unlike the manner of a ram.

CA'NCEROUS, or CANCEROSE, something that belongs to, or partakes of the nature and qualities of a cancer.

CA'NDLE *, a cotton or linen wick, loosely twisted, and covered with tallow, wax, or sperma ceti, in a cylindrical figure; which, being lighted at the end, serves to illumine a place in the absence of the sun.

* The word *Candle* comes from the Latin *candela*, and that from *candor* of *candeo*, I burn; whence also the middle-age Greek *κανδηλα*.

A tallow Candle, to be good, must be half sheep's tallow, half bullocks; that of hogs making them gutter, give an ill smell, and a thick black smoak.

Tallow Candles are of two kinds; the one dipped, the other moulded: the first, which are those in ordinary use, are of an old standing; the latter are said to be the invention of the Sieur le Brez, at Paris. The manufacture of the two kinds is very dif-

different, excepting in what relates to the melting of the tallow, and making the wick, which is the fame in both.

Method of making CANDLES. The tallows, being weighed and mixed in their due proportion, are cut or hacked into pieces, to facilitate their melting, and thrown into a pot, or boiler, having a cavity of fome depth running round the top, to prevent its boiling over. Being thus perfectly melted and fkimmed, a certain quantity of water is thrown in, proportioned to the quantity of tallow, which ferves to precipitate the impurities of the tallow, which had efcaped the fkimmer, to the bottom of the veffel. The tallow, however, intended for the three firft dips, muft have no water; in regard the dry wick, imbibing the water readily, makes the Candles fplit and crackle in the burning. The melted tallow is now emptied through a fierce into a tub, having a tap for letting it out, as occafion requires. The tallow thus prepared, may be ufed, after having ftood three hours, and will continue fit for ufe twenty-four hours in fummer, and fifteen in winter.

—*For the wicks*, they are made of fpun-cotton, which the chandlers buy in fkeins, and wind off three or four together, according to the intended thicknefs of the wick, into bottoms or clues, whence they are cut out with an inftrument contrived for that purpofe, into pieces of the length of the Candle required; then put on the fticks, or broches, or elfe placed in the moulds, as the Candles are intended to be either dipped or moulded.

Making of dipped CANDLES. The liquid tallow is drawn off, from the tub above-mentioned, into a veffel called the mould, fink, or abyfs, of an angular form, perfectly like a prifm, except that it is not equilateral; the fide on which it opens being only ten inches high; and the others, which make its depth, fifteen. On the angle, formed by the two great fides, it is fupported by two feet, and placed on a kind of bench, in form of a trough, to catch the droppings, as the Candles are taken out each dip. At a convenient diftance from this, is feated the workman, who takes two fticks, or broches, at a time, ftrung with the proper number of wicks, viz. fixteen, if the Candles are to be of eight in the pound; twelve, if of fix in the pound, &c. and, holding them equi-diftant, by means of the fecond and third finger of each hand, which he puts between them, he immerges the wicks two or three times for the firft lay; and, holding them fome time over the opening of the veffel, to let them drain, hangs them on a rack, where they continue to drain and grow dry. When dry, they are dipped a fecond time, then a third, as before; only for the third lay, they are immerged but twice, in all the reft, thrice. This operation is repeated more or lefs times, according to the intended thicknefs of the Candle. With this laft dip they neck them; i. e. plunge them below that part of the wick where the other lays ended.

It muft be obferved, that during the operation, the tallow is ftirred from time to time, and the ftock fupplied with frefh tallow. When the Candles are finifhed, their peaked ends, or bottoms, are taken off, not with any cutting inftrument, but by paffing them over a kind of flat brazen plate, heated to a proper pitch, by a fire underneath, which melts down as much as is requifite.

Method of making mould-CANDLES. Thefe Candles are made in moulds of different matters; brafs, tin, and lead, are the moft ordinary. Tin is the beft, and lead is the worft. Each Candle has its mould, confifting of three pieces, the neck, fhaft, and foot: the fhaft is a hollow metal cylinder, of the diameter and length of the Candle propofed; at the extremity of this is the neck, which is a little metallic cavity, in form of a dome, having a moulding within-fide, and pierced in the middle with a hole big enough for the wick to pafs through. At the other extremity is the foot, in form of a little tunnel, through which the liquid tallow runs into the mould. The neck is foldered to to the fhaft, but the foot is moveable, being applied when the wick is to be put in, and taken off again when the Candle is cold. A little beneath the place where the foot is applied to the fhaft, is a kind ftring of metal, which ferves to fupport that part of the mould, and to prevent the fhaft from entering too deep in the table to be mentioned hereafter. Laftly, in the hook of the foot is a leaf of the fame metal, foldered within-fide, which, advancing into the center, ferves to keep up the wick; which is here hooked on precifely in the middle of the mould. The wick is introduced into the fhaft of the mould, by a piece of wire, which, being thruft through the aperture of the hook, till it comes out at the neck, the wick is tied to it; fo that in drawing it back, the wick comes along with it, leaving only enough at the top for the neck; the other end is faftened to the hook, which thus keeps it perpendicular. The moulds, in this condition, are difpofed in a table pierced full of holes, the diameter of each being about an inch: thefe holes receive the moulds inverted, as far as the ftring in the foot. Being thus placed perpendicularly, they are filled with melted tallow, (prepared as before) drawn out of the tap into a tin-pot, and thence poured into the foot. After the moulds have ftood long enough to cool, for the tallow to have arrived at its confiftence, the Candle is taken out, by taking off the foot, which brings the Candle along with it. Thofe who aim at perfection in this work, bleach or whiten their Candles, by faftening them on rods or broches, and hanging them out to the dew, and earlieft rays of the fun, for eight or ten days: care being taken to fkreen them in the day time from the too intenfe heat of the fun; and in the night from rain, by waxed cloths.

Wax CANDLES, are made of a cotton or flaxen wick, flightly twifted, and covered with white or yellow wax.—Of thefe there are feveral kinds; fome called tapers, ufed to illumine churches, proceffions, funeral ceremonies, &c. and others ufed on ordinary occafions.

For the firft kind, their figure is conical, ftill diminifhing from the bottom, which has a hole to receive the hook of the candleftick, the top of which ends in a point: the latter kind are cylindrical. The firft are either made with a ladle, or with the hand.

Manner of making wax CANDLES *with the ladle*. The wicks being twifted and cut of the proper length, a dozen of them are tied by the neck, at equal diftances, round an iron circle, fufpended directly over a large bafon of copper tinned, and full of melted wax; a large ladle-ful of this wax is poured gently, by inclination, on the tops of the wicks, one after another; fo that, running down, the whole wick is thus covered: the furplus returning into the bafon, where it is kept warm by a pan of coals underneath it. They thus continue to pour on the wax, till the candle arrives at its deftined bignefs: ftill obferving, that the three firft ladles be poured on at the top of the wick, the fourth at the height of three fourths, the fifth at one half, and the fixth at one fourth; by which means the candle arrives at its pyramidal form. The candles are then taken down hot, and laid afide of each other, in a feather bed folded in two, to preferve their warmth, and keep the wax foft: they are then taken and rolled, one by one, on an even table, ufually of walnut-tree, with a long fquare inftrument of box, fmooth at bottom. The candle being thus rolled and fmoothed, its big end is cut off, and a conical hole made in it.

Manner of making wax CANDLES *by the hand*. The wick being difpofed, as in the former, they begin to foften the wax, by working it feveral times in hot water, contained in a brafs caldron tinned, very narrow and deep. A piece of the wax is then taken out, and difpofed, by little and little round the wick, which is hung on a hook in the wall, by the extremity oppofite to the neck; fo that they begin with the big end, diminifhing ftill, as they defcend towards the neck. In other refpects, the method is the fame here as in the former cafe, only that they are not laid in the bed, but are rolled on the table juft as they are formed. It muft be obferved, however, that, in the former cafe, water is always ufed to moiften the feveral inftruments, to prevent the wax from fticking; and, in the latter, lard, or oil of olives, for the hands, table, &c.

Cylindrical wax CANDLES, are either formed on the table or drawn. The firft kind are made of feveral threads of cotton, loofely fpun, and twifted together, covered with the ladle, and rolled as the conical ones, but not pierced.

Wax CANDLES *drawn*, are fo called, becaufe actually drawn, in the manner of wire, by means of two large rollers, or cylinders of wood, turned by a handle, which, turning backwards and forwards feveral times, pafs the wick through melted wax, contained in a brafs bafon; and at the fame time through the holes of an inftrument, like that ufed for drawing wire, faftened at one fide of the bafon: fo that, by little and little, the candle acquires any bulk at pleafure, according to the different holes of the inftrument through which it paffes: by this method, may four or five hundred ells length be drawn running. The invention of this was brought from Venice by Pierre Blefimare, of Paris, about the middle of the laft century.

CANICULAR year, annus canicularis, denotes the Egyptian natural year, which was computed from one heliacal rifing of Canicula to the next.

This is called annus canarius, and annus cynicus; by the Egyptians themfelves the Sothic year, from Soth a denomination given by them to Sirius. Some alfo call it the heliacal year.

The Canicular year confifted ordinarily of three hundred and fixty-five days, and every fourth year of three hundred and fixty-fix days, by which it was accommodated to the civil year. The reafon of their choice of Canicula before the other ftars, to compute their time by, was not only the fuperior brightnefs of that ftar, but becaufe its heliacal rifing was in Egypt a time of fingular note, as falling on the greateft augmentation of the Nile, the reputed father of Egypt. Ephef-tion adds, that, from the afpect of Canicula, its habit and colour the Egyptians drew prognoftics concerning the rife of the Nile; and, according to Florus, predicted the future ftate of the year. So that the firft rifing of this ftar was yearly obferved with great attention.

CANKER, in medicine; fee APHTHÆ, *Dict.* and *Sup.*

CANKER *in trees*, a term ufed by our farmers to exprefs a wound or blemifh in the trunk of a tree, which does not heal up by nature, but will increafe and damage, if not indanger the whole tree. Thefe wounds are fometimes occafioned by accidents, as blows, or by the branches of one tree galling another by the motion they are put into by the winds; if this latter be the cafe, the offending branch muft be cut off, or drawn another way, or elfe all remedies are vain.

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The wound muſt be cut and enlarged every way to the quick, and all the decayed wood muſt be taken clean out; then the whole internal ſurface of the wound muſt be rubbed over with tar mingled with oil, and after this it muſt be filled up with clay and horſe-dung mixed together, or with horſe-dung alone, which many eſteem beſt of all; in this caſe the dung muſt be bound over with a rag; hog's dung is by many preferred to horſe-dung for this purpoſe, and it is proper to add to this application the keeping of the roots cool and moiſt, by laying fern and nettles about them. If the Canker be only in one of the boughs of the tree, the ſhorteſt way is to cut off the bough at once; if that be a large one, it ſhould be cut off at ſome diſtance from the body of the tree; but, if a ſmall one, it ſhould be cut off cloſe. The adding a coat of dung, and pond or river mud, about the roots of trees, if they are ſubject to this from their ſtanding in a dry barren land, as is often the caſe, is a very good cure. *Mortimer's Huſbandry.*

CA'NNABIS, hemp in botany, a genus of plants whoſe characters are: it hath digitated (or fingered) leaves which grow oppoſite to one another: the flowers have no viſible petals; it is male and female, in different plants. This plant is propagated in the rich fenny parts of Lincolnſhire in great quantities, for its bark, which is uſed for cordage, cloth, &c. and the ſeeds afford an oil, which is uſed in medicine.

Hemp is always ſown on a deep, moiſt, rich ſoil, ſuch as is found in Holland, in Lincolnſhire, and the fens in the iſles of Ely, where it is cultivated to great advantage, as it might in many other parts of England, where there is the like ſoil; but it will not thrive on clay, or ſtiff cold land: it is eſteemed very good to deſtroy weeds, but it will greatly impoveriſh the land, ſo that this crop muſt not be repeated on the ſame ground.

The land on which hemp is deſigned to be ſown, ſhould be well plowed, and made very fine by harrowing; about the middle of April is a good ſeaſon for ſowing the ſeed: three buſhels will ſow an acre: in the choice of the ſeed, the heavieſt and brighteſt-coloured ſhould be preferred, and particular care ſhould be had to the kernel of the ſeed, ſo that ſome of them ſhould be cracked to ſee if they have the germ or future plant perfect: for in ſome places the male plants are drawn out too ſoon from the female, that is, before they have impregnated the female plants with the farina; in which caſe, though the ſeeds produced by theſe female plants may ſeem fair to the eye, yet they will not grow, as is well known to the inhabitants of Bickar, Swineſhead, and Dunnington, three pariſhes in the fens of Lincolnſhire, where hemp is cultivated in great abundance, who have dearly bought their experience.

When the plants are come up, they ſhould be hoed out in the ſame manner as is practiſed for turnips, leaving the plants a foot or ſixteen inches apart; obſerve alſo to cut all the weeds, which, if well performed, and in dry weather, will deſtroy them. This crop will require a ſecond hoeing about a month after the firſt, in order to deſtroy the weeds: if this be well performed, it will require no further care; for the hemp will ſoon after cover the ground, and prevent the growth of the weeds.

The firſt ſeaſon for pulling the hemp is uſually about the middle of Auguſt, when they begin to pull what they call the fimble-hemp, which is the male plant; but it would be much the better method to defer this for a fortnight or three weeks longer, until theſe male plants have fully ſhed their duſt, without which the ſeeds will prove abortive, produce nothing if ſown the next year, nor will thoſe concerned in the oil-mills give any thing for them, there being only empty huſks without any kernels to produce the oil.

The ſecond pulling is a little after Michaelmas, when the ſeeds are ripe: this is uſually called karle-hemp: it is the female plants, which were left at the time when the male were pulled. This karle-hemp is bound in bundles of a yard in compaſs, according to the ſtatute meaſure, which are laid in the ſun for a few days to dry; and then it is ſtacked up or houſed to keep it dry, till the ſeed can be threſhed out. An acre of hemp, on a rich ſoil, will produce near three quarters of ſeed, which, together with the unwrought hemp, is worth from ſix to eight pounds.

Of late years the inhabitants of the Britiſh colonies in North America have cultivated this uſeful plant, and a bounty was granted by parliament for the hemp, which was imported from thence; but whether the inhabitants of thoſe colonies grew tired of cultivating it, or the bounty was not regularly paid, I cannot ſay; but, whatever has been the cauſe, the quantity imported has by no means anſwered the expectation of the public, which is greatly to be lamented; becauſe, as this commodity is ſo eſſential to the marine, which ſhould be the principal object of this kingdom, the being furniſhed with it from our own plantations will not only ſave the ready money paid for it, but ſecure to the country an ample ſupply at all times without being obliged to our neighbours for it. *Miller's Gard. Dict.*

The ſociety for improving agriculture at Edinburgh has given us the following directions for propagating and dreſſing hemp:

1. Hemp, as well as flax, requires good ſeed; which ought to be renewed from time to time. The beſt is had from Riga or Narva. Hemp-ſeed is not ſo apt to degenerate as flax-ſeed is, and by change of ſoil it will much recover its vigour.

2. Hemp requires a deep, fat, brown ſoil, and may be ſowed on ground newly dunged; nay, if it is not ſufficiently rich and fat, it ought to be dunged over again. It muſt have the ſame plowings and harrowings as flax. Moiſt grounds, or ſuch as breed ruſhes, are altogether improper for hemp, till fully drained.

3. A boll of hemp-ſeed will ſuffice to ſow an acre of land, and ſo proportionally. The ſame ſeaſon of the year wherein you ſow flax, you ought alſo to ſow hemp; and your ground muſt be laid level and flat: when it is once ſown, and well covered with earth, ſo that the birds cannot come at it, you need have no further care of it, until it is ripe and fit to pull.

4. The male hemp is conſtantly ripe five or ſix weeks ſooner than the female. The way to know them is this: the male bears a bloſſom, but no ſeed; the female bears a ſeed. The way to know when the male is ripe, and fit for pulling, is by obſerving when the ſtalk as well as leaf is growing yellow; then that ſort of hemp is ripe: or if, in a fair morning, upon ſhaking of the ſtalks, you perceive much duſt to fall off from the bloſſom, the male hemp is fit for pulling.

5. You muſt obſerve the ſame caution in the pulling of your hemp as in your flax; for there are in hemp, as well as flax, diverſities of degrees of coarſeneſs and fineneſs: therefore, in pulling the male hemp, you muſt take care to ſort the coarſeſt together, the middle ſort likewiſe together, and ſo the fineſt by itſelf. Beware, in pulling it, that you do not break the ſtalks of your female hemp; for, by the breaking of the ſtalks, your ſeed, as well as hemp, will ſuffer. You muſt ſtill, as you have a ſufficient quantity of hemp, make ſmall ſheaves of it about the thickneſs of your thigh; tie them in the middle, and let them dry; for it is a certain rule, that hemp or flax ought never to be watered or graſſed until it is perfectly dry. If you deſign to water your male hemp the ſame ſeaſon that you pull it, you muſt tie it up in ſheaves, about the bigneſs of your waiſt, with three ſtrong ſtrings; one at each end, and one in the middle. It ought to be ſo moderately tied, that you need not fear its burſting; but at the ſame time not ſo hard but that the water may conveniently penetrate to all parts of it. In the tying up your ſheaves, you muſt ſet the one half of your roots one way, and the other half the other way, that all the ſheaves may be of equal thickneſs. If you forbear the watering that ſeaſon, you need not in ſuch caſe tie your hemp into big ſheaves; but when it is ſufficiently dry, ſo as to be out of danger of heating, you ought to put it in a dry barn, or ſtack it in the barn-yard, laying always the roots outward, as you would do corn; and there leave it till the ſeaſon offers for watering it. But all this while you muſt carefully obſerve to keep all your ſorts of hemp apart from each other.

6. When you come to water your hemp, you muſt make bundles or ſheaves, as already obſerved. It is needleſs to enlarge on the watering part, in regard it differs in nothing from what is ſaid under the article FLAX. Your pits for hemp ought to be deep and wide, becauſe of the great length which good hemp grows to. You muſt in all things obſerve the directions given in relation to the watering of flax; and, by trying the ſame experiments directed to make in reference to it, you will diſcover when your ſeveral ſorts of hemp may be fully watered.

7. When your hemp is well watered, you muſt take it up; and, having waſhed away the filth that clings to it, you muſt graſs it in the ſame manner as flax, obſerving the like rules and directions, as to each quality and ſort of hemp. This is ſtill to be underſtood, in caſe you deſign it for cloth: but, if you deſign it for cordage or nets, there will be no occaſion for graſſing it; but only, after it is taken out of the water, you may again ſtook it till it is dry; then put it into a dry barn, where you ought to let it ſweat for ſix weeks or two months, that it may work the more kindly. Note likewiſe, that male hemp is generally fitter for cloth than female, becauſe it is finer.

8. As for your male hemp, you will diſcover when it is ripe and fit for pulling by the following obſervations. When your hemp-ſeed is become large and well coloured, and the pods, or places where the ſeed is lodged, begin to open, ſo as through the ſmall clefts you may perceive the ſeed, you muſt forthwith pull it without loſs of time; for a ſmall delay may be fatal to the whole crop, both of ſeed and hemp. In the pulling it, you muſt obſerve the cautions given; that is, put the coarſeſt, in the middle, and the fineſt ſorts all by themſelves; and you muſt be careful, as you pull your female hemp, not to ſhed the ſeed; but, when your hemp is dry, you ought to have a wooden ſtool, with a ſheet under it, and beat the ſeed into the ſheet, breaking your hemp as little as may be. The female hemp cannot well be watered the ſame year it is pulled; ſo you have nothing to do with it that year, but to fit it for the barn, the ſame way as you was directed to do with the male hemp. When the ſeaſon offers for watering and graſſing, you muſt purſue exactly the rules given in reference to the male hemp.

9. When your hemp is fit for breaking, you muſt make uſe of breaks, which are common in this kingdom. If the weather be fair, you ought to expoſe it to the ſun and air to dry it, that it may break more kindly; but, if it be moiſt and damp, you muſt then dig a pit or hole in the ground about four or five feet deep, at each corner whereof you muſt fix a wooden fork, which fork muſt be three or four feet high from the ground: on theſe forks place ſticks whereon to ſpread your hemp; ſpread it very thin; kindle a gentle fire in the pit of hemp-ſtraw, and therewith dry your hemp: it will dry in a very little time. Take great care not to over dry it, and, above all, not to ſcorch it. When it is dry enough, break it with your breaks, and afterwards rub and ſcutch it.

10. After you have cleared your ſeed from your hemp, you muſt be very careful, while the ſeed is new, to prevent its heating, by frequent turning. Keep it in a place that is dry, but not cloſe; for the air will help to preſerve it. When you have ſcutched your hemp, and wrought it clean from the ſtraw and roots, tie it up ſeverally, according as the kinds and ſorts of hemp are, and put it into a place moderately dry, (for the place where you keep hemp ought to be neither too dry nor too damp;) there keep it until you have occaſion to uſe it. The longer you keep your hemp in this manner, the better will it work, and the goods which it produces will prove the better.

11. The heckling of hemp is of courſe the next thing to be treated of. This is to be more or leſs done according to the uſe to which you deſign to apply it: as, for inſtance, if you deſign your hemp for groſs or coarſe yarn, you need not heckle it in that caſe, but with a large-toothed heckle. If you deſign it for finer uſes, you muſt begin with your coarſe heckle, and heckle it again in the ſecond heckle. If you would have your hemp brought to be yet finer, you muſt heckle it a third time, and in a finer heckle. You muſt always work hemp gradually, and not heckle it at firſt with your finer or fineſt heckle: for, if you do, you muſt expect more tow than hemp fit for uſe and ſervice. When you have a mind to have it extraordinary fine, you muſt not in the leaſt heckle it, but you muſt work it entirely by the help of a bruſh for that purpoſe, made of hogs briſtles, and ſtiffened artificially with glew. This bruſhing does not ſo wear and tear it as the heckles do, but by eaſy degrees ſeparates the threads and fibres thereof. Any body that has a mind to make trial of theſe bruſhes, may be furniſhed with them at Edinburgh for a trifle. A bruſh will laſt many years, if well and carefully uſed. Hemp requires heckles with longer and larger teeth than flax does. If you deſign your hemp for ſail-cloth, two hecklings will ſuffice; and thoſe hecklings are to be in the firſt and ſecond large heckles. But, if you deſign it for cordage, one heckling may be ſufficient, and you may have a heckle with wider and ſtronger teeth for that purpoſe than is uſual. You may mix tow together with your hemp in the making of your cordage; but it were better for the goods and for the buyer to have them made of hemp only; and the tow may be uſed for many profitable purpoſes by itſelf. At all times when you are to heckle or bruſh hemp or flax, you muſt begin with the ends which grew next the ground, becauſe they are ſtrongeſt; and, when they once divide, the other end is more eaſily wrought.

Of ſoftening HEMP *and flax*.—After beating and firſt heckling of the hemp, take a large pewter ſtoup, or white-iron flagon; fill it full of made-up heads of hemp cloſe packed, and put it in a pot of boiling water; the mouth of the ſtoup or flagon is to be ſtopped cloſe with a cloth, ſo as no water get into it. Let it boil full two hours, and it will make the hemp ſoft to heckle, and ſpin as fine as any lint. The cloth of hemp laſts longer than any cloth whatſoever; and the hards of it, when thus prepared, will make good and ſtrong ſhirting and ſheeting, or napry, for country-people.

The ſame method will ſoften flax, and make the fibres of it ſeparate the better after heckling.

CA'NNEL *Coal*, a black bituminous foſſil, frequent in Staffordſhire and Lancaſhire, of a fine hard texture, ſo as to receive a poliſh, and become of ſervice for divers works inſtead of ivory, but chiefly uſed for fuel, as affording a brighter and purer flame than the common ſea-coal. See COAL.

CA'NON, in eccleſiaſtical affairs, a perſon who poſſeſſes a revenue allotted for the performance of divine ſervice, in a cathedral or collegiate church.

Canons are of no great antiquity: Paſquier obſerves, that the name Canon was not known before Charlemaign: at leaſt, the firſt we hear of, are in Gregory de Tours, who mentions a college of Canons, inſtituted by Baldwin XVI, archbiſhop of that city, in the time of Clotharius I.

Originally Canons were only prieſts, or inferior eccleſiaſtics, who lived in community; reſiding by the cathedral church, to aſſiſt the biſhop; depending entirely on his will, ſupported by the revenues of the biſhopric; and living in the ſame houſe, as his domeſtics, or counſellors, &c. They even inherited his moveables, till the year 816, when this was prohibited by the council of Aix la Chapelle. By degrees, theſe communities of prieſts, ſhaking off their dependance, formed ſeparate bodies, whereof the biſhops, however, were ſtill heads. In the tenth century, there were communities or congregations of the ſame kind, eſtabliſhed even in cities where there were no biſhops: theſe were called collegiates, in regard they uſed the terms congregation and college indifferently: the name chapter, now given to theſe bodies, being much more modern. Under the ſecond race of the French kings, the canonical, or collegiate life, had ſpread itſelf all over the country; and each cathedral had its chapter, diſtinct from the reſt of the clergy. But they were not yet deſtined to a life ſo eaſy as now-a-days.

They had the name canon, from the Greek κανων, which ſignifies three different things, a rule, a penſion or fixed revenue to live on, and a catalogue or matricula. Hence, ſome ſay, they were called Canons, by reaſon of the penſion or prebend; (whence they are ſometimes alſo denominated ſportulantes fratres:) others hold, they were called Canons, becauſe obliged to live according to the canonical rules and inſtitutions, which were given them; and others, as M. de Marca, becauſe their names were inſerted in the matricula, or catalogue of the cathedral.

In time, the Canons freed themſelves from their rules, the obſervance relaxed, and, at length, they ceaſed to live in community, yet ſtill formed bodies; pretending to other functions beſides the celebration of the common office in the church, yet aſſuming the rights of the reſt of the clergy; making themſelves a neceſſary council of the biſhop; taking upon them the adminiſtration of a ſee during a vacancy, and the election of a biſhop to ſupply it. There are ſeven more chapters exempt from the juriſdiction of the biſhop, and owning no head but their dean. After the example of cathedral chapters, collegiate ones alſo continued to form bodies, after they had abandoned living in community.

CANON *of ſcripture*, a catalogue or liſt of the inſpired writings; or ſuch books of the bible as are called canonical, becauſe they are in the number of thoſe books which are looked upon as ſacred, in oppoſition to theſe, which either are not acknowledged as divine books, or are rejected as heretical and ſpurious, and are called Apocryphal.

The Canon of ſcripture may be conſidered either as Jewiſh or Chriſtian, with reſpect to the ſacred writings, acknowledged as ſuch by the Jews, and thoſe admitted by the Chriſtians.

The firſt Canon, or catalogue of the ſacred books, was made by the Jews, but who was the author of it, is not ſo certain. The firſt books of Moſes were, queſtionleſs, collected into one body, within a ſhort time after his death; ſince Deuteronomy, which is an abridgment of the other four, was laid in the tabernacle near the ark, according to the command he gave to the Levites. So that the firſt Canon of the ſacred writings conſiſted only of the five books of Moſes. There were no more added to them, till the diviſion of the ten tribes; ſince the Samaritans acknowledged none elſe. However, ſince Moſes, there were ſeveral prophets and other writers, divinely inſpired, who compoſed either the hiſtory of their times, or prophetical books, and divine writings, or pſalms to the praiſe of God; but it cannot be diſcovered, that, any time before the captivity, they were collected into one body, and comprized under one and the ſame Canon. It is evident, that, in our Saviour's time, the Canon of the holy ſcripture was already drawn up, ſince he cites the law of Moſes, the prophets, and the pſalms, which are the three ſorts of books of which that Canon is compoſed, and which he often ſtyles the ſcripture, or the holy ſcripture.

It is generally received that Ezra was the principal author of this Canon, though Nehemiah had ſome ſhare in it; and that he re-eſtabliſhed, corrected, and ordered the ſacred books to be written in new characters.

The Jewiſh Canon is generally called the Canon of Ezra; but it is certain, that all the books were not received into the Canon of the ſcriptures in his time; for Malachi, it is ſuppoſed, lived after him; and, in Nehemiah, mention is made of Jaddua the high-prieſt, and of Darius Codomanus, a king of Perſia, who lived at leaſt a hundred years after his time. Dr. Prideaux, with great appearance of reaſon, ſays, it is moſt probable, that the two books of Chronicles, Ezra, Nehemiah, and Eſther, as well as Malachi, were afterwards added in the time of Simeon the Juſt; and that it was not till then, that the Jewiſh Canon of the holy ſcripture was fully compleated. And, indeed, theſe laſt books ſeem very much to want the accuracy and ſkill of Ezra, in their publication; for they fall ſhort of the exactneſs found in the other parts of the Hebrew ſcriptures.

There are ſome authors who pretend, that the Jews have made one or more Canons; and that they have added to the former the books of Tobit, Judith, Eccleſiaſticus, Wiſdom, and the Maccabees: But it is moſt evidently true, that the Jews had no other Canon but that of Ezra, nor confeſſed any other books for ſacred, but thoſe it contains. The two aſſemblies of the ſynagogue, which, as it is pretended, were held for that purpoſe, are mere chimeras; nor have any antient writers ſaid any thing of them.

As for the Chriſtian church, there is no doubt but it acknowledged thoſe books to be canonical, which were cited, as of divine authority, by Chriſt and his Apoſtles; the ancient catalogues of the canonical books of the Old Teſtament, which are to be met with in Chriſtian writers, are conformable to the Canon of the Jews, and contain no other books; the Chriſtian Church, for several of the first ages, receiving the inspired writings no further than the Jewish Canon. The first, and most ancient catalogue of this kind, is that of Melito, bishop of Sardis, who flourished in the reign of Marcus Antoninus. It agrees with the Jewish Canon, excepting his omission of Esther, and that he makes Ruth and Judges two books. Origen has given us a list of the sacred books, in which he takes in Esther, and joins Ruth with Judges. St. Gregory Nazianzen divides the books of scripture into *Historical*, *Poetical*, and *Prophetical*: he reckons twelve historical books, viz. the five books of Moses, with Joshua, Judges, Ruth, the two books of Kings, Chronicles, and Esdras. Five poetical books, Job, Daniel, and the three books of Solomon. Five prophetical books, viz. four great prophets, and twelve small ones. The council of Laodicea was the first synod in which the number of the canonical books was ascertained; this council assigns only twenty-two books to the Old Testament, including Esther, and joining Baruch and the Lamentations with Jeremiah. St. Epiphanius, reckons twenty-seven canonical books of the Old Testament, yet he admits no more than are in the catalogue of Origen, and observes that the Jews had reduced them to twenty-two. The third council of Carthage, in the year 397, admitted the books of Wisdom, Ecclesiasticus, Tobit, Judith, and the two books of Maccabees into the Canon. The Church of Rome has agreed herein with that of Africa; for Innocent I, in his letter to Exuperius, places the same books in the Canon of scripture, as Pope Gelasius, in the council held in the year 494; and the decree of Pope Eugenius, and the Canon of the council of Trent, agree with the Canon of the council of Carthage. That the council of Trent had no prior authority to proceed on, excepting some slender pretence from the council of Carthage above-mentioned, appears from the current testimony of the Latin Church.

As to the Canon of the New Testament, it is to be observed, that the four Evangelists, the acts of the Apostles, all the epistle of St. Paul (except that to the Hebrews) and the first epistles of St. Peter and St. John, have been received as canonical by the unanimous consent of all the churches in all times; the epistle of St. James, that of St. Jude, the first epistle of St. Peter, and the second and third epistles of St. John, were not received by all the churches from the beginning as canonical, but have since been acknowledged as genuine, and therefore admitted into the Canon.

We must observe, that the Canon of the New Testament was neither settled by any synod, or single authority: this collection was formed upon the unanimous consent of all the churches, who, by constant tradition, reaching to the Apostolical age, had received such a number of them as were written by inspired authors.

CANO'NICAL, in philosophical history, an appellation given by Epicurus to his doctrine of logic.

It was called Canonical, as consisting of a few canons, or rules for directing the understanding in the pursuit and knowledge of truth.

CANO'PUS, in astronomy, a bright star, of the first magnitude in the rudder of Argo, a constellation of the southern hemisphere.

CANO'W, a kind of boat in use among the Indians of America.

The word is also written Canoo, Canoe, and Cannow. It is borrowed from the Spanish canoa, which signifies the same, and that from the language of the Indians.

The common Canows, among the Indians, are those made of trees hollowed; being either greater or less, according to the size of the tree they are made of. They are rowed with paddles, and rarely carry sails; the loading is laid at the bottom: but, having no ballast, they are frequently turned upside down. They have no rudder, the want of which is supplied by the hind oars. The Negroes of Guinea use the same sort of Canows, though made in a different manner. They are long-shaped, having room only for one person in width, and seven or eight in length; they shew little wood above the water; those who row are extremely dextrous, not only in giving the strokes with cadence and uniformity, by which their Canows seem to fly along the surface of the water, but, also, in balancing the vessel with their bodies, and preventing their overturning, which otherwise, on account of their lightness, would continually happen.

Add that, when they are overturned, they have the address to turn them up again in the water itself, and mount them anew. They venture as far as four leagues to sea, but dare not to venture further.

They are usually sixteen feet long, and a foot or two wide, though there are some larger, as far as thirty-five feet long, five wide, and three high, used for the carriage of cattle, and expeditions in war. They are fitted with sails made of rushes.

CA'NTO, denotes a part or division of a poem, answering to what is otherwise called a book.

The word is Italian, where it properly signifies a song.

Tasso, Ariosto, and several other Italians, have divided their longer or heroic poems into Canto's. In imitation of them, Scarron has also divided his Gigantomachia, and Boileau his Lutrin, into chants, or songs. The like usage has been adopted by some English writers, as Butler, who divides his Hudibras, and Dr. Garth, his Dispensary, into Canto's.

CANTO, in the Italian music, signifies a song: hence, Canto simplice is where all the notes or figures are equal, called also Canto firmo: Canto figurato, that where the figures are unequal, and express different motions.

CANTO, signifies also the treble part of a song; hence Canto concertante, the treble of the little chorus, Canto ripieno, the treble of the grand chorus, or that which sings only now and then, in particular places.

CA'NTONING, in the military art, is a method of quartering troops in a town, where the garrison is so numerous, that several regiments must be quartered on the inhabitants for want of caserns or barracks to contain them.

In this case, they divide the town into as many parts as there are regiments to be so quartered, that the officers and soldiers of each may have a distinct part to themselves. This, in the military phrase, is called Cantoning of a town.

CA'NVAS, a very clear unbleached cloth of hemp or flax, wove very regularly in little squares. It is used for working tapestry with the needle, by passing the threads of gold, silver, silk, or wool, through the intervals or squares.

Most of the Canvas for tapestry, which is sold at Paris, is made in the neighbourhood of Monfort l'Amours, and particularly at a place called Mesnil.

There is coarse, middling, and fine Canvas: the finest are generally made of flax, and the others of hemp. All the pieces of Canvas are forty-five ells long, Paris measure. But their breadth is very unequal, some being a quarter of an ell wide, others a quarter and a half, half an ell, half an ell and $\frac{1}{16}$, half ell and $\frac{1}{2}$; $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{5}{6}$ and an half of an ell, Paris measure. There are, however, some from thirty to forty-five ells long, by two ells wide: but the weavers make none of that sort, unless they are bespoke by the merchants.

Though tapestry seems no great object of trade, yet, besides what is used at Paris, and in the other great cities of France, they also export some into foreign countries, particularly into England, Poland, and some other places in the north of Europe.

CANVAS, is also a coarse cloth of hemp, unbleached, somewhat clear, which serves to cover women's stays, also to stiffen men's cloaths, and to make some other of their wearing apparel.

CANVAS, is also a very coarse cloth of hemp, unbleached, which serves to make towels. This sort of Canvas is made in Normandy, in the neighbourhood of Alencon; and in Perche, towards Mortagne. It is commonly sixty ells long, and $\frac{7}{12}$ of an ell broad, Paris measure.

CANVAS, or *Kanefas*. Thus the Dutch call a sort of very coarse cloth made of hemp, very strong and very close, which is made in Holland, and serves to make sails for shipping.

CANVAS, among painters, is the cloth on which painters usually draw their pictures; the Canvas, being smoothed over with a slick-stone, then sized, and afterwards whited over, makes what the painters call their primed cloth, on which they draw their first sketches with a coal or chalk, and afterwards finish with colours.

Canvas is also a name sometimes given to sail-cloth.

CAP *of a gun*, is a piece of lead which is put over the touch-hole of a gun, to keep the priming from being wasted or spilt.

CA'PER, *capparis* (*Dict.*)—At Toulon they cultivate these plants upon the walls, by sowing of their seeds in the holes of the stone-walls, about three or four feet from the ground; so that the roots of the plants penetrate into the joints of the walls, and from thence draw their nourishment. In England it is very difficult to preserve these plants, especially if they are planted in earth; for these plants thrive much better in rubbish: so that, when any person is desirous to cultivate them, they should be planted in pots filled with lime-rubbish and sand, and placed into a moderate hot-bed, to forward their making new roots; after which time they may be exposed in the open air in summer; but in winter they must be sheltered from severe frost, which will destroy them. The stumps of these plants are generally brought over in plenty from Italy every year, by the persons who bring over orange-trees and jasmines; so that they may be purchased from them at a moderate price, which is by far the easiest method of being furnished with these plants; for the seeds are not easily obtained from abroad, nor do they succeed very well with us: although these plants require shelter, when planted in pots, yet they will endure the severest cold of our winters, if growing in a wall. See *plate* IX. *fig.* 1, where *a*, *a*, are the flowers, *b*, the fruit, *c*, the fruit open, *d*, the seeds, *e*, the calix.

CAPH, a Jewish measure of capacity for things estimated by Kimchi at the thirtieth part of the log, by Arbuthnot at the sixteenth part of the hin, or the thirty-second of the seah, amounting to $\frac{5}{6}$ of an English pint. *Arbuthn. Tab. Anc. Coins*, &c.

CA'PITAL *of a lanthorn*, the covering which terminates the lanthorn of a dome, either in the figure of a bell, as that of the Sorbonne, or of a cupolo, or aspiral, as that of the church of Sapienza, at Rome.

CAPITAL *of a mill*, the covering thereof in the form of a cone, which turns vertically on the round tower, in order to expose the sails to the wind.

CAPITAL, amongst merchants, bankers, and traders, signifies the sum of money which individuals bring to make up the common stock of a partnership, when it is first formed. It is also said of the stock which a merchant at first puts into trade for his account. It signifies likewise the fund of a trading company, or corporation, in which sense the word stock is generally added to it. Thus we say, the Capital stock of the bank, &c. The word Capital is opposed to that of profit, or gain, though the profit often increases the Capital, and becomes itself part of the Capital, when joined with the former.

CAPITAL *Picture*, in painting, denotes one of the finest and most excellent pieces of any celebrated master.

F. Chamillard gives a list of the pieces of each famous painter, and the places where they are found. Such are the transfiguration of Raphael, in the church of St. Peter in Montorio, at Rome. The nativity of Coreggio, in the palace of the duke of Modena. The St. Peter martyr of Titian, at Venice, in the church of St. John. The paradise of Tintoret, in the hall of the great council in the same city. The judgment of Michael Angelo, in the pope's chapel in the Vatican. The St. Michael of Guido, in the Capuchin church at Rome. The St. Jerom dying, of Dominichini, in the church of St. Jerom de la Carita at Rome. The marriage of Cana, by Paolo Veronese, in the Louvre at Paris. Raphael painted a multitude of fine madona's, but the most capital, in the judgment of all the connoisseurs, is that in the palace of Chigi, representing the holy Virgin holding the child Jesus by the hand, and St. Joseph approaching to kiss him.

CA'PITIS *Nutus*, in anatomy, the name given by Fallopius to one of the muscles of the head, described by Albinus under the name of the rectus capitis internus major, and by Winslow and others under that of the rectus capitis anterior longus.

CA'PITO, in ichthyology; the chubb is called also by some authors the sephalus and squalus, and in some parts of England the chevin. It is a longer-bodied fish than the carp, and its head is black, large, and somewhat flat. Its back is of a dusky green, and its belly and sides are usually white and silvery, but in the larger and fatter fish they become yellow, and spotted with small black spots; its scales are very large, and its mouth small.

It has no teeth either in the jaws, palate, tongue, or throat; its tail is forked, and all its fins are of a bluish black colour. Its belly is somewhat prominent; it is a river fish, and loves the covert of old stumps of trees and hollow banks, and gives the angler much diversion; it will not live in ponds; it spawns in May, and is in best season in April, when full of spawn, but is never a very delicate fish. *Ray's Ichthyogr.*

CAPI'TULUM, in the ancient military art, was a transverse beam, wherein were holes through which passed the strings whereby the arms of huge engines, as balustæ, catapultæ, and and scorpion, were played or worked.

CA'POC, a sort of cotton so fine and so short, that it cannot be spun; it is as soft as silk: they use it in the East-Indies, and even in Europe, to make beds, mattresses, cushions, pillows, &c. which are very easy and convenient. It serves also to line the palanquins. The Capoc is taken out of a large cod or pod, which contains it with several small seeds, of the bigness of a pepper-corn. Though this pod be but two inches and a half in diameter, and four inches long, yet it yields a large handful and a half of Capoc. When used, care must be taken to leave no seeds among it; for the rats are so fond of them, that they would gnaw the coverings of the mattresses, or other furniture, to come at them, and so spoil them. The tree which bears this fruit, is really of the kind of cotton trees; it grows very tall, and the trunk of some is so thick, that a man cannot grasp it with both his arms; its branches spread very much, and divide and subdivide themselves into three, to the very top. The leaves are large, and placed seven or eight on a stalk, spreading like a fan. The flower consists of one leaf, divided into five lobes, as those of all the cotton kinds are. This tree grows every-where in the East-Indies. The Capoc is sent into Tartary, where there is some demand for it. There are several sorts of trees that produce Capoc; but that which has been described is the best. The Capoc is looked upon as a sort of wad; but the wad which comes from Egypt, is quite different from that of the East-Indies.

CA'PON, a castrated cock.—Capons, besides their use for the table, serve to lead chickens, ducklings, turkey-pouts, peahens, pheasants, or partridges, in lieu of their natural dams, over which they have several advantages, by the largeness of their body, which will brood, or cover, thirty or forty young.

CAPONIE'RE (*Dict.*)—*To construct a* CAPONIERE.

From the exterior flanking angle D (*plate* XIV. *fig.* 1.) draw a line Dp to the angle of the counterscarp p; on each side of Dp draw parallel lines, at the distances of 1$\frac{1}{4}$, 2$\frac{1}{2}$, and fifteen yards from Dp; these lines, being limited by the lines of defence and counterscarp, form the Caponiere.

This work, which can be used only in a dry ditch, serves, besides its defence of the foss, for a convenient passage between the town and its outworks; and, in this case, there is usually a circular excavation made in the angle of the counterscarp, out of which the troops may defile without being seen by the enemy.

CA'POT, at piquet, is when one of the gamesters wins all the cards, in which case he gains forty points.

CAPPA'DINE, a sort of silk flock, taken from the upper part of the silk-worm cod, after the true silk has been wound off. It is called also lassis and carbass, because slight stuffs under those names are made of it.

CAPRIFICA'TION *, a method of impregnating fig-trees, by means of certain insects.

* The word is formed from *caprificus*, the wild fig-tree, from whose fruits the insects are produced, which are the chief instruments of Caprification.

Caprification, or the manner of impregnating fig-trees, of which the ancients speak with so much wonder, is not imaginary, as many have supposed. M. Tournefort assures us, it is still practised every year in most of the Grecian islands, by means of a sort of gnats, or flies, peculiar to the country. The fig-trees there bear much fruit; but this fruit, in which part of the riches of the country consists, would be of no advantage, if it was not managed in the following manner:

There are two sorts of fig-trees cultivated in these islands; the first called ornus, from the Greek ἐρινεός, which is the wild fig-tree, or the caprificus of the Latins; the second is the domestic fig-tree. The former bears three kinds of fruits, none of them fit to eat, but absolutely necessary for ripening the domestic ones. These fruits of the wild fig-tree are called fornites, cratitires, and orni.

The fornites appear in August, and continue unripe till November. In these small worms are bred, from the puncture of certain gnats, observed only about the fig-trees. In October and November, the same gnats wound the second fruits of the same trees. These which are called cratitires only appear at the end of September, and the fornites fall gradually off, after their flies have quitted them. But the cratitires remain on the tree till May, and inclose the eggs left by the flies of the fornites. In May, the third kind of fruit begins to bud on the same trees which bore the other two; this is by far the largest fruit, and is called ornus. When it is arrived at a certain magnitude, and its buds begin to open, it is wounded in that part by such of the flies of the cratitires as can shift from one fruit to the other, to deposit their eggs.

It sometimes happens that the flies of the cratitires lie in some places, and do not come out, though the orni are fit for their reception. In this case, the cratitires must be fetched from elsewhere, and put on the extremities of those branches whose orni are in a good forwardness, in order that they may wound them. If that season be lost, the orni fall, and the insects of the cratitires fly away, finding no orni to prick. The peasants who apply themselves to the culture of fig-trees, are the only judges of the proper season in which this may be prevented; in order to which they carefully observe the bud of the fig; for this part not only shews the season of the fly's exit, but also that in which the fruit may be successively wounded. If the bud be too hard and close, the fly cannot deposit its egg, and the fig drops, when the same eye is too lax and open.

But this is not all: these three kinds of fruit abovementioned are not good to eat; they are only appointed by the author of nature to ripen the fruit of the domestic fig-tree. The method of managing them is thus: in June and July the peasants take the orni, when the flies are ready to come out, and hang them on the domestic fig-trees; several of these they string on a straw, and lay on the tree, more or less, in quantity, as they see occasion. If they miss this season, the orni drop off, and the fruit of the domestic fig-tree, not ripening, falls also in a little time. The country people know so well these precious moments, that every morning, making their review, they lay only the best conditioned orni on the fig-trees, otherwise, they would lose their harvest. 'Tis true, they have a sort of remedy for this, by strewing on the domestic fig-trees the flowers of a plant called a scolimbros, in the tops of which flowers are sometimes found flies fit to wound the figs; or possibly the flies of the orni feed on this plant. In fine, the peasants manage the orni so well, that their flies ripen the domestic figs in about forty days.

These figs are very good crude; to dry them, they are laid in the sun for some time, after which they give them a heating in the oven, to preserve them for the rest of the year. They are the chief food of the peasants of the Archipelago, whose ordinary fare is only barley bread and dry figs. Yet are these figs far from being so good as those of Provence, Italy, and Spain; the heat of the oven deprives them of their fine relish, but, on the other hand, it destroys the eggs of the flies of the orni, which would infallibly produce little worms, which would destroy the fruit. This, one may say, is taking a great deal of pains for fruit that is naught at last. M. Tournefort could not enough admire the patience of the Greeks, who spent above three months in carrying the flies from one fig-tree to another; but he soon understood the reason, for, asking them why they did not cultivate the French and Italian figs, he was answered, that the great quantity of fruit that their own trees yielded, made them preferable. In reality, one of these trees produces generally 224 pounds of figs, whereas the French trees yield not 25 pounds.

As to the manner wherein the puncture of the flies contributes to the maturation of the fruit, poffibly it may be by lacerating the veffels, and extravafating the nutritious juice, when they depofit their eggs; or, when, with the egg, they alfo convey fome liquor which gently ferments with the juice of the fig, and foftens its pulp. Even the Provence and Paris figs ripen much fooner by wounding their buds with a ftraw or feather dipped in oil olives; plums or pears alfo, wounded by infects, are found to ripen the fooneft, and in thefe the pulp about the wound is more exquifite than the reft. *Mem. Acad. Scienc. An.* 1705.

CA'PSTAN (*Dict.*)—The parts of a Capftan are, the foot, which is the loweft part; the fpindle, the fmalleft part; the whelps, a fort of brackets fet into the body of the Capftan clofe under the bars; the barrel, the main body of the whole; the holes for the bars to be put into; the bars, which are fmall pieces of timber by which the men heave; laftly, the pawl, which is a piece of iron bolted to one end of the beams of the deck, clofe to the body of the Capftan, but fo as that it have liberty to turn about every way; and againft it do the whelps of the Capftan bear, fo as that by it the Capftan may be ftopped from turning back.

CA'PSULE, among botanifts, a fpecies of pericarpium compofed of dry elaftic valves, which ufually burft open at the points: this kind of pericarpium fometimes contains only one cell or cavity, fometimes more; in the firft cafe, it is called unilocular; in the fecond, bilocular, trilocular, &c. according to the number of cells in it for the reception of feeds.

CAPUCHI'NE, the name of a particular fpecies of pigeon, in fhape and make much like the jacobine or jack, but fomething larger than that; its beak alfo is longer, and it has a tolerable hood of feathers on the back part of its head, but has no cravat or chain down to the fhoulders as that fpecies has. Its marks are the fame with the jacobine, and it feems to be no other than a baftard breed, between that and a common pigeon. *Moore's Columbarium.*

CARA'COLI, a kind of metal, of which the Caribbees, or natives of the leffer Antilles, make a fort of ornament, in the form of a crefcent, which they alfo call Caracoli. This metal comes from the main land, and the common opinion is, that it is a compound of filver, copper, and gold, fomething like the Corinthian brafs of old. Thefe metals are fo perfectly mixed and incorporated together, that the compound which refults from them, it is faid, has a colour that never alters, how long foever it remains in the fea, or under ground. It is fomething brittle, and they who work it are obliged to mix a large proportion of gold with it, to make the compound more tough and malleable under the hammer.

The Englifh and French filver-fmiths have made feveral experiments thereon, in order to imitate this metal; they who come neareft to it, put, to fix parts of filver, three of copper, and one of gold: the fkilful found this imitated mixture, tho' very fine, was yet much inferior to that among the favages.

Father Labat, from whofe relation this article is extracted, is of opinion that the Caracoli is a fimple metal, as produced from the mines, and afterwards refined. They make with it, in the American iflands, rings, buckles, heads for canes, and fuch other fmall works.

CA'RAITES (*Dict.*)—The Caraites are faid to glory in a defcent from Efdras, and to prove the fucceffion of their churches, by an exact catalogue of all thofe perfons who have either taught or contended againft Caraifm. There are fome who boaft of a ftill greater antiquity, pretending they are defcended from the ten tribes led into captivity by Salmanefer, but it is all fiction. There are many other accounts given of this fect, which have not probability enough to be mentioned. It would be a difficult tafk to fix the exact time when Caraifm began: Father Morin, Dr. Prideaux, and fome others, with great probability, trace the original of this fect to the eighth century. In fact, Caraifm took its rife from the publication of the Talmud; for we do not find, that the word Caraite was fo odious before that time, as it has been fince. On the contrary, by the term Caraite, was intended a perfon who had a confummate knowledge of the facred fcriptures. The compilation of the Talmud appearing in the beginning of the fixth century, thofe of the moft learning among the Jews were prefently difgufted at the ridiculous and incredible fables with which it was ftuffed. They referved their belief for the written word, and admitted the other, as a work of human compofition, proper to explain and interpret the fcriptures in fuch paffages where it fhould be found conducive to that purpofe. However, this did not immediately produce a fchifm among them: but, about the year 750, Anan, a Babylonifh Jew, of the race of David, and his fon Saul, declared openly for the written word of God alone, and difclaimed all traditions, except fuch as manifeftly agree with it, abfolutely denying them the fame authority with the written fcriptures. This declaration produced a fchifm: thofe who maintained the Talmud, being almoft all Rabbins, or difciples of Rabbins, were called Rabbinifts: the other, who admitted the fcripture only as their rule, and made ufe of it for the refutation of the traditions, were called Caraites, or fcripturifts, from the word cara, which in the Babylonifh language fignifies fcripture; as we ourfelves have feen fome proteftants who called themfelves evangelifts, becaufe they would receive no other authority than that of the Gofpel, and rejected all traditions whatfoever. The Rabbinifts then gave them the odious name of Samaritans and Sadducees; not becaufe they really were fo, but becaufe they agreed with thofe fectaries on the head of traditions: though, fince that time, there have been Jews who have imagined, that a Caraite was in reality a Samaritan and a Sadducee; and they have been the more confirmed in this error, for want of applying themfelves to hiftory and chronology.

The Caraites are efteemed to be men of the beft learning, and the ftricteft probity, of all the Jewifh nation: there are very few of them, if any at all, in thefe weftern parts; moft of them are to be found in Poland, Ruffia, and the eaftern countries, where they have their own fynagogues, and obferve fuch ceremonies and cuftoms as are peculiar to themfelves. Upon a computation made of their number, in the middle of the laft century, it appeared to be between four and five thoufand, which is but a fmall number in comparifon of the other Jews.

Our modern critics have been very grofly miftaken, with regard to the Caraites, by too boldly relying on the authority of the Jewifh writings; for the Rabbinifts who are their inveterate enemies, have charged them falfly in almoft every refpect. It were to be wifhed, that thofe who fend to the Eaft for books, would get fome of the Caraites books brought over, moft of which are very learned, and there are but very few of them in Europe. Selden feems to have read moft of them. There are fome in the library of Leyden, but thefe are not much valued.

The author of the Caraite commentary, called Aaron, about the thirteenth age, whofe manufcripts are kept in the library of the fathers of the oratory at Paris, is very juft in his account of the Caraites; he approves their books, which are in the Jewifh canon, and reckons their number as the other Jews do; and, what is ftill more remarkable, acknowledges them as they are pointed at prefent; for they have no other tranfcript than that of the Mafora; and, whenever they read in a different manner, it is as critics only.

CARBE'NSIS *Aqua*, in the materia medica, the name of a mineral water of Germany, of which Hoffman, from Petzlerus, has given the following account: all about the place of its origin, and along the canals through which it paffes, it depofits an earthy and ferrugineous matter, which concretes into a ftony hardnefs. When any alcaline liquor, whether fixed or volatile, is added to thefe waters, they become turbid, and precipitate a whitifh earthy matter to the bottom of the veffel; after the evaporation of the water they leave a fal enixum and an alcaline earth; two quarts of them yield two fcruples, and ten grains of the earth, and twelve grains of the falt. If it be kept for any time in a glafs, or earthen veffel, it depofits a fediment of yellow, ochreous, earthy matter, and when immediately taken from the fpring, it changes to a bluifh brown colour, on being mixed with galls. It contains a very large portion of a fubtile mineral fpirit; for, if a long-necked veffel be filled half full with it, and the orifice ftopped with the thumb, the whole, on a little fhaking, fends up a froth to the top; and when the thumb is taken off, the water fpirts out to feveral feet diftance. It makes an effervefcence, on mixing oil of vitriol with it, but this lafts but a very little time. From the whole it feems to contain a large quantity of calcareous earth, and fome fmall portion of ferrugineous matter; whence it purges both by ftool and urine, though moftly the latter way; the former operation which is pretty conftant, is owing to this alcaline earth meeting with an acid in the prima via, and being by it changed into a bitter purging falt, of the nature of Glauber's. *Hoffman.*

CA'RBUNCLE, *Dict.* — Our jewellers, among whom it is very rare, know the Carbuncle by no peculiar name, and not only now, but for many ages back, this has been the cafe; and, while the genuine Carbuncle was often feen, it was yet generally thought not to exift, and this merely from an error: its name importing a refemblance to a burning charcoal, the world, in general, grew into an opinion of its having the properties of a burning coal, one of which is the fhining in the dark; and fuppofing that property ftrongly commemorated in the name, and finding no gem which had it, they took it for granted that the Carbuncle no longer exifted; nay, the fertile imaginations of fome travellers have gone fo far as to affirm, that a gem, with this property, is yet to be feen in fome places, and given a thoufand abfurd relations about it.

To all this it is only to be anfwered, that the whole is an abfurd error; for that the ancients never attributed any fuch quality to their Carbuncle, but that the whole reafon of their giving the name anthrax to that gem was, that it was, of itfelf, of a very deep and ftrong red, but when held up againft the fun, or when fet upon a bright pale foil, it was exactly of that fort of red colour which is feen in burning charcoal.

Theophraftus, the greateft naturalift of antiquity, afferts this in plain words, and calls the gem that had this property anthrax. Others of the ancients have called it the Garamantine or Carthaginian Carbuncle; and it has been fuppofed, by the better writers among the moderns, to be the fame ftone with the true garnet: this, however, on comparing the ftones, appears

pears to be an egregious error, the difference in colour, and even in figure, between these two gems, being obvious and essential.

The Carbuncle is usually found pure and faultless, and is of the same degree of hardness with the saphire, being second only to the diamond. It is ever found naturally of an angular figure, smaller at the one end than at the other, and at the small end tapering to a pointed pyramid, composed of the same number of planes with the column, which are six, and those usually very unequal. It is found adhering by its base to a heavy and hard ferrugineous stone of the emery kind, and is always more finely coloured towards the point, than at the base of the column. Its usual size is near a quarter of an inch in length, and two thirds of that in diameter in the thickest part. Its colour is very beautiful, and a very deep red, resembling that of a mulberry when nearly ripe, and, where palest, going off into a fine scarlet, and into a purplish or violet tinge of the garnet; but, when held up against the sun, it loses its deep dye, and becomes exactly of the colour of the burning charcoal; so, that the propriety of the name, given it by the ancients, immediately strikes one, on making the trial. It bears the force of fire unaltered, not parting with its colour by it, as do most of the gems; nay, it even will not be at all affected by fire, nor become a whit the paler. This has been an experiment diligently tried by some of our jewellers, who, being disgusted by its too deep colour, have endeavoured the rendering it more vivid and striking to the eye, by divesting it of a part of it by this means, but always without success.

It is found only in the East-Indies, so far as is yet known, and that but very rarely.

The distinctions between the several red gems are very nice, and their names in some degree arbitrary. Many authors have confounded the Carbuncle with the ruby, and determined with Garcias, that every ruby that exceeds twenty-four caracts, in weight, was properly a Carbuncle. This gem, however, is by all trials proved to be evidently the Carbuncle of the ancients, and essentially different from the ruby in wanting the purplish tinge, into which the colour of that gem goes off, as is extremely evident in all the deep ones; this going off into a true scarlet, and for that reason giving the colour of a lighted charcoal in the sun, which neither the ruby, garnet, nor any other gem can do, which has the blue or purple cast. *Hill's Hist. of Foss.*

Artificial CARBUNCLE.— Take ten ounces of matter, prepared of natural crystal and saturnus glorificatus, and, having reduced them to an impalpable powder, add to it an ounce of gold calcined; mix the whole together, and put it into a good crucible, which must not be above half full; cover it and lute it well, let it dry; then put it into a glass-house-furnace for three days, bringing it by little and little nearer to the strongest fire.

After three days, take out the crucible, and put the matter into a marble mortar, which pound to an impalpable powder, to which add its weight of sal gemmæ, also in fine powder; which mix well together, and searce through a fine sieve, the better to incorporate.

Put this powder into a new crucible, which you must not fill above half-way; which cover, lute, and dry as before: then put it into a glass-house furnace, bringing it nearer to the fire by little and little, where let it stand ten hours.

After this, take your crucible out of the furnace, and put it into that where they set their glasses to anneal; let it stand for ten or twelve hours; then take it out, and, by breaking it, you will find the matter tinged of a Carbuncle colour, the most lively and resplendent that can be made by this art; whereof you may make what stones or works you please.

CARD, a sort of instrument or comb, composed of a great number of small pieces, or points of iron wire, a little incurvated like hooks towards the middle, and fastened very closely together by the feet, in rows. A piece of thick leather, which keeps them fast, is nailed by the edges on a flat piece of wood, which is an oblong square, about a foot long, and near half a foot broad, with a handle placed in the middle, on the edge of the longest side: there are always two Cards, between which are put the materials that are to be worked.

The Cards are of very great use in the manufacturies, where they serve to comb, disentangle, and range the wool and such other materials, in order to put them in a condition to be spun, by the manufacturers of cloths, stuffs, stockings, hair, &c. or, to be used unspun in several other works, in much the same manner as the wool and the hair, which the hatters employ in the manufacturing of hats.

CA'RDAMINE, *ladies smock*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of four leaves, and is of the cruciform kind; the pistil arises from the cup, and becomes finally a long pod, which is divided by an intermediate membrane into two cells, and contains usually roundish seeds. To these marks it is to be added, that the pods, when ripe, fly open with violence, and throw out the seeds to a considerable distance. The species of Cardamine, enumerated by M. Tournefort, are fourteen.

This plant is also known by the names of cuckow flower and meadow-cresses. It is a kind of nasturtium, and is pungent and discussive, but is not used either in composition, or common prescription.

CARDI'ACA, *motherwort*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the labiated kind; the upper lip which is imbricated, is considerably longer than the lower, which is divided into three segments; the pistil arises from the cup, and is fixed in the manner of a nail into the hinder part of the flower; this is surrounded by four embryo's, which afterwards, ripening into as many angular seeds, are contained in, and occupy the whole space of the cup, which before contained the flower.

The species of Cardiaca, enumerated by M. Tournefort, are three.

The Cardiaca is accounted attenuating, drying, detersive, and cordial. It promotes urine and the menses, is good in asthma's and palpitations, and is said to facilitate delivery. It may be taken either in powder, or in decoction.

CA'RDING, is the combing, disentangling, and preparing wool, with the instruments called cards described above, that it may be fit for making the several works it is designed for. They also card wad, cotton, flax, hair, and other materials proper for several sorts of manufactures.

Before the wool be carded, it must be greased with oil, of which one fourth part of the weight of the wool is required, for that which is designed for making the woof of stuffs, and the eighth part of that of the warp.

CARDI'OID, in geometry, is thus formed: let the diameter A B (*plate* XIV. *fig.* 2.) of the circle A M B A, revolve about the point A, and, on A B produced, let B *a*, M N, A D, M N, &c. be always equal to A B; then will the point *a* describe a curve, which, from its figure resembling a heart, is called Cardioid.

From the construction it appears, that $AN = BA + AM$, and that N A N is always double of the diameter A B, and is bisected by the circle in M.

This curve is algebraical; if $AB = a$, $aE = x$, $EN = y$, its equation will be,

$$y^4 - 6ay^3 + 12x^2y^2 - 6ax^2y + x^4 = 0 + 12a^2y^2 - 8a^3y + 3a^2x^2.$$

CA'RDUUS *Stellatus*. Star-thistle. — The root of the star thistle is single, about a finger thick, long, and running deep into the ground, of a whitish colour, having a pretty thick cortical part. The lower leaves grow flat on the ground, encompassing the root in a circle, much cut in, or jagged to, the middle rib. The stalk is divided into numerous branches, spreading about, and seldom arising above two feet high, with a few leaves here and there at the division of the stalks. The flowers grow thick upon the branches, consisting of reddish or purple fistular flowers, coming out of heads, which are composed of several scales, each ending in a long, straight, hard, and sharp thorn. The flowers pass away in down, containing white, flattish, oblong seed. The star-thistle grows near high-ways, and upon commons; and flowers in June.

The root is commended by some as a singular remedy against the stone, gravel, or cholic, by giving it either in decoction with wine or water, or in powder, with a convenient vehicle. *Miller's Bot. Off.*

Its leaves are very bitter, and give a faint tincture of red to the blue paper; the root gives it a deeper, and has the taste of an artichoke. The star-thistle contains a salt very like that which is natural in the earth; for its solution is very bitter, and loaded with sal ammoniac and nitre. It is likely, that the sal ammoniac predominates in this plant; for the nitre makes no impression upon the blue paper, whereas the sal ammoniac reddens it considerably: that, which is found in this plant, is joined with a considerable quantity of sulphur and earth; thus the star-thistle is febrifugous, vulnerary, and aperitive. For an intermitting fever they give to drink, at the beginning of the fit, four or six ounces of its juice. It removes the webs of the eyes, and cures wounds.

Camerarius affirms, that at Francfort they make use of the root of star-thistle, instead of that of eryngo: it is employed in aperitive ptisans and broths. One drachm of the seed of star-thistle, infused in a glass of white wine, takes away the viscid matter which obstructs the urinary passages. *Martyn's Tournefort.*

CA'RIA, in natural history, a name given by authors to a very mischievous species of ant, common in some parts of the East-Indies. This creature is larger than our ant, and is the common food of a great many other animals, as the squirrels, serpents, lizards, and a great many birds. In order to defend itself from so many enemies, it enters into large communities, which together erect great hills of earth, of five or six feet high. The fields in some places are full of these, and it is in vain to attempt beating them down, since they would be immediately made up again; the creature builds them with firm and tough clay, which it wets as it uses it; and the walls, or outer case, are built so thick and firm that scarce any rain can hurt them. The whole space within is full of different compartments, to every one of which there is a particular path-way; and these separate paths, joining as they come near one another, make at length one great and general road to the door, or gate of of the city. These animals are generally busied in their cells, and never go out, but at the necessary time to search for food; this excursion they always make regularly at one time of the day, and fall to work on the first corn, or other valuable plant, they find, which they gnaw off very quick, and carry into their habitation.

CARICATU'RA, in painting, an Italian word, principally applied to grotesque figures, which retain an extravagant and ugly, but real resemblance of the person they are designed to represent, and lash whomsoever the painter, carver, or graver, has a mind to satyrize, or divert himself with. Calot excelled in the Caricatura. But burlesque in painting, like burlesque in poetry, should be confined within due bounds.

CA'RIES (*Dict.*)—A Caries is properly a disorder in which the bone, from whatever cause, is deprived of its periosteum, and, having lost its natural heat and colour, becomes fatty, yellow, brown, and at length black; this is the first and lightest degree of the disorder, and is what, according to Celsus, the ancients called os vitiatum, and the nigrities ossium. But the greater degree of this disorder is where the bone is eroded and eaten, and becomes uneven by reason of the number of small holes, of which it is full, when it discharges a filthy sanies, whose acrimony softens, relaxes, and destroys the fleshy parts that grow round it. This is a true Caries or ulcer of the bone, and every bone of the body is subject to this disorder, and, though this ulcer may appear to be ever so safely or happily healed, yet, it too often happens, that, after the cicatrix is formed, and has been so for some time, a new abscess will be made, the whole disorder will return afresh, and the acrimonious and corrupted matter which continually spews out from the carious bone, being collected within, will produce many grievous symptoms, and destroy the neighbouring flesh again.

There have been many names, and many species reckoned of this disorder, and of others that are of kin to it; it is called a Caries, a spina ventosa, a spinæ ventositas, a gangrene, and cancer of the bone by Celsus, sometimes by the Greek term teredo, and sometimes pædarthrocaces. Some authors constitute as many species of this disorder, as there are here accounted names of it; but there is so small difference between these, that it will not warrant the making them so many species: they may very properly, however, be divided into two kinds, the one when the disorder begins in the internal part of the bone, the other when it begins on the outside, or from an external cause. This may be called a Caries, and that a spina ventosa, or, where it happens in children, according to Severinus, a pædarthrocaces.

There are two principal causes of a Caries of the bones; the one where the bone is deprived of its periosteum, by a wound, fracture, or other accident, and is corrupted, either by being exposed to the external air, or heated with greasy dressings; the other where the fluids are interrupted in their circulation by any external violence, or internal cause whatsoever, from whence an inflammation and suppuration succeed, and the bone and periosteum suffer, to such a degree, that, the vessels, which are sent to the part for its nourishment and support, being inflamed and corrupted, the bone is brought into consent, and quickly becomes carious: this disorder, if not quickly remedied, spreads and communicates itself to the neighbouring parts of the bone, and makes the same progress as ulcers do in the softer parts. There are, therefore, several degrees of the Caries of the bones; the first, is when the bone is laid bare, looks greasy, and turns yellowish: as soon as it becomes thoroughly yellow, brown, or black, the incipient Caries then degenerates into a worse state. The third degree is when the bone becomes uneven, rough, and rotten, and the greater erosion the bones have suffered, the more rough and uneven they will appear. When the cranium is perforated through both its tables, or the tibia or femur are eaten through to the marrow, this is a Caries of a very bad kind; but the worst of all Caries, and that in which the case may indeed be almost pronounced desperate, is that which falls upon the joints, or those parts of the bones which lie very deep, because in this case there is no access for the hands to clean the bone, and there is no remedy but the amputating the limb.

Many methods have been attempted for the cure of a Caries; the first and mildest is applied to the slightest degree of the disease, and is performed by the application of spirituous remedies, such as spirit of wine, Hungary-water; or by slight balsamics, such as the powder of birthwort, florentine, iris, myrrh, or aloes. Either of these powders is to be sprinkled on the part, after the sanies has been carefully wiped away with dry lint, and this continued till the cure is perfected. In a Caries that penetrates somewhat deeper, stronger remedies take place, such as powder of euphorbium, or its essence, made in well rectified spirit of wine; or oil of cloves, cinnamon, or guaiacum; either of these may be touched on with a pencil, or laid upon dry lint, and applied: some also use the corrosive medicines, the phagadenic water, and spirit of vitriol, or of sulphur; and, in the place of these, a solution of quicksilver in aqua-fortis may be used with great success. When, by these means, an exfoliation of the bone has been produced, the business is then to treat it with balsamics.

A second method of cure for a greater degree of Caries, is perforating the bone with the trepan, and dressing the part afterwards, either with balsamics or with dry lint. By these means the exfoliation of the bone is forwarded, and new-vessels push themselves through the foraminula, which, joining with the neighbouring flesh, make a new covering for the bone.

The third method of cure is performed by the raspatory, or chissel, taking off the corrupted or vitiated part of the bone, till all beneath appears white, or ruddy, and sound: and the fourth, which is the most ancient, and the most speedy, and certain method, is by the actual cautery, burning down the vitiated part of the bone. This method, however, is not necessary, except in great degrees of this disorder; and, in the performing it, great care must be taken not to injure the neighbouring soft parts. For this reason, an assistant should always draw back the lips of the wound both ways, while this is performed; and, if the opening be not wide enough, it should be opened and enlarged by sponge tents before, or widened by the knife, till the bone lies fair, and the part must be carefully wiped first with dry lint, from the sanies; and, if there be any fungous flesh, that must also first be removed. One application of the cautery, when the disorder is considerable, will seldom prove sufficient; it usually requires to be repeated several times, at proper intervals; and, if the Caries be of such extent that one cautery will not cover it all over, the first must be applied to the middle, and the succeeding towards its edges. This operation is not attended with any great pain, if care be taken not to injure any of the adjacent soft parts; for the bones are, in themselves, free from any sense of pain. Where the cranium is the seat of this disorder, the cautery is attended with great hazard, as it is also in a Caries of the ribs, or sternum, from the neighbourhood of parts of the utmost consequence to life. The carpus and tarsus also will very badly admit of cauterizing, because of the neighbourhood of the tendons and ligaments, which it is scarce possible to avoid injuring in the operation. After cauterizing the part, it is to be dressed with dry lint only, or, if the patient complain of great heat in the part, the lint may be dipped in spirit of wine before it is applied; afterwards balsamics are to be applied, till the part exfoliate, and then, if the cure be perfect, the vacuity will soon be filled with new found flesh. But, if the bone remains bare, or the flesh it is covered with, be soft and spongy, and does not adhere sufficiently to the subjacent bone, or where the bone remains discoloured, in either of these cases the cure will not stand, but the disorder will break out again, unless prevented. In these cases therefore, the work must be all done over again, the spungy flesh removed, and the actual cautery again applied, otherwise the cure can never stand. *Heister's Surgery.*

CARLI'NA, in botany, the name of a genus of plants, the characters of which are these: the flower is naturally of the radiated kind; its disk is made up of a number of flosculeS, affixed to the embryo seeds, but its outward edge or circle not of semiflosculeS, but merely of flat petals, affixed to no embryo's, but contained in the same general cup with the flosculeS, which is large and prickly. The embryo's finally ripen into seeds, winged with down, and divided from one another by imbricated leaves.

CARLI'NÆ RADIX, in the materia medica, the name of a root kept in the shops in some places, and distinguished into two kinds, the white and the black; the white is the root of the common carline thistle, which produces no stalk; the other of the Carlina caulescens, called the black chamelion thistle. The white carline root is of the thickness of one's thumb, and is often two feet long; it is brown on the outside, and white within, and should be chosen plump, firm, and well dried. It is accounted a very great medicine in pestilential diseases.

The black is a smaller and shorter root than the white, and is much less esteemed in medicine. The plant which produces the white grows very frequent with us on hilly places, and is a very singular plant, producing a number of fine long prickly and jagged leaves, and, in the center of them, a large purple flower, of the thistle kind, but growing close to the ground: the other is very frequent in France, but is not met with in England.

Carline is esteemed a very powerful sudorific and alexipharmic. Schroder tells us also, that it is good against worms, and in dropsies; and that it is a powerful emmenagogue and diuretic. *Pomet's Hist. of Drugs.*

CARMI'NE (*Dict.*)—To make Carmine take five drachms of cochineal, thirty-six grains of chouan, eighteen grains of the husk of the roucou, and the same quantity of roch alum; pulverize each of these ingredients apart in a clean mortar. Boil two pints and a half of clear river or rain water in a clean pot, and, while it boils, pour in the chouan, let it boil up three times, continually stirring the liquor with a wooden spatula; then pass it through a clean linen cloth, put the water so strained into a clean vessel, set it on the fire; as soon as it begins to boil, put in the cochineal, let that boil up three times; then add the roucou, and boil it up once; last of all, pour in the alum, and at the same time take the vessel off the fire. Immediately philtrate the liquid through a linen cloth, without squeezing, into a clean earthen or china dish; let this red liquor stand for seven or eight days, then pour off gently the clear which swims on the top, and let the bottom or fæces dry in the sun or a stove, and afterwards take it off with a brush or feather, and this Carmine will be of a fine powder and beautiful colour.

X x Observe

Obſerve Carmine is not to be made in cold weather, becauſe it does not precipitate readily but congeals and ſpoils.

The cochineal which remains in the linen cloath, after the liquor is ſtrained off, may be uſed over again; but the Carmine from this ſecond boiling will neither be ſo much in quantity, nor ſo good in quality, as the former.

Another method of making Carmine: take three pints of clean water, put them in a glazed earthen pan, ſet the pan before a coal fire, and add one grain of chouan; when the mixture boils, ſtrain it through a fine ſieve, then put this firſt water in the ſame pot over the fire again, and immediately add two drachms of meſtick or cochineal, and ſtir it once with your ſpatula. When the new mixture boils, add a grain of autour, and, directly after the autour, eight grains of cream of tartar finely pulverized, eight grains of white talc, and the ſame quantity of Roman alum powdered; let the whole boil two or three minutes, take it off the fire, let it cool without meddling with it, till it is lukewarm, and then the water will look redder than ſcarlet; paſs the liquor, when lukewarm, through a fine linen cloth into an earthen veſſel, leaving the groſs ſediment at the bottom of the pot to ſtrain off, and preſs into another veſſel, which will give you the common Carmine; let your veſſel ſtand three days, decant off the water, and the Carmine will remain at the bottom of the diſhes. Dry them in the ſhade, free from duſt, and you will procure about eighteen or nineteen grains of fine Carmine without reckoning the common.

Obſerve the talc muſt be cleanſed in the following manner to be uſed in this operation: take talc, calcine it in a good fire, then throw it into water, and knead it with your hands; when the water looks white, take it out with a cup and paſs it through a ſieve into a large veſſel, where let it ſtand two hours, in which time the talc will precipitate; then decant the water, dry the ſediment, and add eight grains thus prepared to make your Carmine.

Though the preceding methods may be good, we think the following which is that of Kunckel, deſerves the preference:

Take cochineal four ounces, alum well cleanſed one pound, and fine wool half a pound; pulverized tartar half a pound, wheaten bran eight large handfuls. Boil the bran in about twenty-four pints of water more or leſs at pleaſure; let this water ſtand for a night to ſettle that it may be very clear; and, to make it the clearer, filtrate it. Take a copper kettle of a ſufficient bigneſs to permit the wool to be at liberty; pour in equal quantities of bran water and common water in proportion to the quantity of wool you deſign to boil in it, put in your alum, tartar, and wool, then boil the whole for two hours, obſerving to ſtir the wool up and down, in order to cleanſe it thoroughly; after the wool has boiled its proper time, put it into a net, to let it drain; then take the other half of your bran water, to which add twenty-four pints of common water, and boil them well. In the heighth of the boiling put in your cochineal finely pulverized, mixed with two ounces of tartar; this mixture muſt be ſtirred inceſſantly to prevent it from burning. Put in the wool, boil it an hour and half, ſtirring as before directed; when it has taken the colour, put it again into a net to drain. It will now have a fine ſcarlet dye.

In order to extract the Carmine from the wool, take about thirty-two pints of clear water, in which diſſolve a ſufficient quantity of pot-aſh to make a ſtrong lye; cleanſe the lye by filtration, boil your wool in it till it has loſt all its colour, becomes white, and the lye has received all the tinge. Squeeſe your wool well, and paſs your lye through a filtrating bag. Then diſſolve two pounds of alum in water, pour this ſolution into the coloured lye, ſtirring the whole well; by this addition the dye will curdle and thicken; filtrate it again and it will come out quite clear; if it ſhould yet be tinged with the colour, it muſt be boiled over again, and a ſolution of alum added to it: at laſt it will curdle, and the colour or Carmine remain in the filtre. Care muſt be taken to pour freſh water on it frequently to take out the alum or any ſalts that may remain; then dry the colour and keep it for uſe, after having reduced it to an impalpable powder. If in the operation you find the water boil away too much, have boiling water at hand to add to it.

If you would make Carmine at leſs expence and trouble, you may omit tinging the wool, and make uſe of ſhreds of ſcarlet cloth, obſerving the proceſs as before directed. Kunckel aſſures us he has tried both methods, and always with ſucceſs.

Carmine is counterfeited by a preparation from Braſil or Fernambuca wood. They pound the wood in a mortar, and then infuſe it in white wine vinegar; then boil theſe ingredients together, and the froth affords a kind of Carmine, but vaſtly inferior to the beauty of that we have been ſpeaking of.

CARNA'TION, *caryophyllus*, in gardening, the name of a beautiful genus of flowers.

Theſe flowers, are propagated either from ſeeds (by which new flowers are obtained) or from layers for the increaſe of thoſe ſorts which are worthy maintaining; but I ſhall firſt lay down the method of propagating them from ſeeds, which is thus:

Having obtained ſome good ſeeds, either of your own ſaving, or from a friend that you can confide in; in the beginning of April, prepare ſome pots or boxes (according to the quantity of ſeed you have to ſow:) theſe ſhould be filled with freſh light earth mixed with rotten neats-dung, which ſhould be well incorporated together; then ſow your ſeeds thereon (but not too thick) covering it about a quarter of an inch, with the ſame light earth, placing the pots or caſes ſo as to receive the morning ſun only, till eleven of the clock; obſerving, alſo to refreſh the earth with water, as often as it may need it: in about a month's time your plants will come up, and, if kept clear from weeds, and duly watered, will be fit to tranſplant in the beginning of June, at which time you ſhould prepare ſome beds (of the ſame ſort of earth as was directed to ſow them in) in an open airy ſituation, in which you ſhould plant them at about three inches ſquare, obſerving to water and ſhade them as the ſeaſon may require, being careful alſo to keep them clear from weeds: in theſe beds they may remain until the beginning of Auguſt, by which time they will have grown ſo large as almoſt to meet each other; then prepare ſome more beds of the like good earth (in quantity proportionable to the flowers you have raiſed) in which you ſhould plant them at ſix inches diſtance each way, and not above four rows in each bed, for the more conveniently laying ſuch of them as may prove worthy preſerving; for in theſe beds they ſhould remain to flower.

The alleys between theſe beds ſhould be two feet wide, that you may paſs between the beds to weed and clean them. When your flowers begin to blow, you muſt look over them to ſee if any of them promiſe to make good flowers; which as ſoon as you diſcover, you ſhould lay down all the layers upon them: thoſe which are well marked, ſhould be reſerved to plant in borders, to furniſh you with ſeed; and thoſe which burſt their buds, and ſeem to have good properties, ſhould be planted in pots, to try what their flowers will be, when managed according to art: and it is not till the ſecond year that you can pronounce what the value of a flower will be, which is in proportion to the goodneſs of its properties.

Having made choice of ſuch of your flowers as promiſe well for the large ſort, theſe you ſhould mark ſeparately, for pots, and the round whole-blowing flowers, for borders; you ſhould pull up all ſingle flowers, or ſuch as are ill-coloured, and not worth preſerving, that your good flowers may have the more air and room to grow ſtrong: theſe having been laid, as ſoon as they have taken root (which will be ſome time in Auguſt) they ſhould be taken off, and planted out, thoſe that blow large in pots, and the other in borders, as hath been already directed.

The beſt ſeaſon for laying theſe flowers is in June, as ſoon as the ſhoots are ſtrong enough for that purpoſe, which is performed in the following manner: after having ſtripped off all the leaves from the lower part of the ſhoot intended to be laid, make choice of a ſtrong joint about the middle part of the ſhoot (not too near the heart of the ſhoot, nor in the hard part next the old plant;) then with your penknife make a ſlit in the middle of the ſhoot from the joint upwards half-way to the other joint, or more, according to their diſtance; then with your knife cut the tops of the leaves, and alſo cut off the ſwelling part of the joint where the ſlit is made, ſo that the part ſlit may be ſhaped like a tongue: and that outward ſkin being pared off, which, if left on, would prevent their puſhing out roots; and having looſened the earth round the plant, and, if need be, raiſed it with freſh mould, that it may be level with the ſhoot intended to be laid, leſt by forcing down the ſhoot you ſplit it off; then with your finger make an hollow place in the earth, juſt where the ſhoot is to come, and with your thumb and finger bend the ſhoot gently into the earth, obſerving to keep the top as upright as poſſible, that the ſlit may be open; and, being provided with forked ſticks for that purpoſe, thruſt it into the ground, ſo that the forked part may take hold of the layer, in order to keep it down in its proper place; then gently cover the ſhank of the layer with the ſame ſort of earth, giving it a gentle watering, to ſettle the earth about it, obſerving to repeat the ſame as often as it is neceſſary, in order to promote their rooting. In about five or ſix weeks after this, the layers will have taken root ſufficient to be tranſplanted; againſt which time you ſhould be provided with proper earth for them, which may be compoſed after the following manner:

Make choice of ſome good up-land paſture, or a common that is of an hazel earth, or light ſandy loam; dig from the ſurface of this your earth about eight inches deep, taking all the turf with it; let this be laid in an heap to rot and mellow, turning it once a month, that it may ſweeten; then mix about a third part of rotten neat's-dung, or, for want of that, ſome rotten dung from a cucumber or melon-bed; let this be well mixed together; and, if you can get it time enough before-hand, let them lie mixed ſix or eight months before it is uſed, turning it ſeveral times, the better to incorporate their parts.

In the middle of February, if the ſeaſon is good, you muſt tranſplant theſe layers into pots for their bloom (which ſhould be about ſeven or eight inches over at the top in the clear;) in the doing of which, obſerve to put ſome pot-ſherds or oyſter-ſhells over the holes in the bottoms of the pots to keep the earth from ſtopping them, which would detain the water in pots to the great prejudice of the flowers: then fill theſe pots

about

about half-way with the same good compost as was before directed, and shake the plant out of the small pots with all the earth about the roots; then, with your hands, take off some of the earth round the outside of the ball, and from the surface, placing one good plant exactly in the middle of each pot, so that it may stand well as to the height, i. e. not so low as to bury the leaves of the plant with earth; nor so high, that the shank may be above the rim of the pot; then fill the pot up with the earth before-mentioned, closing it gently to the plant with your hands, giving it a little water, if the weather is dry, to settle the earth about it; then place these pots in a situation where they may be defended from the north wind; observing to give them gentle waterings, as the season may require.

In this place they may remain till the middle or latter end of April, when you should prepare a stage of boards to set the pots upon, which should be so ordered as to have little cisterns of water round each pot to prevent the insects from getting to your flowers in their bloom; which if they are suffered to do, will mar all your labour by destroying all your flowers in a short time.

About the middle of April, your layers will begin to shoot up for flower; you must therefore be provided with some square deal-sticks, about four feet and half long, which should be thicker towards the bottom, and planed off taper at the top: these sticks should be put carefully in the pots as near as possible to the plant without injuring it; then with a slender piece of bass-mat fasten the spindle to the stick to prevent its being broken: this you must often repeat as the spindle advances in height; and also observe to pull of all side-spindles as they are produced, and never let more than two spindles remain upon one root, nor above one, if you intend to blow exceeding large. Towards the beginning of June your flowers will have attained their greatest height, and their pods will begin to swell, and some of the earliest begin to open on the one side; you must therefore observe to let it open in two other places at equal angles: this must be done as soon as you perceive the pod break, otherwise your flower will run out on one side, and, be in a short time past recovering, so as to make a compleat flower; and, in a few days after the flowers begin to open, you must cover them with glasses which are made for that purpose.

During the flowering season, particular care should be taken not to let them suffer for want of water, which should by no means be raw spring-water; nor do I approve of compound waters, such as are enriched with various sorts of dung; but the best and most natural water is that of a fine soft river; next to that is pond-water or standing water; but, if you have no other but spring water, it should be exposed to the sun or air two days before it is used, otherwise it will give the flowers the canker and spoil them.

Thus having been full in the culture of this noble flower, I shall just mention that of the pink, which differs not in the least from that of the Carnation in its manner of propagating, but only requires much less care, and need not be potted, growing full as well in good borders, where they make as elegant a shew, during the season of flowering, as any plant whatever, and afford as agreeable a scent. *Mill. Gard. Dict.*

CARP, in ichthyology, a fish too well known to need description. The Carp is the most valuable of all kinds of fish for the stocking of ponds. It is very quick in its growth, and brings forth the spawn three times a year; so that the increase is very great: the female does not begin to breed till eight or nine years old, so that in breeding ponds a supply must be kept of Carp of that age. The best judges allow, that in stocking a breeding pond four males should be allowed to every twelve females. The usual growth of a Carp is two or three inches in length in a year, but, in ponds which receive the fattening of common sewers, they have been known to grow from five inches to eighteen in one year.

A feeding pond of one acre extent will very well feed two hundred Carp of three years old, three hundred of two years old, and four hundred of a year old. Carp delight greatly in ponds that have marley sides; they love also clay ponds well sheltered from the winds, and grown with weeds, and with long grass at the edges, which they feed on in the hot months. Carp and tench thrive very fast in ponds and rivers near the sea, where the water is a little brackish, but they are not so well tasted as those which live in clear water. No fish will thrive in a pond where there are many roach, except the pike which feeds on them. Grains, blood, chickens guts, and the like, may be at times thrown into ponds where there are Carp, to help to fatten the fish.

If the breeding and feeding this fish were a thing more understood than it is at present, the advantages might be very great, and fish-ponds become as valuable an article as gardens. The gentleman who has land in his own hands, may, besides furnishing his own table, and making presents to his friends, raise a great deal of money, and very considerably improve his land at the same time, so as to make it really yield more this way, than by any other employment whatever. Suppose the place a meadow of forty shillings an acre, four acres of this in a pond will return every year, very easily, a thousand fed carps from the least size that is eaten to fifteen inches long, besides pikes, pearch, tench, and other fry. Suppose the Carps are saleable at from sixpence to a shilling a piece, they will bring twenty-five pounds, which is six pounds five shillings an acre for the land made into the pond.

When a great deal of water is designed to be brought, they first spit off the ground on which the bank is to stand, and form the pan of the pond. The gentleman who keeps land in his own hand, and will do this, will find no expence in making his pond, if near his other land; for the earth that is dug out may be laid on the lands, and will save all the price of manure for a long time.

If the soil about the waters be moorish, the making a pond will keep up a supply of water that will make it always moist, and it will serve excellently for the planting of oziers, which will turn to a very considerable account. If cattle graze near the large ponds, they will serve them for watering-places, and they will delight to stand in them in hot weather, in which case their dung which falls in is a fine food for the fish, at the same time that it does great good also to the cattle.

The Carp is a very cunning and wary fish; it very often escapes the net, and, when angled for, requires great skill and patience in the sportsman to make any great work of it. The Carp always chuses the deepest parts of ponds and rivers, and in the last it is generally found in places where the stream is least perceptible. The Carp will never bite in cold weather, and in the hot months the angler can never be either too early in the morning, or too late in the evening, for the sport; when he has once taken the bait, there is no fear of getting away, for he is one of the leather-mouthed fishes.

The tackle for fishing for Carp must be very strong, and it will be proper to bait the place beforehand where he is to be fished for, with a coarse paste. The red worm is the best bait in March, the cade in June, and the grasshopper in July, August, and September.

Not only these baits, but a sweet paste may be used in angling for Carp, with great success. There are many kinds of these pastes made up by the anglers, but the general basis of them all is sugar or honey with flour: these sorts of pastes are not only proper to bait the hook with, but they may be thrown into the water some hours before to draw the fish together. It may be proper also to bring the Carp to the place intended for the angling for them, by throwing in cow dung and blood, or bran and blood mixed together, some chickens guts cut small, and small pellets of these sweet pastes: this will learn them to frequent the place, as a part best supplied with food, and the having fed with safety before will make them the less suspect the bait on the hook. A very much esteemed paste is made thus: take common wheat flour, and veal, or any other young meat, of each equal quantities; beat them together in a mortar, till the meat is thoroughly dissolved or broke to pieces; then add about half the quantity of honey; beat it well together again, and finally add more flour till the whole is of a proper consistence. This has the advantage of a paste, and an animal bait at once, and hangs well to the hook, so that it seldom misses success. *Mortim. Husbandry.*

CA'RPENTERS.—The antiquity, utility, extent, and nature of their business are so well known, there needs no description. A lad for this trade ought to be stout, ingenious, write a tolerable hand, understand arithmetic, geometry, and architecture, without which qualifications they are often a little better than labourers.

Their working hours are from six to six, and their wages commonly fifteen shillings a week, but some make more. With an apprentice they take from ten to twenty pounds.

To set up a sort of a jobbing-master does not require a great deal besides tools: but there are several degrees of them, up to what are termed master-builders, who had need to have a good deal of judgment and money too; and some of these are also surveyors and draughtsmen, whose chief business is to draw plans, survey and estimate other men's works.

They were incorporated into a company in the year 1344, in the reign of king Edward III, with a power to make by-laws; and confirmed by king Edward IV. in 1474; livery-fine ten pounds.

Their hall is overagainst London-wall, between great and little Moor-gates; and their court-day on the first Tuesday of the month.

They have a stand, in Cheapside, in which they sit to attend the lord-mayor, on the day of his installation.

Arms, argent, a chevron ingrailed between three pair of compasses (pointing towards the base, and a little extended) sable. Motto. Honour God.

CA'RPENTRY (*Dict.*)—Carpentry is the most antient of all kinds of architecture; its origin goes back as far as the beginning of the world. Men, at first, ignorant of what treasures the earth contained within her womb, and knowing nothing but her external productions, felled trees in the forests to build their first cottages; they afterwards erected nobler buildings of the same materials. Architecture stands indebted to Carpentry for one of the prettiest embellishments of its orders, if it be true that fluted columns are done in imitation of the contraction of the trunks of trees as they grow upward. This metropolis even to this day furnishes remains of the antient custom of building in wood, and shews our ancestors preferred it it even to ftone. One may add, in favour of this art, the almoft univerfal cuftom of building in wood throughout all the northern countries.

The application of Carpentry in the art of building is infinitely ufeful; the Carpenter frames houfes, builds ftair-cafes, lays floors; and the roofs of our public edifices and churches are generally framed in timber, as well as thofe of our private houfes: by the help of this art are alfo made a number of ufeful machines.

The principal objections to it arife from the danger of fire, to which accident it is very liable; wherefore particular care fhould be taken in all buildings to difpofe of the timber properly fo as to guard againft it. Carpentry is of late years brought to great perfection, efpecially fince builders and undertakers have joined the ftudy of fome parts of the mathematics to their experience and practice; it is to be wifhed this was become more univerfal, though there is yet a great defect in this art for want of better methods with regard to the difpofition of the timber; for, by the number of pieces employed, and their mifapplication of them, the ftrength of the timber is much leffened; fee the article TIMBER, under which are fome remarks extracted from M. de Buffon.

CARPI'NUS, *the hornbeam*, in botany, the name of a genus of trees, the characters of which are thefe: the flower is of the catkin kind, being compofed of a number of fmall leaves, affixed to an axis in a fquamofe manner, under each of which there ftand a great number of ftamina: thefe are the barren male flowers, the embryo fruits appearing in other parts of the tree, between the leaves of larger and more beautiful fpikes; which finally become a fruit of an umbilicated kind, compreffed and ftriated, and containing a roundifh nut or kernel pointed at one end.

CA'RRIAGE (*Dict.*)— *Private* CARRIAGES are thofe which private people keep at their own expence, for their own conveniency, and that of their families; as thefe have no relation to the fciences, it is needlefs to give an account of them in this work.

Public CARRIAGES are thofe which every one is free to make ufe of, on paying fo much a head for perfons, or fo much per pound weight, for goods, merchandizes, or other effects.

There are again two forts of thefe Carriages, fome of which no man can keep, or let out, at leaft in France, but by virtue of a privilege; fuch are the waggons, carts, covered waggons, and horfes belonging to, or under the direction of the poft-office; as alfo the ftage-coaches and boats which fet out on a fet day, for certain towns in the provinces, and likewife poft-chaifes, calafhes, litters, and horfes.

The other public Carriages are thofe which every one is at liberty to have, keep, and let out, after what manner, and to whom he pleafes; fuch as drays, cars without racks, the waggons and carts ufed by carriers, higglers, and others.

Water CARRIAGES are, in general, all thofe veffels which ferve to carry perfons or merchandize by fea, rivers, lakes, or canals, whether failed, rowed, or drawn by men or horfes; but the word Carriage is feldom ufed, when we fpeak of fhips, frigates, or other large veffels, which fail over the fea.

A defcription of the CARRIAGES made ufe of by Ralph Allen, Efq; to carry ftone from his quarries, fituated on the top of a hill, to the water-fide of the river Avon, near the city of Bath.

Thefe quarries are at the diftance of a mile and an half from the river, and about 500 feet above the level of its furface, which makes a flope fo fteep, that the fmall price the ftone is fold at, would hardly defray the charges of bringing it down without fome proper contrivance, fuch as the following, which is a great improvement on fome Carriages and waggon-ways made ufe of at the coal mines near Newcaftle.

Plate XI. *fig.* 2. reprefents this Carriage in perfpective, as feen from a diftance of 12 feet from the left of the fore wheels, the height of the eye being about 6 feet. The geometrical plan was laid down from a fcale of 20 to an inch; that is, every 20th of an inch anfwers to one inch in the machine.

Fig. 3. reprefents the elevation of one of the fides of this Carriage, when both the fore-wheel and hind-wheel of that fide are locked, from a fcale of 20 to an inch.

From the confideration of thefe two figures, it will appear, that this Carriage confifts of a ftrong floor of oaken planks, three and a half feet wide, and about thirteen feet long, ftrengthened above by feveral ribs to defend it from the ftones that lie upon it, and fixed upon four beams of the fame wood, about four inches fquare and fourteen feet long.

At fix inches from the ends are fixed the fore-fide and back-fide ftrongly faftened to the beams, and to the floor, by feveral fcrews and nuts. See *fig.* 2.

To thefe two ends, when occafion requires, may be faftened two fides made of planks thirteen feet long, which fit into the fide of the outward beams by means of hooks and rings, and are kept up by means of latches to be feen in *fig.* 2, 3. Thefe fides are alfo further ftrengthened by a chain going acrofs in the middle of the Carriage.

At right angles under thefe beams, at a proper diftance (fee *fig.* 3.) are faftened two ftrong timbers, by means of large fcrews and nuts.

In thefe timbers well ftrengthened and plated with iron, where the greateft ftrefs lies, are placed two femicylindrical pieces of brafs at each end, to ferve as a collar for the axle-trees of the wheels, which, being well greafed, turn with very little friction.

There is likewife under thefe four beams already mentioned another piece of timber of about fix inches by four well faftened to it, at right angles, and at fuch a diftance, as is feen in *fig.* 3.

This piece ferves as a fixed point to place a lever, which locks, or keeps from turning, the hind-wheel, by preffing upon it.

The axle-tree is about three inches diameter.

One of its ends is fquare, the other round, and on thefe two ends the wheels are placed in an alternate pofition; that is, the right-handed fore-wheel is on a fquare, and the left on a round part of the axle-tree, whilft the right-handed hind-wheel is on a round end, and the left on a fquare end of the axle-tree; thereby any one of the wheels may be locked feparately; for, when the wheel placed on the round end is locked, the other, together with the axel-tree, revolves within it; and, when the wheel which is faftened on the fquare is locked, the other revolves notwithftanding as ufual upon the axel-tree, which is then unmoveable.

Thefe wheels are made of caft iron about twenty inches diameter, and have a flanch fix inches broad next to the Carriage, which hinders them from running off from the oaken frame on which they move.

The manner of locking and unlocking of the wheels is as follows: when either of the hind-wheels is to be locked, a ftrong lever, which they call the jigg-pole, is placed on that end of the timber next to the wheel to be locked, and after it is paffed the iron loop, to fecure it the better, a chain coming from the roller, to be feen in *fig.* 3, is clapped over the extremity, and by means of a fhort iron bar, and the rochet and clink, feen in *fig.* 3, one of the drivers, or perfons that attend the Carriage, in a very little time ftops the wheel either partly or intirely. To unlock which, it is only lifting up the end of the clink or catch, made long on purpofe; for then, the lever preffing no longer, the chain is flackened, taken off, and the jigg-pole laid in the cart, till another occafion ferves. They have two jigg-poles, one for each hind-wheel.

The fore-wheels are locked, by means of a thick fquare iron bolt, feen in *fig.* 3, coming out in the direction of the axletree, between the fpokes, or radii, of the fore-wheels: thefe bolts are protruded forward to lock the wheels, and draw back to unlock them feparately. Towards the middle of the backfide are two iron rods turning feparately on the fquare of an axle. When either of thefe is brought by the hand from a vertical pofition, in which they are drawn to an horizontal one, the iron rod, of which it takes hold by its lower end, is pufhed forward four or five inches, and fhoots the fquare bolt between the fpokes, or radii.

When the wheel muft be unlocked, this bolt is drawn back into its former pofition, by bringing the iron rod into its former vertical fituation. As thefe Carriages are loaded with a confiderable (often with upwards of four tons) weight of ftone, when they come down the hill, all the contrivances explained above would be ufelefs, and that great weight fink the Carriage too deep into the ground, without pieces of oak laid all along the way which thefe Carriages then pafs over. Thefe are fufficiently feen in *fig.* 2.

Although thefe Carriages are very heavy, even when empty, yet by means of the frame on which they move, and the little friction the axel-trees feel revolving in the brafs collars, two horfes not only draw them up the hill very eafily when empty, but draw them along on the plain when loaded, at a very good rate. As foon as the Carriages come to the brow of the hill, the horfes are taken off, and one or more of the wheels locked by the driver, who ftands behind, to moderate the motion as he thinks proper.

When the Carriages are come to the water-fide, and have been unloaded, they change the horfes from end to end, fo that the part of the Carriage which went before defcending, becomes the hind-part in afcending the hill, which avoids the trouble of turning with thefe wheels.

Thefe Carriages are loaded at the quarries, and unloaded at the water-fide, by means of a very good and curioufly contrived crane, fully defcribed under the article CRANE.

Though the above defcription is very intelligible, yet, to make every thing ftill plainer, we fhall further explain thefe curious Carriages by the following references.

Plate XI. *fig.* 2. ABCDIIIIHFEG, the body and bottom of the Carriage, without the fides, which are put on upon occafion, in the place BDHF, and faftened by means of the hooks *g g g*, and the latches *e f*.

IIII, the crofs pieces on the bottom to ftrengthen it.

MN, ftrong pieces of timber under the bottom.

K, A crofs piece under the bottom, having an iron loop at the top, to receive the end of a lever, that preffes on the hind-wheel L 2, to ftop it from turning round when the motion is too rapid.

L, L 1, L 2, three of the four wheels, the fourth being out of fight in this pofition of the Carriage, whofe circumferences have

have a flanch on the inside, that the other part may bear on the timbers, or waggon-way.

H, an iron roller for the chain to wind on, to hold down the stopping lever, as it presses on the hind-wheel.

O, O 4, O 1, &c. the waggon-way, or parallel timbers, laid with a descent, for the Carriages to run down by their own weight.

Fig. 3. FHDB, the right side of one of the Carriages, fixed, by means of the hooks at *gggg*, and the latches *ef*, shewn in the fourth figure.

L, a fore-wheel, with a round hole in the nave, to receive a round end of the axis, that goes through the piece of timber P, from another part of which the bolt *p* is shot between the spokes, to stop the wheel from turning round, when the motion is to be retarded.

H *p*, an iron rod pushed forwards from behind, to bolt or lock the fore-wheel above-mentioned.

L 2, a hind-wheel fixed upon, and turning round with the axis coming through the piece of timber Q, the end of which axis is made square for that purpose.

RK, a lever, whose end goes through an iron eye on the timber K, having there its center of motion, with the compass-piece *qq*, to press on the upper part of the wheel L 2, to stop it, upon occasion, from turning with the axis.

H, a roller, on which is wound the chain HR, which pulls down the end of the lever at R, and keeps it in its place, to press hard upon the wheel at *qq*.

O 2, O 1, the waggon-way which supports the strong part of the circumference of the wheel, while the flanch, or larger circumference of each wheel, falls on the inside of the timber, that the Carriage may not jump, or run out of the way.

A new CARRIAGE *for removing large weights by a small force.*—The whole of this machine is shewn in *plate* XI. *fig.* 8. in so plain a manner, that a short description will be abundantly sufficient. X is the load; suppose a block of stone of an extraordinary weight laid on the Carriage Y, which is supported on the wheels V V, and the other part of the machine on the wheels W W; in order to draw this Carriage, a pile, as R, is drove into the ground, to which the machine is fastened by a rope, as shewn in the figure. Then a rope is passed through the pulley S, and one of its ends, as T, is fastened, by means of a hook, to an eye-bolt in the machine; and the other end goes round the cylinder H, which is the axle-tree of the indented wheel FG. AB is a double lever, or balance, whose center of motion is at C. At a proper distance on each side of the center of motion, is a crotchet, as DO, EP, which move freely round on the iron pins D, E. Now it is evident, that, when the end A, of the balance AB, is pulled down, the points B and E will ascend, and the crotchet EP will cause the wheel G to move round, and, consequently, the the cylinder H; by which means the Carriage Y must advance. The same will follow when the end B is pulled down; for the points A and D will by that means ascend, and the crotchet DO will cause the wheel G, with its axis H, to move round, and, consequently, the Carriage Y to advance. It must also be observed, that, when the point B descends, the point E will also descend, and, consequently, the crotchet EP will move farther towards G, and take hold of some other notch in the wheel: the same will follow with regard to the crotchet DO, when the point A descends. And, consequently, by two ends of the balance AB, rising and falling alternately, the Carriage Y will be continually advancing in proportion as the rope NS winds round the cylinder H. The motion, indeed, is but slow; but strength is gained in the same proportion as time is lost.

In constructing this machine, after determining the semi-diameter HG of the wheel, and the length of the crotchets from their centers of suspension, the iron pins D and E must be placed in such a manner, that the lines of direction GI, and FK, be tangents to the circumference of the wheel, at the points F and G, when the balance AB is in a horizontal situation.

Block-CARRIAGE, is a cart made on purpose for carrying of mortars, and their beds, from one place to another.

Truck-CARRIAGES, are two short planks of wood, supported on two axle-trees, having four trucks, or wheels, of solid wood, about a foot and a half, or two feet diameter, for carrying mortars or guns upon battery, when their own Carriages cannot go, and are drawn by men.

Letter or *bill of* CARRIAGE, is a writing given to a carrier, or to the master of a waggon, cart, or other Carriage, containing the number and quality of the pieces, chests, bales, &c. of merchandizes which he is intrusted with, that he may demand the payment of the Carriage from those to whom the merchandizes are directed, and that the person who receives them may see whether they be delivered to him in a good condition, in the same number as they were given to the carrier, or on the day set down in the bill of Carriage.

CA'RRIED *over*, with book-keepers, is the sum total of the several sums set down in one page, which sum, when the page is full, is wrote down at the bottom of it, with these words before it, Carried over; to signify, that that sum is Carried over to the next page, on the top of which it is set down, with these words before it, Brought over.

CA'RRIER, one who carries merchandizes, or other goods, from one place to another, in waggons, carts, or other wheel-carriages.

CARRIER *pigeon*, a sort of pigeon used, when properly trained up, to be sent with letters from one place to another.

It is larger in size than most of the other kinds. Its length from the tip of the back, to the end of the tail, being often fifteen inches; but its greatest weight not twenty ounces. Its flesh is firm, and its feathers close; it is long-necked, and of a better shape than most other pigeons. The upper chap of the bill is half covered from the head with a white or blackish tuberous, furfuraceous flesh, which projects or hangs over both its sides, on the upper part nearest the head, and ends in a point about the middle of the bill. This is called the wattle. The eyes are surrounded with the same sort of corrugated flesh, for the breadth of a shilling, and their iris is red. Their beak is long, strait, and thick; their wattle generally broad across the beak, short from the head towards the point, and tilting forward from the head; and the head narrow, long, and flat; the neck very long and thin, and the breast broad; the feather is chiefly black or dun, though there are blues, whites, and pieds.

It has its name from its remarkable sagacity in carrying a letter from one place to another. Though you carry them hood-winked, twenty, or thirty, nay, sixty, or an hundred miles, they will find their way, in a very short time, to the place where they were bred.

CART, a vehicle mounted on two wheels, drawn by one or more horses, used for the carriage of various sorts of heavy things.

The word seems to be derived from the French charrete, which signifies the same; or rather from the Latin carreta, a diminutive of carrus.

A Cart differs from a wain, in that the former is drawn by horses, and has two sides called trills; whereas a wain is drawn by oxen, and has a wain-cope.

The parts and apparatus belonging to a Cart, are, the trill-hooks and back-band, which hold the sides of the Cart up to the horses; the belly-band, passing from one side, under the horse's belly, to the other; the Cart-rails, being the two rails on the top of the Cart; Cart-staves, those that hold the Cart and the races together; Cart-body, all that part where the loading is laid for carriage, called, in Sussex, the buck, q. d. belly of the Cart; Cart-ladders, the crooked pieces set over the wheels, to keep hay and straw loaden off them; Cart-saddle, the leathern or wooden pannel, laid on the fillar-horse; the floats, the under-pieces which keep the bottom of the cart together; the trigen, a pole to stop the wheel of a Cart when it goes too fast down a steep place.

CACTOU'CHES, in heraldry, a name given to a sort of oval shields, much used by the popes, and secular princes in Italy, and others, both clergy and laity, for the painting and engraving their arms on. Many suppose this form derogatory to the honour of the person; but, though the square shield, with the rounded and pointed bottom, is more in use with us, as also with the French and Germans, yet this is supposed, more truly, the figure of the Roman shield, borne by the soldiery, and therefore more ancient and honourable than either that, or the indented shield of the Germans. *Nesbit's Heraldry, pag.* 12.

CA'RTWRIGHT, a person who builds carts, &c.

CARTWRIGHTS *timber*, is that which is used by the Cartwrights and coach-makers. This timber is of two sorts, particularly elm-timber, which is chiefly used in Cartwrights work, namely, the round timber, and the hewn timber.

The round timber is that which is still in logs, or blocks, that is to say, which has not yet been squared with the saw, and has the bark upon it still; but has, nevertheless, been cut to a certain length, proportionable to the works in which the Cartwrights would use it.

Hewn timber is that which has been squared with the saw, and reduced to a thickness and size proper for other works of the Cartwright.

With the round timber they make the naves, or stocks of the wheels, the coach-beams, the jaunts, &c. The hewn timber serves to make the coach-standards, poles, beams, &c.

Rules concerning round elm-timber used by CARTWRIGHTS.—The round timber for naves, or stocks of wheels, ought to be six feet and a half high, and ten inches diameter, at least, at the thinnest end; those pieces which are from twelve to sixteen inches diameter, are reckoned the best, because they may serve for the largest cart-wheels.

The round timber for axle-trees must be six feet long, and from seven to eight inches diameter.

The pieces designed for pole, ought to be of several sizes, according as they are intended for coaches, or for other carriages.

Those for coaches must measure from ten to twelve feet in length, and the others from twelve to fifteen, without any knots, and be well bent.

For the jaunts, the pieces must be two feet eight or ten inches long, or even three feet.

Rules for the hewn timber used by CARTWRIGHTS.—The pieces of timber for supporting the standard of a coach must be cut six feet and a half long, six or seven inches broad, and four or five thick.

The standards, of six feet seven or eight inches long, five or six inches broad, and three or four inches thick.

And the poles, nine feet long, three inches and a half square at the smallest end, and four inches at the thickest end.

It must be observed, that there are several other pieces of elm-timber used in the Cartwrights business, which they themselves cut, the timber-merchants leaving several pieces, in the form of round timber, of divers sizes and lengths, for which there are no settled rules, the workmen chusing them at the sales, or in the timber-yards, according as they find them proper for the several works wherein they would use them.

Other timber for CARTWRIGHTS.—The ash timber is commonly cut into standards and poles: some of it is also cleft in pieces of round timber, proper to make those sorts of carriages on which they carry wine in France. These pieces of round ash timber ought to be from ten to eighteen feet long, and eight or nine inches diameter.

The yoke elm-timber is commonly cut into axle-trees, and other pieces in which elm is used; but it is seldom employed but in those provinces where elm is scarce.

Of the branches of elm and yoke-elm, which are not large enough to be cleft in round timber, or cut for the several pieces of Cartwrights work mentioned above, they commonly make the spokes of wheels, though they make them also sometimes of other wood, and particularly of oak.

CA'RVING, the art of engraving or cutting figures in wood, &c.

To carve a figure or design in wood, it must first be drawn, or pasted on the wood; which done, the rest of the block, not covered by the lines of the design, are to be cut away with little narrow pointed knives. The wood, fittest for this use, is that which is hard, tough, and close, as beech, but especially box. To prepare it for drawing the design on, they wash it over with white lead, tempered in water, which better enables it either to bear ink, or the crayon, or even to take the impression by chalking. When the design is to be pasted on the wood, this whitening is omitted, and they content themselves to see the wood well planed. Then wiping over the printed side of the figure with gum tragacanth, dissolved in water, they clap it smooth on the wood, and let it dry; which done, they wet it slightly over, and fret off the surface of the paper gently, till all the strokes of the figure appear distinctly. This done, they fall to cutting, or carving, as above.

CARYOPHY'LLUS, *the clove* (*Dict.*)—The Dutch, who have ingrossed all the clove-trees, make immense advantage of the fruit, which are so much esteemed throughout Europe, and for which the Spaniards and Portuguese struggled so long, and to so little purpose. This valuable and noble spice grows only in the island of Amboyna, the Moluccas, which are five in number, and the islands of Meao, Cinomo, Cabel, and Marigoran.

The Indians call cloves callafar, and the inhabitants of the Moluccas call them chinke. The trees which bear cloves, are much like our laurel-trees, only the leaves of the cloves are a little narrower, and resemble the leaves of almond and willow-trees. The very wood and leaves taste as strong as the cloves themselves. These trees bear a great quantity of branches and flowers, and each flower brings forth a clove. The flowers are at first white, then green, at last they grow beautifully red, and pretty hard, and are properly the cloves. While they are green, they emit a most sweet and comfortable odour. When they are dry, they are of a red colour; but, when gathered, they assume a smoaky black. They do not gather them one by one, as they do other fruit; but they tie a rope to the bough, and so strip it off by force: that hurts the tree for the next year, but the year after it bears a great deal more. Others beat the trees with long poles, as we do walnut-trees, and the cloves fall down, and commonly the tree bears more fruit than leaves. They grow with little stalks, hanging on the tree like cherries: they sell them with these stalks, dirt, and dust together, to the Indians; but the cloves that are transported to Holland, are clean, and without stalks. If you leave them on the tree without gathering them, they grow thick, and are called the mother of cloves. The Javanese value these more than others; but the Dutch chuse rather to buy the least.

They never trouble themselves to plant clove-trees; for the cloves that fall on the ground produce enough of them, and the rain makes them grow so fast, that they bear fruit when they are eight years old, and continue bearing for above one hundred years. Some are of opinion, that clove-trees do not grow well on the sea-side, or when they are too far from the sea; but many seamen, who have been in the island, assure us, that they grow very well every-where, upon mountains, in the valleys, or near the sea-side. They ripen from the latter end of August to the beginning of January. Nothing groweth about them, for their heat draws in all the nourishment and moisture of the ground. See *plate* XIII. *fig.* 2. which represents a branch of the clove-tree; *d*, the common clove; *e*, its blossom; *f*, a ripe clove; *g*, fruit open; *h*, seed.

CARYOPHILLUS is also the name of a genus of plants, called in English Carnations. See CARNATION.

CA'SHOO, a medicinal and aromatic drug, which is reckoned among perfumes.

Cashoo is extracted from a tree which is called *catee*, in the country where it grows. That country is a province of Indostan, or the mogul's empire, which is called Behar; the capital of it is Patna. This province, which the famous river Ganges crosses, lies a hundred leagues above the kingdom of Bengal. Cashoo is properly nothing but an extract made by a decoction and maceration of the parts of that tree, and rendered solid by evaporation. There are two sorts of simple Cashoo, the rough, and the purified, or refined; the latter is a compound of purified Cashoo, mixed with aromatic drugs, and made into lozenges of several sizes, the biggest of which are as large as a half-crown piece. This Cashoo is made for the use of the Indians, who chew it, either alone, or mixed with pinang, or areca. Rough Cashoo is a commodity which is brought down the Ganges as far as Bengal, whence it is distributed, by means of trade, throughout all the Indies, where there is a great consumption of it; and to the Europeans, who send it into Europe, but mostly purified; for Cashoo is never used rough, neither in the Indies nor elsewhere.

They purify the Cashoo to different degrees, according to the use which the Indians would make of it. It appears, that the Cashoo which comes into Europe, is purified to the first degree only.

CASK, a wooden vessel, in which is put wine, or any other liquor; and also sometimes dry goods, as sugar, almonds, &c.

A Cask in staves, is that of which all the staves are ready prepared, and want only to be joined and hooped. They often put them thus on board the vessels designed for the American islands, because they take less room, and can be easily made up, either with the hoops, which are also often carried in bundles, or made in those places where wood proper for them is to be met with.

CASK-*gauging*, the method of finding the contents of all kinds of Casks.

Under the article GAUGING in the Dictionary, we have enumerated the general forms, or varieties of Casks, and, under the name of each solid, shewn the method of gauging it; to which we shall here add the two following, omitted in the Dictionary.

How to gauge a CASK *in the form of an hyperbolic spindle.* See *plate* XXXIII, *fig.* 17, in the Dictionary. The middle frustum of which GAHICF shall represent a Cask, whose diameter at the bung AC = 31 inches, and the diameter at the heads GF, HI, are each 24 inches, and the length KL = 32.5 inches; and to find the content of this frustum in ale and wine gallons.

A general Rule for gauging a Cask in the form of an hyperbolic spindle.

To twice the square of the bung diameter add the square of the head, and call this the first number. To the square of the length add the difference of the squares of the bung and head diameters; multiply this sum by fourteen times the square of the difference between the bung and head diameters, which product is a dividend: from thirty-five times the square of the length, take five times the square of the difference of the head and bung diameters, and the remainder is the divisor; the quotient of this division call the second number: then multiply the difference of the first and second numbers, by the length of the Cask, and that product divide by 1077.15 for ale, and by 882.354 for wine (which are no more than three times the divisor for circles) will give the content in gallons respectively; = 74.5 ale gallons, or 91.2 wine gallons.

But the content of the middle frustum of the hyperbolic spindle may be more expeditiously found, by finding a mean diameter thus:

The Rule.

To the head diameter add two thirds of the difference of the diameters, and to this add one twelfth of the quotient found by dividing the square of the difference of the diameters by the head added to twice the bung diameter, and this sum is the mean diameter sought.

How to gauge a CASK *in the form of a circular spindle.* See *plate* XXXIII, *fig.* 14, in the Dictionary.

Definition.

If the arch of the circle CAD be turned about upon its chord CD, it will describe a solid CFAH, DIBGC, called a circular spindle.

A general Rule for gauging a circular spindle.

First, to twice the square of the bung diameter add the square of the head diameter, and call that sum the first number. Secondly, to the square of the length add the square of the head diameter, and from that sum take the square of the bung diameter, and multiply the remainder by fourteen times the square of the difference of the head and bung diameters, and that product is a dividend; then multiply the square of the length by 35, added to five times the square of the difference of the diameters, and that shall be a divisor; the quotient of this division is the second number. Then multiply the difference of the first and second numbers by the length of

the

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the Cask, divide the product by 1077.15 for ale, and by 882.354 for wine, and this gives the content in ale and wine gallons respectively.

But the content of the circular spindle may be found more expeditiously, by finding a mean diameter thus:

The Rule.

To the head diameter add two thirds of the difference of the diameters, and to this $\frac{11}{100}$ of the square of the difference of the diameters divided by the head, and twice the bung diameter, and this sum is the mean diameter sought.

As it is requisite to find the length of a Cask before the contents of it can be calculated, several instruments have been invented, but the sliding callipers seem best adapted to this purpose; a view of which instrument, placed on a Cask, is given in *plate* XXXIII, *fig.* 11, in the Dictionary.

CASKETS, in the sea-language, are small ropes made of sinnet, and fastened to gromets, or little rings, upon the yards; their use is to make fast the sail to the yard, when it is to be furled.

Breast-CASKETS, are the longest and biggest of these, or those in the midst of the yard, betwixt the ties.

CAST, is particularly used to denote a figure, or small statue of bronze.

CAST, among wax-chandlers, denotes a ladle-ful of melted wax, poured on the wicks of candles, made by the ladle.

CAST, among founders, is applied to tubes of wax, fitted in divers parts of a mould of the same matter, by means of which, when the wax of the mould is removed, the melted metal is conveyed into all the parts which the wax before possessed.

CAST also denotes a cylindrical piece of brass, or copper, slit in two, lengthwise, used by the founders in sand, to form a canal, or conduit, in their moulds, whereby the metal may be conveyed to the different pieces intended to be Cast.

CAST, among plumbers, denotes a little brazen funnel, at one end of a mould, for casting pipes without soldering, by means of which, the melted metal is poured into the mould.

CAST of the country, with miners, the colour of the earth.

CAST, in falconry, denotes a set, or couple of hawks. *Dict. Rust.*

CASTA'NEA, *the chesnut-tree*, in botany, a genus of trees, whose characters are: the flower is of the amentaceous kind, being composed of a number of stamina, arising from a five-leaved cup, and fixed to a slender capillament, or axis. These are the male flowers, but the fruit grows on other parts of the tree: these are roundish, echinated, and open into four parts, and contain chesnuts with their kernels.

M. Tournefort has enumerated four, and Mr. Miller five species of Castanea.

These trees are propagated by planting them in February, in beds of fresh, undunged earth: the best nuts for sowing are such as are brought from Portugal and Spain, and are commonly sold in winter for eating, provided they are not kiln-dried, which is generally the case of those brought from abroad, which is done to prevent their sprouting, or rooting, in their passage; therefore, if they cannot be procured fresh from the tree, it will be much better to use those of the growth of England, which are full as good to sow, for timber, or beauty, as any of the foreign nuts, though their fruit are much smaller; these should be preserved, until the season for sowing, in sand, where mice, or other vermin, cannot come to them, otherwise they will soon destroy them. Before you set them, it will be proper to put them into water, to try their goodness, which is known by their ponderosity; those of them that swim upon the surface of the water, should be rejected, as good for nothing; but such as sink to the bottom, you may be sure, are good.

In setting these seeds, or nuts, the best way is, to make a rill with an hoe (as is commonly practised in setting kidney-beans) about four inches deep, in which you should place the nuts, at about four inches distance, with their eye uppermost; then draw the earth over them with a rake, and make a second rill at about a foot distance from the former, proceeding as before, allowing three or four rows in a bed, with an alley between, three feet broad, for a conveniency of cleaning the beds, &c. When you have finished your plantation, you must be careful, that it is not destroyed by mice, or other vermin, which is very often the case, if they are not prevented by traps, or other means.

In April these nuts will appear above ground; you must, therefore, observe to keep them clear from weeds, especially while young: in these beds they may remain for two years, when you should remove them into a nursery, at a wider distance. The best season for transplanting these trees is either in October, or the latter end of February; but October is the best season: the distance they should have in the nursery, is three feet, row from row, and one foot in the rows: you must be careful, in transplanting these trees, to take them up without injuring their roots, nor should they remain long out of the ground; but, if these trees have a downright tap-root, they must be cut off, especially if they are intended to be removed again: this will occasion their putting out lateral roots, and render them less subject to miscarry, when they are removed for good.

The time, generally allowed them in this nursery, is three or four years, according to their growth; but, the younger they are transplanted, the better they will succeed; during which, you should be careful to keep them from weeds, observing also to prune off the lateral branches, which would retard their upright growth; and, where you find any that are disposed to grow crooked, either by their upper bud being hurt, or from any other accident, you may, the year after planting, in March, cut them down to the lowermost eye next the surface of the ground, which will cause them to make one strong upright shoot, and may be afterwards strained into good straight trees; but this should not be practised, unless the plants have absolutely lost their leading shoots; for, although the stems of the trees should be very crooked, (as is generally the case with the trees when young) yet, when they are transplanted, and have room to grow, as they increase in bulk, they will grow more upright, and their stems will become straight, as I have frequently observed, where there have been great plantations. But, in doing of this, you must be careful not to disturb their roots, which, perhaps, might destroy them. These trees require no other manure than their own leaves, which should be suffered to rot upon the ground; and, in the spring of the year, the ground should have a slight digging, when these should be buried between their roots, but not too close to the trees, which might be injurious to their young fibres.

After having remained three or four years in the nursery, they will be fit for transplanting, either in rows, for avenues to a house, or in quarters, for wilderness plantations; but, if you intend them for timber, it is by much the better method to sow them in furrows (as is practised for oaks, &c.) and let them remain unremoved; for these trees are apt to have a downright tap-root, which, being hurt by transplanting, is often a check to their upright growth, and causes them to shoot out into lateral branches, as is the case with the oak, walnut, &c.

CA'STLE, *castellum*, in hydraulics, is used for a kind of pavilion, or water-house, in which are inclosed the cocks of several water-pipes, with a little bason, in order to make a distribution thereof.

CA'STOR, the name of a fixed star, of the second magnitude, in the head of the first of the Twins.

Its latitude northwards, for the year 1700, according to Hevelius, was 10°. 4′. 23″. and its longitude, of Cancer, 16°. 4′. 14″. It is also called Rasalgenze, Apollo, Aphellon, Avelar, and Arular. *Hevel. Fermam. Sobiesc.*

CAT-*gut*, a denomination given to small strings for fiddles, and other instruments, made of the intestines of sheep, or lambs, dried or twisted, either singly, or several together.

These are sometimes coloured red, sometimes blue, but are commonly left whitish, or brownish, the natural colour of the gut. They are used also by watch-makers, cutlers, turners, and other artificers. Great quantities are imported into England, and other northern countries, from Lyons and Italy. *Savar. Dict. Comm.*

CAT-*harpings*, are small ropes, running in little blocks, from one side of the shrouds to the other, near the deck: their use is to force the shrouds, and make them tight, for the more security and safety of the masts.

CAT, or CAT-*head*, in a ship, is a short piece of timber, lying aloft right over the hawser, having at one end two shivers, wherein is reeved a rope, with a great iron hook fastened to it, called cat-hook.

CAT'*s-head* is also a denomination given to a sort of waste stony lumps, not inflammable, found in coal-mines. In these there are frequently impressions of ferns. *Philos. Trans.* N°. 360.

CAT-*holes*, in a ship, are over the ports, as right with the capstan as they can be: their use is to heave the ship a-stern, upon occasion, by a cable, or hawser, called stern-fast.

CAT-*salt*, a name given by our salt-workers to a very beautiful granulated kind of common salt. It is formed out of the bittern or leach-brine, which runs from the salt when taken out of the pan. When they draw out the common salt from the boiling-pans, they put it into long wooden troughs, with holes bored at the bottom for the brine to drain out; under these troughs are placed vessels to receive this brine, and across them are placed certain small sticks, to which the Cat-salt affixes itself in very large and beautiful crystals. This salt contains some portion of the bitter purging salt, and is very sharp and pungent, and is white when powdered, though pellucid in the mass. It is used by some for the table, but the greatest part of what is made of it, is used by the makers of hard soap.

CAT-*silver*, a name given to certain fossil substances, usually called also glemmer, and in Latin micæ. They are various species of the biacteria, or foliaceous talcs, in small spangles.

CA'TACOMB, a vast assemblage of subterraneous sepulchres about Rome, in Italy, chiefly at about three miles from that city in the Via Appia; supposed to be the sepulchres of the martyrs; and which are visited accordingly, out of devotion; and reliques thence taken, and dispersed throughout the catholic countries, after having been first baptized by the pope, under the name of some saint.

These Catacombs are said by many to be caves, or cells, wherein the primitive Christians hid, and assembled themselves together; and where they interred such among them as were martyred. Each Catacomb is three feet broad, and eight or ten high; running in form of an alley, or gallery, and communicating with others: in many places they extend within a league of Rome. There is no masonry or vaulting therein,

therein, but each ſupports it ſelf: the two ſides which we may look on as the parietes, or walls, were the places where the dead were depoſited; which were laid lengthwiſe, three or four rows over one another, in the ſame Catacomb, parallel to the alley. They were commonly cloſed with large thick tiles, and ſometimes pieces of marble cemented in a manner inimitable by the moderns. Sometimes, though very rarely, the name of ſome of the deceaſed is found on the tile: frequently a palm is ſeen painted, or engraven, or the cypher X p, which is commonly read *pro Chriſto*.

The opinion held by many proteſtant authors is, that the Catacombs are heathen ſepulchres, and the ſame with the puticuli mentioned by Feſtus Pompeius; maintaining, that, whereas it was the practice of the ancient Romans to burn their dead, the cuſtom was, to avoid expence, to throw the bodies of their ſlaves to rot in holes of the ground: and that the Roman Chriſtians, obſerving, at length, the great veneration paid to relicks, reſolved to have a ſtock of their own: entering, therefore, the Catacombs, they added what cyphers and inſcriptions they pleaſed, and then ſhut them up again, to be opened on a favourable occaſion. Thoſe in the ſecret, add they, dying, or removing, the contrivance was forgot, till chance opened them at laſt. But this opinion has even leſs of probability than the former.

Mr. Monro, in the Philoſophical Tranſactions, takes a medium between the two extremes. He ſuppoſes the Catacombs to have been originally the common ſepulchres of the firſt Romans, and dug in conſequence of theſe two opinions, that ſhades hate the light, and they love to hover about the places where the bodies are laid.

Laying up the bodies in caves is certainly the original way of diſpoſing of the dead, and appears to have been propagated by the Phœnicians throughout the countries to which they ſent Colonies: the interring as we do now, in the open air, or in temples, was firſt introduced by the Chriſtians. When an ancient hero died, or was killed in a foreign expedition, as his body was liable to corruption, and for that reaſon unfit to be tranſported intire, they fell on the expedient of burning, in order to bring home the aſhes, to oblige the manes to follow, that ſo his country might not be deſtitute of the benefit of his tutelage. It was thus burning ſeems to have had its original; and by degrees it became common to all who could bear the expences of it, and took place of the ancient burying: thus Catacombs became diſuſed among the Romans, after they had borrowed the manner of burning from the Greeks; and now none but ſlaves were laid in the ground. Places, thus prepared, might afford convenient reſortments for the primitive Chriſtians, but could never be built by them. When the Empire became Chriſtian, they were again diſuſed; till the reading of I know not what author who mentions them, occaſioned them to be again looked into.—As to the famed cypher X p, it is obſerved to have been in uſe among the ancients, long before Chriſtianity aroſe. The abbot Bencini ſays, it was compoſed of the Greek letter X P, under which ſomething myſtical was comprehended; but no author gives any account what that myſtery was.

CATAPU'LTA (*Dict.*)—The Catapulta had a force, which it is not eaſy to comprehend, but which all good authors atteſt. Vegetius ſays, that the baliſta diſcharged darts with ſuch rapidity and violence, that nothing could reſiſt their force. Athenæus tells us, that Agiſtratus made one of little more than two feet in length, which ſhot darts almoſt five hundred paces. Theſe machines were not unlike our croſs-bows. There were others of much greater force, which threw ſtones of three-hundred weight, upwards of an hundred and twenty-five paces. We find ſurprizing effects of theſe machines in Joſephus: "The darts and force of the Catapulta deſtroyed abundance of people. The ſtones from the machines beat down the battlements, and broke the angles of the towers. There was no phalanx ſo deep but one of theſe ſtones would ſweep an whole file of it from one end to the other. Things paſſed this night that ſhewed the prodigious force of theſe machines. A man who ſtood by Joſephus, had his head taken off by a ſtone at an hundred and ſeventy-five paces diſtance."

Battering CATAPULTA.—*Plate* XIV. *fig.* 3, 4. repreſents the form and conſtruction of a Catapulta, that is ſuppoſed to carry an hundred weight, which may ſuffice as the doctrine of all the reſt to ſuch as carried twelve-hundred and upwards, it being eaſy to increaſe their powers.

The baſe is compoſed of two large beams 2, 3. The length of thoſe beams is fifteen diameters of the bore of the capitals, which meaſure will be explained when we deſcribe the capitals 9. At the two extremities of each beam, two double mortiſes are to be cut to receive the eight tenons of the two croſs beams 4, 5, each of them four of the diameters in length, without their tenon, obſerving to mark the center of them exactly by a line cut ſtrong in the wood 6. The croſs-beam 5 muſt be hollowed a little on the upper ſide, or made not ſo thick as that at the other end 4, to give the greater bent to the tree or arm 22, of which we ſhall ſoon ſpeak.

In the center of each of the beams of the baſe 2, 3, at the ſixth diameter of their length, a bore 8, perfectly round, ſhould be cut ſixteen inches in diameter: theſe bores muſt be exactly oppoſite to each other, and ſhould increaſe gradually to the inſide of the beams; ſo that each of them, being ſixteen inches on the outſide towards the capitals 9, ſhould be ſeventeen and an half at the opening on the inſide; the edges to be carefully rounded off. We come now to the deſcription of the capitals 9, which are in a manner the ſoul of the machine, and ſerve to twiſt and ſtrain the cordage, that are its principle, or power of motion.

The capitals 9 are either of caſt braſs, or iron, each conſiſting of a wheel with teeth, 10, of two inches and half thick. The hollow or bore of theſe wheels ſhould be eleven inches, and about a fourth in diameter, perfectly round, and with the edges ſmoothed down. The inward ledge muſt be four inches deep and one thick; but, as that thickneſs would make it larger by one inch than the outſide bore of the beams 2, 3, they muſt be cut to the depth of four inches ſo as to receive it exactly. As the friction would be too great, if the capitals rubbed againſt the beams by the extreme ſtraining of the cordage which draws them towards theſe beams, that inconvenience may be eaſily remedied by the means of eight little wheels 13 of an inch in diameter, and an inch and one ſixth in length, as in figure placed circularly, and turning upon axes as in *fig.* 4.

Theſe little wheels or cylinders of caſt braſs ſhould be round, and equal in their diameters, that the capitals may work equally on all ſides.

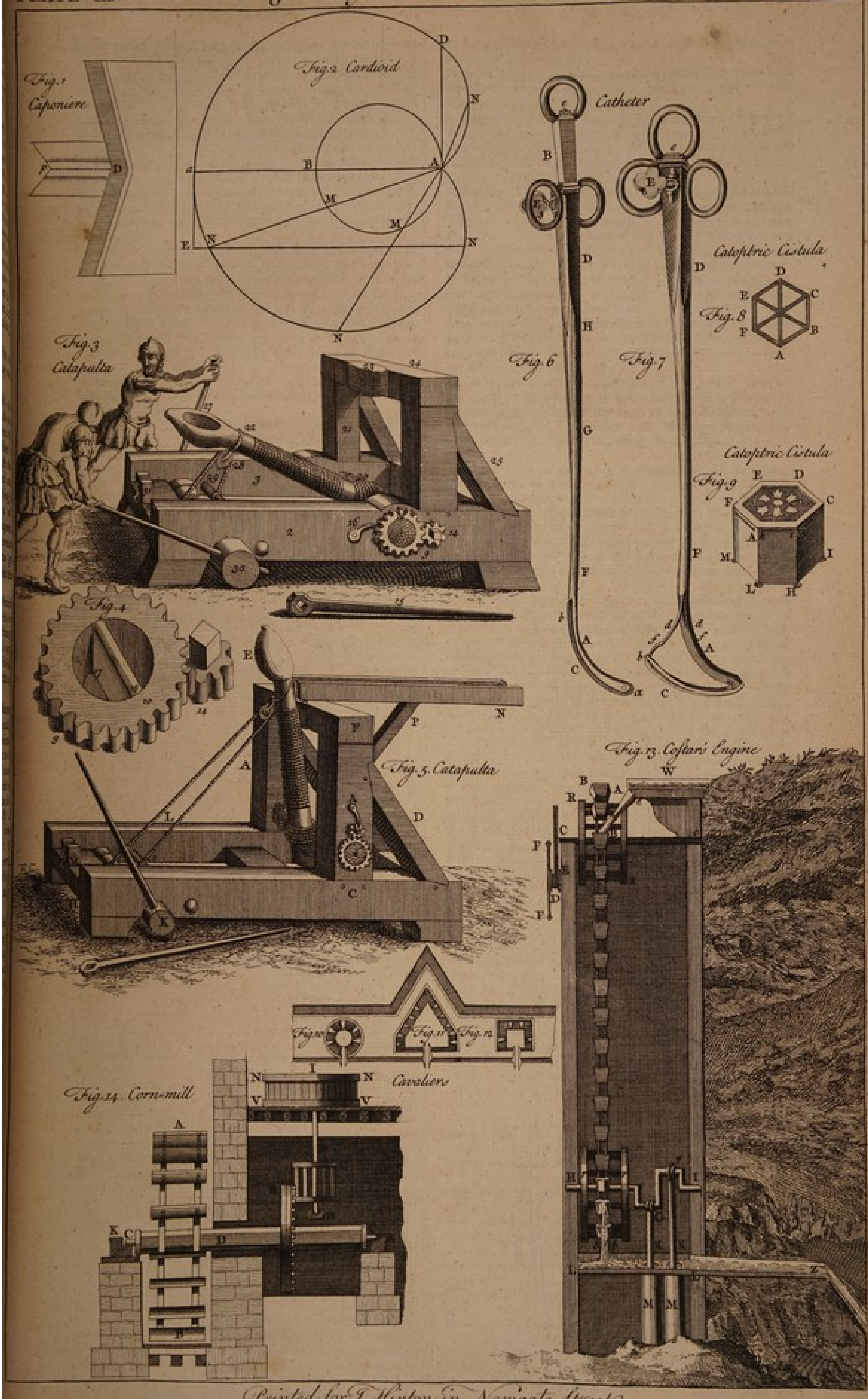
Upon this number of cylindrical wheels the capitals, 9, muſt be placed in the beams 2, 3, ſo that the cylinders do not extend to the teeth of the wheels, which muſt receive a ſtrong pinion 14. By the means of this pinion, the wheel of the capital is made to turn for ſtraining the cordage with the key 15. To the wheel a ſtrong ſtay 16 is annexed, and another of the ſame kind may be added, to prevent any thing from giving way through the extreme and violent force of the ſtrained cordage. Theſe precautions are neceſſary upon account of the cylindrical wheels, which, by entirely preventing the friction of the capitals, make them the more eaſy to give way through the extraordinary and almoſt inconceivable tenſion of the cordage.

This muſt be ſtill greater in a Catapulta carrying four-hundred weight or upwards. In ſuch large machines, the wheels ought to be multiplied, and, for the greater precaution, a ſtrong ſtay added to every wheel. We come now to the capital-piece, or piece within the capital, over which the cordage is folded, and which ſuſtains the whole force in ſtraining it to the proper height.

This capital-piece is a nut or croſs pin of iron, 17, hammered cold into form, that divides the bore of the capitals exactly in two equal parts at their diameters, into which it is inſerted at the depth of about an inch. This piece or nut ought to be about two inches and one third thick at the top 18, and rounded off and poliſhed as much as poſſible, that the cords folded over may not be hurt or cut by the roughneſs or edges of the iron. Its height ought to be eight inches, decreaſing gradually in thickneſs to the bottom, where it ought to be only one inch. It muſt be very exactly inſerted in the capitals: its depth of eight inches adds force to the engine, and prevents its giving way through the ſtraining of the cordage. Perhaps, its being caſt with the capital, and of the ſame metal, might have an equal, if not a better effect.

After applying the two capitals to the bores of the two beams in the baſe, in an exact line with each other, and fixing the two croſs diametrical nuts or pieces, over which the cordage is to fold, one end of the cord is put through the void ſpace of one of the capitals in the baſe, and made faſt to a nail withinſide of the beam. The other ſide of the cord is then carried through the bore in the oppoſite beam and capital, and ſo folded or wound over the croſs pieces of iron in the center of the two capitals till they are full, the cordage forming a large ſkain 20. When this is done, the laſt end of the cord is tied to the firſt which I have mentioned. The tenſion or ſtraining of the cordage ought to be exactly equal, that is to ſay, the ſeveral foldings of cord over the capital-pieces ſhould be equally ſtrained, and ſo near each other, as not to leave the leaſt ſpace between them. As ſoon as the firſt folding or bed of cord has filled up one whole ſpace or breadth of the capital-pieces, another muſt be carried over it; and ſo on, always equally ſtraining the cord till no more will paſs through the capitals, and the ſkain of cordage entirely fills them, obſerving to rub it from time to time with ſoap. The cord may alſo be carried through with both ends, taking it from the center.

At three or four inches behind the cordage, thus wound over the capital-pieces, two very ſtrong upright beams 21 are raiſed: theſe are poſts of oak fourteen inches thick, croſſed over at top by another of the ſame ſolidity. As this part of the machine is two or three inches behind the ſkain of cordage, it muſt have a ſmall obliquity towards the cordage, in ſuch a manner, that, the arm or tree 22 fixed at the bottom, exactly in the center of the cordage, half of which holds it on one ſide, and half on the other, it is neceſſary, I ſay, that the arm ſtrike with ſome obliquity againſt the cuſhion or ſtomacher 23, which muſt be placed exactly in the middle of the croſs beam 24. Without this obliquity the ſpring of the cordage would be



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be somewhat abated from relaxing before the tree reached the cross beam. The height of the upright beam 21 is seven diameters and an half, and three inches, each propped behind with very strong props, fixed at bottom in the extremities of the base 2, 3. The cross beam 24 must be propped in the same manner in the center. The upright and cross beams, props, &c. in this part of the machine, should be strengthened, especially in the joints, with double squares of iron of four inches broad, and a quarter of an inch thick, pinned with strong pins, keyed at the end of them to keep them firm. Care must be taken to place the cushion or stomacher in the center, as has been said. It should be covered with tanned ox-hide, and stuffed with hair, the arm striking against it with inconceivable force.

When the Catapulta is to batter with stones, the bottom of the arm must be placed exactly in the center of the skain or cordage. This is the more important, because, if it be not exactly in the middle, the tension will be unequal; and, whatever should be more on the one than the other side, will infallibly break in straining, which is worth nothing. To prevent mistakes in so important a circumstance, a piece of wood, of the same bigness with the end of the tree or arm, might be fixed in the skain of cordage when formed. The same piece of wood might serve to mark the center of the cords, in carrying them backwards or forwards through the spaces in the capitals.

The tree, arm, or stylus, as Ammianus Marcellinus calls it, should be of excellent ash, the soundest that can be got. Its length is from fifteen to sixteen diameters of the bore of the capitals. The end at bottom to be fixed in the middle of the skain is ten inches thick, by fourteen broad: that is to say, it should be narrower in the first than the second dimension, to make it the stronger, and prevent its bending: for, if the arm bends, it must have more breadth.

The bottom of the arm which the cords receive, must have these dimensions, its edges being smoothed off; for, without that precaution, they would fret or cut the cordage, which are of Cat-gut. The rest of the arm should be made in an elliptical form, not so thick by an inch as the end fixed in the cords, and of the same breadth, to the place where it strikes against the stomacher, which ought to be somewhat thicker, but flat, lest the violence of the stroke cut it in two: in the same place the arm should form a little curve.

To strengthen the arm or tree, of which the force of being discharged is every thing that can be conceived of most violent, it should be wrapped round with a cloth dipped in strong glue like the tree of a saddle, and bound very hard with waxed thread of the sixth of an inch in diameter from the large end at bottom, almost to the top, as in the plate.

The force of this arm is entirely surprizing, when the trigger is struck. The experiments Mr. Follard made of it in his Catapulta convinced him of this. Though his machine threw only a weight of half a pound, the working of the arm in great machines might be judged from it. The ancients who experienced the same every day, had no better expedient to prevent the arms of this kind of machine from breaking, than to make them of two pieces of wood of equal length. These they joined together with abundance of art and care, and strengthened with a strong binding of wax cord.—We shall now proceed to the manner of working the Catapulta.

At the top of the arm, just under the iron hand or receiver 27, a strong cord is made fast, with two loops to it twisted, the one within the other, for strength. Into these two loops the hook of the pulley 28 is put; this pulley should be of brass with double wheels. Upon occasion another may be hooked on at bottom, and to the center of the cock or trigger. The cord 29 is then put through the wheels of the two pullies, and fastened to the roll 30, round which, in turning, it divides itself. The roll ought to be placed in such a manner that the end of the arm at top, to which the pulley is hooked, may almost touch it when the hand or receiver is come to its proper place at bottom. The cock or trigger 31 which serves as a stay, is then brought to it, and made fast by its hook to the extremity of the hand, which is either in the form of a spoon, as in the plate, or of an iron hand, with three branches a little curving; in this the body to be discharged is put. If the machine is to throw flints, they are put into an osier basket, that exactly fits the hand or receiver: the pulley at the neck of the arm is then unhooked, and, when the trigger is to let it off, a stroke must be given upon it with an iron bar or crow of about an inch in diameter; the arm then goes off with a force little unequal to that of a modern mortar. It is to be observed, that the tree or arm describes an angle of ninety degrees, beginning at the cock, and ending at the stomacher or cushion; which we shall farther explain in describing another Catapulta for throwing large darts.

My little Catapulta, says Mr. Follard, is only ten inches long, by thirteen broad. It throws a ball of lead of a pound weight almost five-hundred yards. This kind of machines carry a greater or less distance, according to the points of elevation given them, and the different degrees of the cordage which we have carried to thirty-six. We believe, that a Catapulta, according to the proportions here laid down, must carry at least eight hundred yards. However, adds he, we do not pretend to advance this as a certainty, not having had opportunity to make the experiment.

Plate XIV. *fig.* 5. represents another battering Catapulta with its capitals affixed in its upright beams, and canal for throwing great darts, or many at a time.

A, Are the two double beams of the capitals fixed upright upon the base C, and supported by the props D, with tenons and mortises, which serve to strengthen them against the stroke of the arm E upon the cross-beam F, which should have its cushion or stomacher G.

When the arm E is to be brought down to the cross-beam H, it is done by the roller K, round which runs the cable L. The cock M is then brought to it, which ought to form a little curve. This Catapulta is scarce less simple than the former, and, according to Mr. Follard, might be of great use in besieged places, if planted at bottom and behind the walls.

It was particularly used for throwing darts of an extraordinary size, and sometimes several together; the other threw both stones and darts at once, and in very great numbers. The same author saith, that he doubted at first whether the Catapulta could do this or no, but was not long without discovering the mystery. As there is something curious in it, he gives the following explanation of it:

N, Is a canal of oak rounded withinside in form of a gutter. Its length is six diameters of the capitals, and its breadth in proportion to the size of the large dart, or bundle of darts to be discharged. These darts were larger and longer, and more or less in number, according to the size of the machine.

When arrows were to be shot in the manner of cartridges, the end of the canal or gutter was placed in a cut of the depth of two inches in the center of the cross-beam F, which is fitted exactly. It entered about two inches into the cushion or stomacher, supported by the prop P, to hinder it from bending or giving way. The upper part of the arm ought to be flat at the place where it strikes the great dart or cartridge, and covered with a plate of steel, a quarter of an inch thick.

To discharge a bundle of large darts, they undoubtedly made use of a deal box of a round form, into which the bundle of arrows were put, tied with a very small twine in the middle, to keep them in a right line and parallel with each other. This box was put into the canal or gutter, and projected six or seven inches beyond the cushion towards the arm. It must have been very slight, loosely put together, and of little or no weight, except at the end struck by the arm, which, it is supposed, might be an inch thick or upwards. Its length was according to that of the arrows, that is to say, it should be about half as long, their length being two diameters and an half of the bore of the capitals, as in the former Catapulta. The trigger was then struck, and the arm, coming flat against the box, drove it with the arrows to a very great distance. The wind took the pieces of the box, which soon separated, and the arrows, scattering and spreading in their flight, did terrible execution in the ranks of the enemy.

My little Catapulta, says Mr. Follard (from whose Polybius most of these extracts are made) discharged ten arrows in this manner, to the distance of almost an hundred paces, at eight degrees of elevation. The antients no doubt made use of the quadrant in planting their machines, as the moderns do for their mortars.

CATARACT *of water* (*Dict.*) — In most rivers the descent of the stream passes as it were by insensible degrees from their fountains to their mouths, where they empty themselves into the sea; but there are some whose fall in certain places is much more violent and rapid than the common current of the stream, and these are termed Cataracts. The Rhine, for example, forms two, one at Bilefeld and the other near Schaffouse. The Nile has several and two among them very remarkable, which fall down from a great height between two mountains. The river Vologda in Muscovy has two famous Cataracts near Ladoga. The river Zaira in Congo begins with a kind of Cataract which falls from the precipice of a mountain. But the most famous Cataract of all is that of the river Niagara in Canada; it falls like a prodigious torrent, one hundred and fifty-six feet perpendicular, and is near a mile broad; the mist or fog it makes by its descent may be seen at five leagues distance; it rises to the clouds, and forms a very fine rain-bow, when the sun shines. At the bottom of this Cataract the eddy of the water is so violent, and the whirlpools so terrible, that the river is not navigable for six miles below it. Father Charlevoix's description of it is very particular, and we apprehend may not be unacceptable to our readers. My first care, says he, was to visit the finest cascade that is perhaps in nature. I perceived, at first view, that baron de la Hontan was so much deceived, as to the height and figure of it, that one could scarce imagine he had ever seen it.

It is true, if you take the mensuration of its height from the three mountains, which you pass in your way to it, the fall is not much less than six hundred feet, as M. de l'Isle has laid it down in his chart, no doubt on the credit of La Honton and father Hennepin. But, after I arrived at the top of the third mountain, I observed that, the remainder of the

the way to this water-fall which is about three leagues, we went ſometimes up, ſometimes down hill, which certainly theſe travellers did not attend to. As this Cataract can only be approached on the ſide, and conſequently ſeen in profile, it is not eaſy to meaſure its height with inſtruments: we therefore attempted it with a rope fixed to a long pole, and, after repeated experiments, could find no greater depth than one hundred and fifty feet, ſometimes but one hundred and twenty; the pole might poſſibly meet with ſome rock that bulged out, but, from all the obſervations I could make, I apprehend it about one hundred and forty or one hundred and fifty feet.

As to its figure, it reſembles a horſe-ſhoe, and is about four hundred paces in circumference; exactly in the middle it is divided by a narrow iſland, one eighth of a league in length, at the lower extremity of which the waters unite again.

It may be obſerved as a truth in general, that, in whatever countries the number of inhabitants is not ſufficient to form political bodies of men, the earth is uncultivated, irregular, uneven, the beds of rivers are unequal, not level, and ſubject to Cataracts. The rendering the Rhone and Loire navigable has been the work of ages. It is by confining the waters within their banks, cleaning the bottoms of rivers, and directing their courſe, that they become uſeful and ſerviceable. In all countries where there are few inhabitants nature is imperfect, or at leaſt loſes much of her beauty.

CATA'RRHAL *Fever*, a ſecondary or ſymptomatic fever, by means whereof nature endeavours to correct the vitious quality of the lymph, and expel it the body.

CATCH-*word*, among printers, denotes the firſt word of a page, which is put alſo at the bottom of the preceding page, in order to ſhew how the leaves and ſheets follow each other, and facilitate the folding and binding.

CATE', or CATEA, in natural hiſtory, the name of the tree which produces the drug called caſhoo. It grows in the province of Behar, and in ſome other provinces of Indoſtan, or the Mogul's dominions. It was by a miſtake that Garcias, who was firſt phyſician to a viceroy of Goa, gave the name of that tree to the lozenges, or ſmall cakes of caſhoo, otherwiſe called catechoo, which miſtake Monſ. Lemery has followed. The ſame phyſician alſo miſtook the tree called Caté for a kind of lycion, or rather for that of the ancient Greeks and Romans; for that Indian tree does by no means anſwer the deſcription which Dioſcorides has given us of the lycion. It is preſumed that the Caté is rather a kind of acacia: the caſhoo is made of its bark. They trade in that commodity at Bengal, whither this drug is carried by the river Ganges.

CATERPI'LLAR, *eruca*, in natural hiſtory, an inſect too well known to need deſcription.

There are ſeveral kinds of this inſect, which are very pernicious to a garden; but there are two ſorts which are the moſt common, and deſtructive to young plants: one of them is that which the white butterfly breeds: it is of a yellowiſh colour, ſpotted with black; and commonly infeſts the tender leaves of cabbages, cauliflowers, and Indian creſs. Theſe eat off all the tender parts of the leaves, leaving only the fibres intire; ſo that very often we ſee, in autumn-ſeaſon, whole gardens of winter cabbages and ſavoys almoſts deſtroyed by them; eſpecially in thoſe which are crouded with trees, or are near great buildings. They always increaſe moſt in very dry ſeaſons, and, when the plants have been ſtinted by the drought, they are conſtantly attacked; whereas thoſe which are in vigour, ſeldom ſuffer much by thoſe inſects. Nor is there any other method found out to deſtroy them, that I know of, but to pick them off the plants before they are ſpread from their neſts; by which means, though perhaps many may be overlooked, yet their numbers will be greatly diminiſhed. But this work muſt be often repeated during the warm weather, when the butterflies are abroad, which are continually depoſiting their eggs, and in a few days time will be metamorphoſed to perfect Caterpillars. But as theſe, for the moſt part, feed upon the outer leaves of plants, ſo they are more eaſily taken than the other ſort, which is much larger: the ſkin is very tough, and of a dark colour; this is called, by the gardeners, a grub, and is exceeding hurtful. The eggs of this ſort of Caterpillar are, for the moſt part, depoſited in the very heart or center of the plant, (eſpecially in cabbages;) where, after it has obtained its form, it eats its way out through all the leaves thereof; and alſo the dung, being lodged between the incloſed leaves of the cabbages, gives them an ill ſcent.

This inſect alſo burrows juſt under the ſurface of the ground and makes great havock on young plants, by eating them through their tender ſhanks and drawing them into their holes. The miſchief is chiefly done in the night: whenever you obſerve this, you ſhould every morning look over your plat of plants; and, wherever you ſee any plants eaten off, ſtir the ground round about the place with your fingers an inch deep, and you will certainly find them out. This is the only method I know of deſtroying them. For the metamorphoſes of Caterpillars, ſee the article BUTTERFLY.

CATERPILLAR-*eaters*, a name given by ſome authors to a ſpecies of worms which are bred in the body of a Caterpillar, and eats its fleſh: theſe are owing to a certain kind of fly which lodges her eggs in this animal, and they, after their proper changes, become flies like their parents.

CATHE'TER (*Dict.*)—The learned Mr. Le Cat, in the Philoſophical Tranſact. Numb. 476, has publiſhed the following new Catheter.

The body G (*plate* XIV. *fig.* 6.) of the Catheter is almoſt intirely ſolid, leaving in its center but juſt room enough for the paſſage of the wire. Without this ſolidity, and this narrowneſs of the paſſage of the wire, the Catheter would not be firm; and the wire itſelf, liable to waver, would not run true, but would impart its weakneſs, or want of juſtneſs, to the moveable piece C, which is the guide of this operation.

This body, G, is ſoldered to the piece D at H, making it enter ſquare into the ſaid piece D, till it meet the ſlider B, which I ſuppoſe intirely within the piece D. The rings are very large and ſtrong for the conveniency of uſing it.

This Catheter is made of ſilver, from the rings incluſive to F: all the reſt, together with the wire, ought to be of the hardeſt gold; becauſe it is on this end of the Catheter that the greateſt ſtreſs is laid, and ſilver has not firmneſs enough to reſiſt the efforts that theſe pieces muſt ſuſtain. And particular care muſt be taken, that all the angles and prominences be rendered very ſmooth.

I enter into theſe details of the make of the inſtrument, becauſe I have learned, to my coſt, that the workmen do not think of them.

Fig. 7. ſhews the whole mechaniſm of this Catheter, by repreſenting it open, and ſuch as it is in the bladder, while the inciſion is making.

The piece B of *fig.* 6. is here ſunk in its ſheath D; whereby the ſmall ſtyle or wire is thruſt towards the crooked end of the Catheter, and, at the ſame time, puſhes the end *b* of the ſmall moveable piece C towards the ſame part. The Catheter being thus open in the bladder, when the operator draws the inſtrument towards him, it is ſtopped by the neck of this organ, at the place marked *d d*, and then the angle *b* projects about a finger's breadth from the orifice of the bladder. Yet there are ſome ſubjects, in whom this orifice, being very wide or relaxed, gives greater way to the efforts made by the widening, *d d*, of the anterior angle of the Catheter; whereby it happens, that, inſtead of ſtopping this angle at *d d*, it lets it paſs through to *f f*, which brings the inciſion ſo much nearer the neck of the bladder: nay, I have ſeen in ſome dead bodies, in which the relaxation is ſtill greater, that the proſtate was ſomewhat concerned in the inciſion; which is no great misfortune. But even this may be eaſily avoided, by taking care, in the firſt inciſions, to diſengage the part that anſwers to the projecting angle from every thing that may hide from us the proſtate and bladder; and then, the foregoing caſe becoming viſible, it is eaſy to guard againſt it, by cauſing the projecting angle of the Catheter to be puſhed, or by puſhing it one's ſelf farther into the bladder.

This projecting part of the Catheter is not ſeen; but it is very perceiveable to the touch, through the integuments, and ſtill more ſo, after they are cut through.

I muſt not omit obſerving here, that, notwithſtanding all the care I have taken to inſtruct the inſtrument-maker in the conſtruction of this Catheter, and eſpecially of the moveable piece *b* C, in order to make it ſolid, yet it has often proved too weak to bear the effort of thruſting the part forward, which we are obliged to do on one ſide; ſo that it bent, and remained in the middle, whilſt the reſt of the Catheter was to the left ſide.

In caſe of this accident, it came into my thought to turn the Catheter up-ſide-down, ſo that the angle of the moveable piece might anſwer to the upper part of the neck of the bladder, and ſtop there, while the concave and immoveable part of the Catheter anſwered to the inciſion, and that the very end of the Catheter projected at the place where I was to open the body of the bladder. And, upon ſeveral trials, I found that this place was the very ſame which had before been pointed out by the angle of the moveable piece; therefore, when I have one of theſe Catheters, on which I cannot depend, I make uſe of it in this laſt manner, and it intirely anſwers my expectation; becauſe the fixed piece of theſe Catheters is always very ſolid, and that the angle of the moveable piece does its duty as well on the upper as on the under ſide of the neck of the bladder. It has even ſeemed to me, that the end of the inſtrument makes the greater protruſion forward. In fine, this Catheter, being almoſt ſtraight, eaſily aſſumes in the bladder every ſituation which one finds neceſſary to give it.

CATO'PTRIC *Ciſtula* (*Dict.*) — To make a Catoptric Ciſtula is to repreſent ſeveral different ſcenes of objects, when looked in at different foramina, or holes.

Provide a polygonous ciſtula, or cheſt, of the figure of the multilateral priſm A B C D E F, (*plate* XIV. *fig.* 8.) and divide its cavity by diagonal planes E B, F C, D A, interſecting each other in the center, into as many triangular locules, or cells, as the cheſt has ſides. Line the diagonal planes with plain mirrors: in the lateral planes make round holes, through which the eye may peep within the locules of the cheſt. The holes are to be covered with plain glaſſes, ground within-ſide, but not poliſhed, to prevent the objects in the

the locules from appearing too distinctly. In each locule are to be placed the different objects, whose images are to be exhibited; then, covering up the top of the chest with a thin transparent membrane or parchment to admit the light, the machine is compleat. For, from the laws of reflection, it follows, that the images of objects, placed within the angles of mirrors, are multiplied, and appear some more remote than others; whence the objects in one locule will appear to take up more room than is contained in the whole chest. By looking, therefore, through one hole only, the objects in one locule will be seen, but those multiplied, and diffused through a space much larger than the whole chest: thus every new hole will afford a new scene: according to the different angles the mirrors make with each other, the representations will be different; if they be at an angle greater than a right one, the images will be monstrous, &c. The parchment that covers the machine, may be made pellucid, by washing it several times in a very clear lye, then in fair water, and bracing it tight, and exposing it to the air to dry. If it be desired to throw any colour on the objects, it may be done by colouring the parchment. Zahnius recommends verdigrease ground in vinegar, for green; decoction of Brasil-wood for red, &c. He adds, that it ought to be varnished, to make it more pellucid.

To make a Catoptric cistula to represent the objects within it prodigiously multiplied, and diffused through a vast space.

Make a polygonous cistula or chest, as before, but without dividing the inner cavity into any apartments or locules; (*plate* XIV. *fig.* 9.) line the lateral planes C B H I, B H L A, A L M F, &c. with plane mirrors, and, at the foramina or apertures, pare off the tin and quicksilver, that the eye may see through; place any objects in the bottom M I, *e. gr.* a bird in a cage, &c. Here the eye, looking through the aperture *h i*, will see each object, placed at bottom, vastly multiplied, and the images removed at equal distances from one another. Hence, were a large multangular room, in a prince's palace, lined with large mirrors, over which were plain pellucid glasses to admit the light; it is evident the effects would be very surprizing and magnificent.

CA'TUS *Pardus*, in zoology, the name of a beast of prey, called also by some Catus montanus, and by us the cat of mountain. It is of the size of a mastiff dog, but it resembles, in all respects, the common domestic cat in shape, except that the tail is, in proportion to the creature's size, considerably shorter. It is also, if any thing, shorter, in proportion to its length, than our cat, and is of the common colour of that animal, only that it is variegated with black spots. Its throat is white, and its spots are long upon the back, and round upon the sides and legs; the beard or whiskers are plainly the same as in the cat; it is less fierce against the human species than many of the other beasts of prey, and may even be tamed. It naturally grows very fat. *Ray. Syn. Quad.*

CAVALIE'RS, *in fortification*, (*Dict.*)—Cavaliers are of various shapes, such as square (*plate* XIV. *fig.* 12.) or round, (*fig.* 10.) or like a horseshoe, or a plain line; but when they are constructed in flankers, as is usually the case, (*fig.* 11.) they are of a like figure to that flanker; leaving a space of about eight or ten yards, or more, between the parapet of the flanker and the outline of the Cavalier.

They should be faced with earth, or plank, or brick; but not with stone, because the splinters, knocked off by the enemy's cannon, would greatly annoy the troops that may be posted in the line below the Cavalier.

Any other particulars will be sufficiently known from the figures; observing, in the plans, to represent their outside limits by a double line, to express the sloping of the earth, and to put a ramp in the gorge.

CAU'DA *Ceti*, a fixed star of the second magnitude, called also by the Arabs dineb kaetos. Its longitude in the year 1700, according to Hevelius, was 28° 22′ 14″ of Pisces, and its latitude southward 2° 44′ 35″.

CAUDA *Cygni*, a fixed star of the second magnitude in the Swan's tail, called by the Arabs dinebadigege, or eldegiagick. Its longitude, according to Hevelius, in the year 1700, was 1° 16′ 45″ of Pisces, and its latitude northward 59° 57′ 33″.

CAUDA *Delphini*, a fixed star of the third magnitude, in the tail of the Dolphin. Its longitude, according to Hevelius, in the year 1700, was 9° 55′ 17″ of Aquarius, and its latitude northward 29° 9′ 20″.

CAUDA *Leonis*, a fixed star of the first magnitude, in the Lion's tail, called also by the Arabs dine beleced. Its longitude, according to Hevelius, in the year 1700, was 17° 27′ 46″ of Virgo, and its latitude northern 12° 18′ 55″.

CAUDA *Ursæ majoris*, a fixed star of the second magnitude, in the extreme part of the tail of the great Bear, called also by the Arabs alalioth and benenah. Its longitude, according to Hevelius, in the year 1700, was 22° 39′ 24″ of Virgo, and its latitude northward 59° 25′ 7″.

CAUDA *Ursæ minoris*, a fixed star of the second magnitude, in the extreme part of the tail of the lesser Bear, called also the polar star, and by the Arabs abrukabah.

CA'VEATING, in fencing, the act of disengaging, or shifting the sword from one side of the adversary's sword to the other.

Caveating is a motion whereby a man brings in an instant his sword which was presented on any side of his adversary's, generally beneath its hilt, to the opposite side; either from within, to without, or vice versa; or from having its point high, to below, or the reverse; and either on the same side it is presented in, or the opposite side.

CAUK, or *Cawk*, is used by the miners in the Peak to denote a worse sort of sparr; being a ponderous white stone found in the lead mines, and which will draw a white line like chalk, or the galactites.

It is of a much more dense and compact nature than galactites, and resembles crystals, except that it wants transparence. There is a singular process mentioned by Dr. Lister, which is that of vitrifying antimony by its means. This is done with great readiness and speed by it, and the glass, thus made, will produce some effect on other metals, which no other glass will, nor indeed any other preparation of antimony. The method of preparing it is this: take a pound of antimony, flux it clear; have in readiness an ounce or two of Cauk in a lamp red-hot, put it into the crucible to the melted antimony, and continue it in fusion; then cast it into a clean mortar not greased, decanting the clear liquor from the lump of Cauk. This process gives more than fifteen ounces of glass of antimony, like polished steel, and bright as the most refined quicksilver. The Cauk, in the mean time, is found to be diminished, not increased in its weight, and will never flux with the antimony, though ever so strong fire be given it. This is a very odd mineral, and this learned author supposes it to be allied to those white, milky, and mineral juices which are found in mines. The effect of both is evidently the same; for the milky juice of lead mines vitrifies the whole body of antimony, in the same manner that the Cauk does in this experiment. *Phil. Transf.* Numb. 110.

CA'ULIFLOWERS, are the produce of a kind of cabbage, and have of late years been so far improved in England, as to exceed, in size and goodness, any that are raised in the rest of Europe; they are in season in the months of May, June, and July, but the skill of the gardener can continue them much longer. The manner of propagating them is this:

Having procured some good seed, you must sow it before the middle of August, upon an old cucumber or melon bed, sifting earth over the seeds to a quarter of an inch in thickness: if the weather prove very hot and dry, the beds must be shaded with matts, and be lightly watered at times. In about a week's time the seeds will appear above ground, and they must be uncovered by degrees, but not exposed to too much sun at first. In a about a month more they should be pricked out on another old bed, at three inches distance, and shaded and watered, when first transplanted; but after this they must not be much watered, nor be suffered to have too much rain, which will make them black-shanked, or rotten in the stalks. In this bed they are to remain to the middle of October, when they are to be planted out for the winter season: they are then to be planted out in rich beds, and those which are to be early ripe, are to be shaded with bell glasses, two under each glass, and in February to be planted out again: the rest are to be at first set at a greater distance, and to stand.

When the Cauliflowers begin to fruit, they must be carefully watched, and some of the inner leaves must be bent down over the flower, to shade it from the sun, which would otherwise turn it yellow. The very finest of the Cauliflowers, which are not loose and frothy about the edges, and very firm, should be saved for seed; and the flower stems, as they shoot out, supported with sticks till the seeds are ripened, which must then be carefully gathered, and dried for use. *Mill. Gard. Dict.*

CA'USALTY, in metallurgy, the lighter parts of sulphureous and earthy ores of metals carried off in the water used in washing them, and subsiding afterwards from it. *Boerhaave's Chem.*

CAU'STICA (*Dict.*)—The celebrated Heister, in his Surgery, gives directions for making an excellent caustic stone, in the following manner:

Take of pot-ash, and the strongest quick-lime, equal quantities of each, for instance, six ounces; or of pot-ash, one pound, and of quick-lime, six ounces; which, when pounded separately, are to be mixed. Then, putting them in a large glass or pot, a large quantity of water is to be poured upon them; and they are to stand for an hour or two, till they are sufficiently incorporated with each other: then what is colliquated is to be separated from the subsiding mass, strained through a linen cloth, and condensed in an iron vessel over the fire. After which this consistent mass, being put into a crucible, is to be fused over a brisk fire, till it assumes the consistence of oil. Then it is to be poured into a vessel or mortar; and, before it is entirely cold, it is either to be cut to pieces, or broken, and kept for use, in a close-stopped glass, in a dry place.

From this glass we take what is sufficient for opening an abscess, and apply it either whole, or grossly pounded in a mortar, securing it on the part affected. If any moist substance is laid upon the Caustic, it generally operates, and corrodes the subjacent parts sooner, in the space of an hour or two, for instance; but, when it becomes old, it generally loses its corrosive quality.

Boerhaave's method of preparing the lapis septicus, or potential cautery, is as follows:

Take lime made of burnt stones, that is quite fresh, very dry, solid, not affected by any moisture, nor as yet cleft asunder; of this put one part into a clean iron pot, and lay upon it two parts of the purest pot-ash, in such a manner, that the lime may be covered all over with this alcali. Let these be then left together in the pot, with a cloth flung over them, till the lime begins to crack and split asunder: when you observe this, add four times their weight of water, and boil them for the space of one or two hours. When the fæces are subsided, pour off the liquor, and let it be strained through Hippocrates's sleeve, made of thick linen cloth, till it at last passes through as limpid as pure water. Put this lixivium into a large iron ladle over the fire, and, taking care that it do not boil over, evaporate it till it becomes perfectly dry. Then increase your fire till the ladle grows red-hot, and, as soon as ever the salt has done smoaking, it will melt. When it is in this state, pour it out upon a hot brass plate; and, whilst the matter continues very soft, make it smooth, and cut it into such pieces as are fit for chirurgical uses. Let these be put into a very dry, hot, strong glass-bottle, by the fire-side, and instantly stop it with a choice dry cork: let the mouth of the bottle be then dipped in melted pitch, and be very accurately secured, that no moisture may possibly get through it, which is attracted by the alcali, prepared in this manner, with an incredible power, even through corks and bladders: but, if you observe these cautions, it may be kept for years. When you want to take a bit out for use, it must be done in a hot dry air, or near a good fire, and then the bottle must be immediately stopped again, as before.

Remarks.

1. This salt, from the truly igneous virtue of the lime attracted into the fixed igneous alcali, acquires a most acute and quick corroding power, which was neither in the alcali nor in the lime, when they were separate. The acrimony of it exceeds that of all other salts hitherto known; for, if you cut a round hole in a sticking plaister, and apply this to a human body, and then put a bit of this salt upon the skin in the vacuity, and cover it over with another plaister, that it may not fall off, it will, in a very short time, consume the skin, and the membrana adiposa; and hence it is valued by the surgeons, for what they call their potential cautery, above all others.

2. If almost any parts of animals are thrown into a fresh lixivium of this salt, whilst it is boiling, they will, in a short time, be converted into a liquid matter; at will likewise most vegetable substances, and the sulphurs of fossils. A poor man, unfortunately falling into a boiling copper of such a lixivium, had his cloths, and all the soft parts of his body, consumed, so that there was found nothing of him left, but his bones: hence this lixivium is of incomparable service, where the parts are gangrenous to a great depth, and almost sphacelated, at it disposes them to a happy separation; but it requires the prudent application of a skilful surgeon.

3. This salt melts with a pretty moderate fire, and then it runs like wax. By this easy fusion, therefore, it is capable, without the assistance of an intense fire, of dissolving a great many bodies, which, otherwise, are not dissolved without difficulty, as myrrh, gum sandarach, and others. The antient chymists wrote a great deal about the art of making alcali's melt in the fire like wax; and hence they called the operation *inceration*. Might they not mean the process we have just now described? Certainly the salt produced by it has this property.

4. If lime is first slaked, or extinguished, either in the air, or with water, as almost all old lime is, or is converted into a powder; then, if it is thus managed with a fixed alcali, it will not produce this acrid kind of salt. This salt, when it is once melted in the air, or is kept a good while, not carefully stopped, loses this singular virtue; and then it deposits a large quantity of inactive stony fæces, which did not appear before: hence, therefore, we learn, that fire communicates to inert stone, and shells of fish, an acrimony, that is not easily procurable in any other manner: when a native vegetable salt, therefore, from a natural, soft, saponacious one, is converted into a fixed alcali, does it not require this acrimony from the fire?

5. The salt, thus prepared, obtains this singular property, that it becomes vastly disposed to a union with the expressed and distilled oils, both of vegetables and animals, and thus to form a soap. And this seems to arise from its being rendered so exceedingly penetrating, that it becomes capable of intimately dividing these oils, and uniting with them, which, without the assistance of this sharp lime, can scarcely be effected conveniently: nor, without the lime, would the alcali run so easily in the fire; for that melts with a great deal of difficulty.

Lunar CAUSTIC, called also lapis causticus, is a preparation of silver, sometimes of copper, usually made by dissolving the metal with spirit of nitre, evaporating two thirds of the fluid, and boiling the rest to an oily consistence, which, when cold, grows hard.

CAU'STICUM *antimonial*, the name given in the late London Dispensatory to what was before called butter of antimony.

CAU'TIONARY *Towns*, places of strength, which one prince or power puts in the possession of another, as a security either for the payment of a debt, or performance of some other matter stipulated between them. Rochelle, Saumur, and some other cities in France, were allowed to the reformed, for their strength and security.

CA'XOU, in metallurgy, a word used to express a chest of ores of silver, or any other metal, that has been burnt, ground, and washed, and is ready to be refined.

CA'ZIMI, among the Arabian astronomers, denotes the center or middle of the sun. A planet is said to be in Cazimi, when it is not distant from the sun either in longitude or latitude above 17′, or the aggregate of the semi-diameter of the sun's disk and that of the planet.

CE'DAR, in botany, a large tree which pushes out branches at the distance of ten or twelve feet from the ground. They are large, and at a distance from each other. Its leaves are pretty much like those of rosemary. It is an ever-green, and lives very long, but dies as soon as its top is cut off. The leaves stand upright, and the fruit hangs down; that fruit is a small one, like that of the pine-tree, except that its rind is thinner, smoother, and more open. The seed is like that of the cypress-tree.

There are still some Cedars on mount Libanus, but in small number, above and to the east of Biblos and Tripoli. There are none to be seen any where else on those mountains. But it is very probable that there were a great many more formerly, since their timber was used in so many considerable works. There are some Cedars also growing in some parts of Africa, in the isle of Cyprus, and in that of Crete or Candia. Josephus, the Jewish historian, asserts, that Solomon planted so large a quantity of Cedars in Judea, that they were as numerous as the sycomore-trees, which are very common in that country.

They used that timber not only for beams, and for the boards which covered the buildings, and made up the cielings of the apartments, but they put it likewise into the body of the walls, so that there were, for instance, three rows of stone and one of Cedar-wood. They also made statues of it, when they would have them last a long time. It is used to make fine turners and inlaid work, and in some floors and cielings of royal palaces, and other stately edifices; but, in those places where it grows, it is employed in land and sea buildings, like common timber.

During the hottest season of the year, there runs naturally, and without any incision, from the trunk and large branches of this tree, a white, clear, and transparent resin, which is called Cedar-gum, or masticine-manna, which hardens and forms itself into grains like mastic. The largest trees hardly yield six ounces of it a day.

When the gum has done running of itself, they make incisions into the tree, from whence issues afterwards an unctuous liquor, which dries, as it runs along the trunk of the tree. This is the resin of Cedar, which is sold at the druggists shops; it is of a fine yellow colour, friable, lucid, transparent, and of a good smell.

Lastly, the Cedar furnishes also a third sort of drug, called turpentine, or resin of Cedar; it is a liquor clear, like water; of a strong penetrating scent, contained in small bladders or vesicles, which the excessive heat of the sun causes to rise on the trunk of the tree. These gums and resins of Cedar are to be met with in France.

Mr. Miller observes, that what we meet in the scripture of the lofty Cedars, can be no ways applicable to the stature of this tree; since, by the experience of those we have now growing in England, as also from the testimony of several travellers, who have visited those few remaining trees on mount Libânus, they are not inclined to grow very lofty, but, on the contrary, extend their branches very far: to which the allusion made by the Psalmist agrees very well, when he is describing the flourishing state of a nation: they shall spread their branches like the Cedar-trees.

The wood of this famous tree is accounted proof against all putrefaction of animal bodies. The saw-dust is thought to be one of the secrets used by those mountebanks, who pretend to have the embalming mystery. This wood is also said to yield an oil, which is famous for preserving books and writings; and the wood is thought, by lord Bacon, to continue above a thousand years sound. It is likewise recorded, that, in the temple of Apollo at Utica, there was found timber of near two thousand years old. And the statue of the goddess, in the famous Ephesian temple, was said to be of this material also, as was most of the timber work of that glorious structure.

This sort of timber is very dry, and subject to split; nor does it well endure to be fastened with nails; therefore pins of the same wood are much preferable.

The Cedar brought from Barbadoes and Jamaica is a spurious sort, of so porous a nature, that the wine will leak through it. That produced in New England is a lofty grower, and makes excellent planks, and flooring that is everlasting. They shingle their houses with it, and use it in all their buildings.

ings. This is the oxycedrus of Lycia, which Vitruvius describes as having its leaves resembling those of cypress.

The Cedar of Greece and Asia was no other than a smaller kind of juniper, which, having prickly leaves, was by some called oxycedrus; and the common juniper was at that time called also by the name of Cedar. The Lycian Cedar of the Greeks was this juniper kind; but the cedrium and cedrelæum, which were a kind of pitch and an oil separated from it by melting, were not prepared from this Cedar, but from the Syrian Cedar; which was a larger shrub, and resembled the cypress, and therefore was confounded with that tree, being called by some the wild cypress. The cedrium was always made from this species, but the oleum de coda, or code oil, was made from the fruit of the oxycedrus, or prickly-leaved juniper, called Cedar by the Greeks, and growing in their own country.

The shittim and the almug, mentioned in scripture, are usually supposed to have been kinds of Cedar.

Johnston, in his Dendrographia, is of opinion, that pitch was anciently made of Cedar, as well as of the pine and fir, grown old and oily.

CE'GINUS, in astronomy, a fixed star of the third magnitude, in the left shoulder of Bootes. Its longitude, according to Hevelius, for the year 1700, was 13° 26′ 4″, and its latitude northern 49° 35′ 47″.

Some also give this denomination to the star otherwise called Cepheu.

CEI'BA, in botany, the Indian name of the silk cotton tree. Dr. Linnæus calls it xylon, which is the old name applied to the common cotton; and he has given to that genus the modern title of gossypium. The characters are: it hath a rosaceous flower, consisting of several leaves placed in a circular order: from whose calyx arises the pointal, which afterwards becomes a fruit shaped like a bottle, divided into five parts from the top to the bottom; in which are contained several round seeds wrapped up in a soft down, and fastened to the five-cornered pyramidal placenta.

These trees grow very plentifully both in the East and West-Indies, where they arrive to a prodigious magnitude: the West-Indians hollow the trunks of those trees for making their canoes, for which they are chiefly valued.

It is reported, that in the island of Cuba, in Columbus's first voyage, was seen a canoe made of an hollowed trunk of one of those trees, which was ninety-five palms long, and capable of containing one hundred and fifty men.

And some modern writers have affirmed, that there are trees now growing in the West-Indies, so large as scarcely to be fathomed by sixteen men, and so high, that an arrow can scarcely be shot to their tops.

The wool of these trees is of a dark colour, and too short to spin; so that it is little valued: but sometimes the inhabitants stuff beds and pillows with it, though it is accounted unwholesome to lie upon. The inhabitants of the West-Indies call this silk-cotton; but, the ancient American name for this plant being Ceiba, father Plumier hath continued it under that name, and constituted a genus of it.

These plants are preserved in some curious gardens in Europe, where they thrive very well, if they are placed in a bark-stove; but, as they are trees of a large growth, it can hardly be expected to see either fruit or flowers from them in England; since they grow to a great magnitude before they produce either in their own country.

CE'LERI, a name given by our gardeners to some species of apium.

We have two sorts of this plant cultivated in our gardens, the Italian Celeri, and the celeriac.

The seeds of this plant should be sown at two different seasons, the better to continue it for use, through the whole season, without its running up to seed. The first sowing should be in the beginning of March, in an open spot of light earth; but the second sowing should be in April, in a moister soil. In about a month's time after sowing, the plants will come up; they must be kept clear of weeds, and, if the season is dry, they must be watered. When they have been a month or five weeks above ground, they will be fit to transplant. They must now be set at three inches distance, in beds of moist rich earth. In the middle of June some of the plants of the first sowing will be fit to transplant for branching; the soil in which it is now planted must be moist, rich, and light.

The manner of planting it at this time is this: you must dig a trench of ten inches wide, and eight or nine inches deep, loosening the earth at the bottom, and laying it level; and the earth which comes out of the trench, is to be equally laid on each side of the trench, to be ready to draw in again to earth the Celeri, as it advances in height. The trenches should be made at three feet asunder, and the plants set in them at six inches distance. The tops of their leaves, and ends of their roots, are to be cut off when planted; and they are to be watered, to fix the earth to their roots: after this, they require little care but the drawing up the earth to them, as they advance in height; it must be carefully observed, in doing this, never to bury the heart of the plant, nor ever to perform it but in dry weather; for, if done in wet, the plants will rot. The earth between the trenches is to be used, when that which was thrown out in the digging of them is all employed; and, soon after midsummer, some of the first sowing will be ready to cut, and the succeeding ones, if rightly managed, will continue it till April or May. Many plantations are indeed also made out of one sowing, by pulling up the strongest plants first, then some time after the strongest of the remaining, and, finally, the least of all, which will be got to a proper growth by that time. *Miller's Gardener's Dict.*

CE'LTIC *Philosophy.*— Under this denomination we are to comprehend not only the philosophers of Gaul, but all those who formerly flourished in Europe, either in the Britannic islands, among the Germans and Iberians, or in Italy. Burnet tells us, it is very probable that the Germans and Britons had their druids, who, if they were not so learned as those among the Gauls, and held in less esteem, yet professed the same principles and taught the same doctrine. It is not surprizing any account of their philosophy should be so obscure as it is, considering the interval of time wherein it flourished between us and even the ancient Romans. No writings or monuments are left to clear up the point; it is most probable they concealed their opinions from all who were not initiated in their mysteries, never wrote down, but conveyed their arcana by oral tradition. The fables of Solinus, Pliny, Pomponius Mela, Aul. Gellius, Herodotus, and Strabo, shew abundantly the weakness and ignorance of the Latin and Greek writers on this subject. Cæsar himself, the conqueror of the Gauls, though so nice an observer of the manners and customs of those he vanquished, says little of the Celtæ, and what he says is involved in a cloud of fables. What farther contributes to the obscurity of this history, is, the many different people who went by the general name of Celtæ; from hence an amazing variety of principles and customs must necessarily have been introduced. As, for example, in the time of Cæsar and Tacitus, the Gauls differed from the Germans very much, though they were of the same origin; the Germans were much heavier than the Gauls, who, according to Justin, had refined their manners by an intercourse with the Greeks, who had settled at Marseilles; and that the Gauls, from them, had contracted a politeness natural to their nation. The Greeks and Romans are both ignorant of the antiquity of the Celtæ in all respects.

The Celtæ were more addicted to war than study; they followed the chace in their vast forests with more ardour than they pursued metaphysical subtilties. But their moral philosophy was far more excellent than that of the Greeks and Romans, who had a dangerous way of rendering truth obscure by argumentation. But, notwithstanding the contempt they entertained for the polite sciences, they had among them sages and philosophers who kept their philosophy a secret, though in a different manner from that among the Greeks and Romans. These sages were called druids, a name famous in antiquity, though very obscure as to its original. The most probable opinion is, that they derive their name from the oak, because, by an invariable tradition, they are said to have assembled in groves of oaks, and held the oak sacred. The conformity of their doctrines with those of the Magi, among the Persians and Chaldeans of Babylon, argues them not unacquainted with those philosophers.

The druids had a great influence over the state; they in short left the prince only a power of commanding in time of war. The tyranny of these priests was no doubt destructive of the royal authority; for, if a prince pretended to take the reins of government into his own hands without consulting them, they at once interdicted him from being present at sacrifices, and at once launched out all the anathemas of religion against him, and, being followed with blind obedience by their disciples, subverted the government; they were, in short, impostors who subjected a weak people under the yoke of shameful ignorance. According to ancient writers, the druids wore collars of gold, dressed magnificently, and the pomp in which they lived, created the esteem and authority they had among the Gauls.

The druids were divided into several classes; according to Ammianus Marcellinus, there were among their body, bards, eubages, and those strictly called druids. The employment of the bards was to celebrate the actions of heroes in verse. The eubages applied themselves to the contemplation of nature, and discovering her secrets. Those which were called druids, by way of eminence, joined to the study of physics that of ethics and politics. They had two sorts of doctrine, one for the people, which was therefore public; another for their disciples, which they had kept so inviolably secret, that no part of it has transpired, except that of the immortality of the soul, which, Pomponius Mela says, they divulged with a design to animate the courage of their countrymen, and inspire them with a contempt of death.

The Celtæ, like other nations, sunk into idolatry. Their priests the druids, who certainly had clearer notions of the Deity than the people, encouraged them in this foolish superstition. This reproach may too justly be objected to all legislators. The gods they worshipped, were Theutates, Hesus, and Taranes; the Romans make Theutates Mercury, Hesus Mars, and Taranes Jupiter; but this is doubted by

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men of learning among the moderns. It is however certain by the concurring testimony of antiquity, that they shed human blood on their altars, and the druids were the priests who slew the unhappy victims.

After the Gauls were conquered by the Romans, they, who before looked on God as the soul of the world, and worshipped him every-where, and in all places, though some were in a particular manner dedicated to him; followed the example of their masters, built temples and consecrated altars. The druids insensibly lost their credit, and were at last banished by a decree of the senate, either because it was apprehended they carried on some dangerous designs against the state, or continued human sacrifices.

The druids both among the Gauls and Germans preserved their authority by divination. But, what is more remarkable, these divinations were generally delivered by women, from whence grew the prodigious respect they had for them, which was sometimes carried to the pitch of adoration; for Tacitus tells us Velleda and Aurinia were reckoned among the goddesses.

We shall conclude this article by observing that the Celtæ, from a firm persuasion of the immortality of the soul and a future state, possessed true courage, had a just contempt of death, despised luxury, and refused to meet no danger, when virtue and honour called. It is indeed a pity such a nation had druids for their priests.

CE'MENT (*Dict.*)—We have various receipts for making Cement to mend broken china or glasses; one of the finest, and, at the same time, strongest Cements for this purpose is, the juice of garlick stamped in a stone mortar; this will leave little or no mark, if done with care.

Another Cement for broken glasses, china, and earthen ware, may be prepared by beating the white of an egg very clear, and mixing with it fine powdered quick-lime; or isinglass, powdered chalk, and a little lime may be mixed together, and dissolved in fair water, with which the glasses, &c. are to be cemented, and then set in the shade to dry; a precaution that should always be observed, which ever of the above Cements are used.

For the manner of preparing a Cement to bind together the various embellishments of grottoes. See the article GROTTO.

CEME'NTATORY *Water, aqua cementatoria.*—Those springs produce the water which passes under this name, that are strongly impregnated with vitriol of copper, which are met with at the bottom of several copper-mines, but especially in Hungary, near Neuvol, at the bottom of the Krapack mountains. The property of turning iron into copper is generally attributed to them; but, notwithstanding the knowledge of chemistry be so imperfect, it is easy to see there is no transmutation, but a simple precipitation, caused by the iron steeped in this water. This is the manner of the process to make this pretended transmutation:

The Cementatory water is very clear and limpid at the spring-head; reservoirs are made to catch it in considerable quantities. The water collected in these reservoirs is put into wooden troughs, about a foot wide, and of the same depth; as to their length, it is not determined; they are sometimes 100, sometimes 150 feet long. These troughs are filled with old iron as full as they can hold, then the Cementatory water is let in which covers the iron, dissolves and destroys it, and puts in its stead the copper with which it is impregnated. It has the same form as the iron, and in three months, or thereabouts, according to the strength of the vitriolic water, all the iron is consumed and destroyed, and the copper is entirely precipitated. The reason why the precipitated copper takes the same shape as the iron had before, is, because the vitriolic acid, having more affinity with the iron, leaves the copper which it held in a state of dissolution, to cleave to the iron: from whence it follows, that the quantity of copper which precipitates is exactly equal to the quantity of iron which dissolves.

By this method it is said a large quantity of copper is obtained, without much expence or trouble; and this copper, they tell you, is more ductile and malleable than what is procured from the mine after several meltings. This copper is soft, and like clay while under water, but it assumes a consistence and acquires a hardness on being brought into the air.

The two most famous springs of Cementatory water in Hungary, are those of Smolnitz and Heregrund: the first of these is said to furnish 600 quintals of such copper as we have described, such is the abundance of its water, and so strongly is it impregnated with vitriol of copper. Besides, it is remarkable that iron steeped in this water dissolves in three weeks entirely, and the copper succeeds in its place; whereas other springs take three months, sometimes a year, before the operation is completed.

Several other springs of the same quality are found in Hungary, Germany, Sweden, &c. Henckel, in his Pyritologia, page 764, explains the cause of these phænomena in this manner. The waters of these springs, says he, passing over the copper pyrites which are dissolved in the bowels of the earth, take off the vitriolic particles which are formed on the pyrites, and carry them along with them.

CE'NSUS, among the Romans, was an authentic declaration, made by the several subjects of the empire, of their respective names and places of abode, before proper magistrates, in the city of Rome, called censors; and in the provinces censitors, by whom the same were registered.

This declaration was accompanied with a catalogue, or enumeration in writing, of all the estates, lands, and inheritances they possessed; their quantity, quality, place, wives, children, tenants, domestics, slaves, &c.

The Census was instituted by king Servius, and was held every five years. It went through all the ranks of people, though under different names: that of the common people was called Census, or lustrum; that of the knights Census, recensio, recognitio; that of the senators, lectio, relectio.

Hence, also, Census came to signify a person who had made such a declaration: in which sense it was opposed to incensus, a person who had not given in his estate or name to be registered.

The Census among the old Romans was held, as is commonly thought, every five years; but this must not be taken to be precisely true: on the contrary, Dr. Middleton has shewn, that both the Census and lustrum were, for the most part, held irregularly and uncertainly, at very different and various intervals of time.

The Census was an excellent expedient for discovering the strength of the state: by it they learnt the number of the citizens, how many were fit for war, and who for offices of other kinds; how much each was able to pay of taxes towards the charge of the war.

The Census, according to Salmasius, was peculiar to the city of Rome. That in the provinces was properly called professio; but this distinction is not every-where observed by the ancients themselves.

CENT, signifies properly a hundred, being an abridgment of the word centum; but it is often used, in commerce, to express the profit or loss arising from the sale of any commodity: so that, when we say there is 10 per Cent. profit, or 10 per Cent. loss, upon any merchandize that has been sold, it is to be understood that the seller has either gained or lost ten pounds on every hundred pounds of the price at which he bought that merchandize, which is $\frac{1}{10}$ of profit, or $\frac{1}{10}$ of loss, upon the total of the sale.

To gain 100 per Cent. (or Cent. per Cent.) in trade, is the doubling of one's capital: to lose 50 per Cent. is to lose one half of it.

Cent, is also used in the trade of money, and signifies the benefit, profit, or interest of any sum of money, which is laid out for improvement.

Thus we say, money is worth 4 or 5 per Cent. upon exchange; that is to say, it brings 4 or 5 pounds profit for every hundred pounds laid or lent out.

Cent, is also used with regard to the draughts, or remittances of money, made from one place to another. Thus we say, it will cost $2\frac{1}{2}$ per Cent. to remit money to such a city.

When we say that a broker, or exchange-agent, takes one-eighth per Cent. fee or perquisite, for the contracts or bargains that are made by his means and interposition, it is to be understood, that there is to be paid to him the eighth part brokerage of a pound, which is 2 s. 6 d. for every hundred pounds he caused to be negociated. The one eighth per Cent. is commonly paid by both the contracting parties; that is to say, by him who gives, and by him who receives, the money; so that the brokers have $\frac{1}{4}$ or $\frac{1}{4}$ per Cent. for every bargain, which amount to 5 s. or $\frac{1}{4}$ of a pound for every 100 l. and 2 l. 10 s. for every 1000 l.

CE'NTAURS, in mythology, a kind of fabulous monsters, half men, half horses.

The poets feign that the Centaurs were the sons of Ixion and a cloud. The reason of this fancy is, that the castle to which they retired was called νεφέλη, which signifies a cloud. This fable is differently interpreted: some will have the Centaurs to have been a body of shepherds and herdsmen, rich in cattle, who inhabited the mountains of Arcadia, and to whom is attributed the invention of bucolic poetry.

The Centaurs in reality were a tribe of Lapithæ, who inhabited the city Pelethronium, adjoining to mount Pelion, and first invented the art of breaking horses, as is intimated by Virgil.

CENTENI'NUM *Ovum*, among naturalists, denotes a sort of hen's egg, much smaller than ordinary, vulgarly called a cock's egg; from which it has been fabulously held that the cockatrice or basilisk was produced. *Brown, Vulg. Err.*

The name is taken from an opinion, that these are the last eggs which hens lay, having laid an hundred before; whence Centeninum, q. d. the hundredth egg.

M. La Peyronie has carried the history of the ova Centenina to a greater length, as well as certainty; a hen was brought to him which for a considerable time laid no other eggs: the same hen was also observed to crow like a cock, and to render by the cloaca a thin yellow matter, much like the yolk of an egg diluted in water. Upon opening her, she was found hydropical; a bladder as big as the fist, full of water, was found contiguous to the oviduct, which it pressed and crowd-ed ed in such a manner, as not to leave the cavity thereof above five lines in diameter; so that a common egg, such as it is when it falls from the ovary into the tube, could not pass without bursting, by which the yolk was let out, and discharged another way. *Mem. Acad. Scienc. An.* 1710.

CE'NTER (*Dict.*)— CENTER *of the equant*, in the old astronomy, a point in the line of the aphelion; being so far distant from the center of the excentric, towards the aphelion, as the sun is from the excentric towards the perihelion.

CE'NTERING *of an optic glass*, the grinding it so as that the thickest part is exactly in the middle.

Method of CENTERING *an object-glass.*— A circular object-glass is said to be truly centered, when the center of its circumference is situated in the axis of the glass; and to be ill centered, when the center of its circumference lies besides the axis. Thus let *d* (*Plate* XV. *fig.* 1.) be the center of the circumference of an object-glass *a b c*, and suppose *e* to be the point where its axis cuts its upper surface. If the points *d* and *e* do not coincide, the glass is ill centered. Let *a f g* be the greatest circle that can be described about the center *e*, and, by grinding away all the margin without this circle, the glass will become truly centered. Now, the center *e* which lies in the axis of the glass, may be found by several methods, but I prefer this that follows:

Let a couple of short cylindrical tubes be turned in wood or brass, and let the convexity of the narrower be so exactly fitted to the concavity of the wider as just to turn round in it with ease, but without waddling; and let the planes of the bases of the tubes be exactly perpendicular to their sides. Place the base of the narrower tube upon a smooth brass plate, or a wooden board of an equal thickness, and, with any sharp-pointed tool, describe a true circle upon the board round the outward circumference of the base: and upon the center of this circle, to be found when the tube is removed, describe a larger circle upon the board. These two circles should be so proportioned, that the one may be somewhat greater, and the other somewhat smaller, than any of the glasses intended to be centered by them. Then, having cleared out all the wood within the inner circle, put the end of the tube into this hole, and there fasten it with glew, so that the base of the tube may lie in the surface of the board: then having fixed the wider tube very firmly in a hole made in the window-shutter, and having darkened the room, lay the glass to be centered upon the board fixed to the narrower tube; and having placed the center of it, as near as you can guess, over the center of the hole, fix it to the board with two or three lumps of pitch, or soft cement, placed at its circumference. Then put the narrower tube into the wider as far as it can go, and fix up a smooth screen of white paper to receive the pictures of objects that lie before the window, and, when they appear distinct upon the screen, let the inner tube be turned round upon its axis, and, if the center of the glass happens to be in this axis, the picture will be perfectly at rest upon the screen; if not, every point of it will describe a circle. With a pencil mark the highest and lowest places of any one circle, described by some remarkable point in that part of the picture which appears most distinct; and, when this point of the picture is brought to the highest mark, stop the circular motion of the tube, and, keeping it in that position, depress the object-glass, till the point aforesaid falls exactly in the middle between the two marks. Then turn the tube round again, and the point of the picture will either rest there or will describe a much smaller circle than before, which must be reduced to a quiescent point by repeating the same operation. Then, I say, the center (of refraction) of the glass will lie in the axis of the tube, and, by consequence, will be equidistant from the circumference of the large circle described upon the board fixed to it. Now, to describe a circle upon the glass *f g b* (*fig.* 2.) about its center of refraction, let a long slender brass plate *a c b* be bent square at each end, as represented in the figure, leaving a piece in the middle equal in length to the diameter of the large circle *a d b e* that was described upon the board; and let the square ends of the plate be filed away, so as to leave a little round pin in the middle of each. Then having laid it over the glass, along any diameter of the large circle *a d b e*, make two holes in the board to receive the pins *a b*, and find the center of this circle upon the long plate; and with this center *c* describe as large a circle as you can, upon the glass underneath, with a diamond-pointed compass; and grind away all the margin as far as this circle *f i k*, in a deep tool for grinding eye-glasses; and then the glass will be truly centered. If the pitch or cement be too soft to keep the glass from slipping, while the circle is describing, it may be fixed firmer with wax or harder cement.

To shew the reason of this practice, (*fig.* 3.) represents a section of the object-glass *k l m*, of the board *a b*, and of the tubes *c d* and *b i*, and of the window-shutter *n o*. Imagine the plane of this section, or of the scheme, to pass through *e*, a point in the glass, which keeps its place, while the rest are turning round it, by the motion of the tube; let it also pass through *l* the center of refraction in the glass, and cut an object in the line P Q R; then let a pencil of rays flowing from any Q be collected to the focus *q*, upon the screen S T; and the points Q, *l*, *q*, will be in a straight line described by the axis, or principal ray, of the pencil. Draw Q *e f*, cutting the screen in *f*; and, while the tube is turning round, the line Q *l q* will describe a conical surface, whose axis is the fixed line Q *e f*; and, therefore, the focus *q*, or image of the point Q, will describe a circle *q g x* about *f*, to be found upon the screen by bisecting the interval *g x* between the highest and lowest points of the circle. Now, as *f* is the center of this circle, so *e* is the center of another circle described by *l*; and, therefore, by depressing the glass *k l* along the surface of the board *a b*, till the image *q* falls upon the mark *f*, the point *l* will be depressed to *e* the center of motion, and then it will be in the axis of the tube, and consequently equidistant from the circumference of the circle described upon the board *a b*; and here it is plain that the image *q* will be at rest in the point *f*.

It is not necessary to the accuracy of the practice, that the point Q should be in the axis of the glass. For if the glass *k l m* be turned about its axis Q L *q*, the image *f* of any collateral point Q will remain at rest; because the points Q *l* are at rest, and the axis Q *e f* of the oblique pencil is a straight line.

The chief advantage of having a glass well centered is this, that the rays coming through any given hole or aperture, whose center coincides with the axis of the glass, will form a distincter image, than if that center lay beside the axis; because the aberrations of the rays from the geometrical focus of the pencil are as the distances of their points of incidence from the center of refractions in the glass.

If the picture be received upon the unpolished side of a piece of plane glass, instead of the paper S T, its motions may be discerned more accurately by viewing it from behind through a convex eye-glass; as in a telescope where cross-hairs are usually strained over a hole put into the place of the rough glass. Therefore, as object-glasses are commonly included in cells that skrew upon the end of the tube, one may examine whether they be pretty well centered, by fixing the tube, and by observing, while the cell is unskrewed, whether the hairs keep fixed upon the same lines of an object.

CENTRI'FUGAL *Wheel*. See *Centrifugal* WHEEL.

CE'NTRO-BARYC *Method* (*Dict.*)— The doctrine is comprised in the following theorem, with its corollaries.

Every figure, whether superficial or solid, generated by the motion of a line or a figure, is equal to the factum of the generating magnitude into the way of its center of gravity, or the line which its center of gravity describes.

Demonst. For suppose the weight of the whole generating magnitude collected in the center of gravity; the whole weight, produced by its motion, will be equal to the factum of the weight moved, into the center of gravity. But, when lines and figures are considered like homogeneous heavy bodies, their weights are as their bulks: and, therefore, the weight moved is the generating magnitude; and the weight produced, that generated. The figure generated, therefore, is equal to the factum of the magnitude, into the way of its center of gravity. Q. E. D.

Corol. 1. Since a parallelogram A B C D (*Plate* XV. *fig.* 7.) is described, if the right line A B proceed according to the direction of another A C, with a motion still parallel to itself; and the way of the center of gravity E is equal to the right line E F, perpendicular to C D, that is, to the altitude of the parallelogram: its area is equal to the factum of the base C D, or the describent line, into the altitude E F. See PARALLELOGRAM in the Dict.

Corol. 2. In the same manner it appears, that the solidity of all bodies, described by a plane descending according to the direction of any right line A C, is had by multiplying the describing plane by the altitude. See PRISM, and CYLINDER in the Dict.

Corol. 3. Since a circle is described, if the radius C L (*fig.* 5.) revolve round a center C, and the center of gravity of the radius C L be in the middle F; the way of the center of gravity is a periphery of a circle X, described by a subduple radius: consequently the area of the circle is equal to the factum of the radius C L, into the periphery described by the subduple radius C F.

Corol. 4. If a rectangle A B C D (*fig.* 5.) revolve about its axis A D, the rectangle will describe a cylinder, and the side B C the superficies of a cylinder. But the center of gravity of the right line B C is in the middle F; and the center of gravity of the generating plane in the middle G, of the right line E F. The way of this latter, therefore, is the periphery of a circle described by the radius E G; that of the former, the periphery of a circle described by the radius E F. Wherefore, the superficies of the cylinder is the factum of the altitude B C, into the periphery of a circle described by the radius E F, or the base. And the solidity of the cylinder is the factum of the generating rectangle A B C D, into the periphery of a circle described by the radius E G, which is subduple of E F, or of the semidiameter of the cylinder.

Suppose *v. gr.* the altitude of the describing plane, and therefore of the cylinder B C $= a$; the semidiameter of the

base

baſe D C $= r$; then will E G $= \frac{1}{2} r$; and, ſuppoſing the ratio of the ſemidiameter to the periphery $= 1 : m$, the periphery deſcribed by the radius $\frac{1}{2} r = \frac{1}{2} m a r$. Therefore, multiplying $\frac{1}{2} m r$ by the area of the rectangle A C $= a r$; the ſolidity of the cylinder will be $= \frac{1}{2} m a r$. But $\frac{1}{2} m a r = \frac{1}{2} r . m r . a$ the area of the circle deſcribed by the radius D G. It is evident, therefore, the cylinder is equal to the factum of the baſe into the altitude.

Corol. 5. In like manner, ſince the center of gravity of the right line A B (*fig.* 8.) is in the middle M, and the ſurface of a cone is deſcribed, if the triangle A B C revolve about its axis; if P M $= \frac{1}{2}$ C; the ſuperficies of the cone will be equal to the factum of its ſide A B, into the periphery deſcribed by the radius P M, on the ſubduple of the ſemidiameter of the baſe B C.

Suppoſe, *v. gr.* B C $= r$, A B $= a$; the ratio of the radius to the periphery $1 : m$; then will P M $= \frac{1}{2} r$, and the periphery deſcribed by this radius $= \frac{1}{2} m r$. Therefore, multiplying $\frac{1}{2} m r$ into the ſide of the cone A B, the product is the ſuperficies of $\frac{1}{2} a m r$. But $\frac{1}{2} a m r$ is alſo the factum of $\frac{1}{2} a$ and $m r$: therefore, the ſurface of the cone is the product of the periphery, into half the ſide.

Corol. 6. If the triangle A C B (*fig.* 6.) revolve about an axis, it deſcribes a cone; but if C B be biſected in D, and the right line A D be drawn, and A O $= \frac{2}{3}$ A D; the center of gravity will be in O. The ſolidity of the cone, therefore, is equal to the factum of the triangle C A B, into the periphery deſcribed by the radius P O; but A D : A O :: B D : O P; and A O $= \frac{2}{3}$ A D, and D B $= \frac{1}{2}$ C B. Therefore, O P $= \frac{2}{3}$ D B $= \frac{1}{3}$ C B.

Suppoſe, *v. gr.* C B $= r$, A B $= a$; the ratio of the radius to the periphery $= 1 : m$. Then will O P $= \frac{1}{3} r$ the periphery deſcribed by this radius $\frac{1}{3} m r$; the triangle A C B $= \frac{1}{2} r$; and, therefore, the ſolidity of the cone $\frac{1}{3} m r \frac{1}{2} a r = \frac{1}{6} a m r^2$. But $\frac{1}{6} a m r^2 = \frac{1}{2} r . m r \frac{1}{3} a$. Or, the factum of the baſe of the cone into the third part of the altitude.

This elegant theorem, which may be ranked among the chief inventions in geometry of the laſt age, was taken notice of long ago by Pappus; but the jeſuit Guldinus was the firſt who ſet it in its full light, and exhibited its uſe in a variety of examples. Several other geometers, after Guldinus and Pappus, alſo uſed it in meaſuring ſolids, and ſurfaces generated by a rotation round a fixed axis, eſpecially before the late invention of the integral calculus: and it may ſtill take place in ſome caſes, where the integral calculus would be more difficult. M. Leibnitz has obſerved, that the method will hold, though the axis or center be continually changed during the generative motion.

CE'PITES, in natural hiſtory, a name uſed by the ancients to expreſs a gem, which gave the repreſentation of ſeveral cluſters of plants and flowers in the beds of a garden, with naked veins, expreſſing the walks between.

CERA'STES, *the horned ſnake*, in zoology, the name of a ſpecies of ſerpent, which has on its forehead two protuberances, looking like ſhells, but of a more ſolid texture, and, from their reſemblance of horns, have given it its name: theſe are often no larger than grains of barley: its teeth are like thoſe of the viper, and are placed in the ſame order: it is of the number of viviparous ſerpents, and is remarkable among the ſerpent claſs for its long enduring thirſt. It is found in Lybia and Arabia, particularly about the town of Suez.

CERA'SUS, *the cherry-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, or compoſed of ſeveral petals arranged in a circular form: the piſtil ariſes from the cup, and finally becomes a roundiſh or heart-faſhioned fleſhy fruit, containing a ſtone of the ſame ſhape with its kernel.

The ſeveral ſorts of cherry-trees are propagated by binding, or grafting the ſeveral kinds into ſtocks of the black or wild red cherries, which are ſtrong ſhooters, and of a longer duration than any of the garden kinds. The ſtones of theſe two kinds are ſown in a bed of light ſandy earth in autumn, and the young ſtocks produced from them are to remain where they riſe till the ſecond autumn after their ſowing, when, in October they ſhould be planted out into a rich earth, at three feet diſtance from row to row, and at about ten inches diſtance in the rows. The ſecond year after the planting-out, they will be fit to bud, if they are intended for dwarfs; but, if they are intended for ſtandards, they will not be tall enough till the fourth year, for they ſhould be budded or grafted near ſix feet from the ground. The grafting is uſually performed in ſummer, and the head of the ſtock is to be cut off in the beginning of the March following, about ſix inches above the bud; and if the bud has ſhot well, and there is any fear of its being diſplaced by the winds, it muſt be gently tied up to the part of the ſtock left above it. The autumn afterwards, theſe trees will be fit to remove, and be ſet where they are to remain; or they may be left two years. Many, when they plant theſe trees in their places, lop off a great part of their heads, but this is an injury that often kills them; and, when they eſcape, they ſeldom get well over it for four or five years. If the trees are intended for walls, it is adviſeable to plant dwarfs between the ſtandards, that theſe may cover the lower part of the wall, while the others ſpread over the upper part; and, when the dwarfs riſe to fill the whole walls, the ſtandards ſhould be taken entirely away. When theſe trees are taken up from the nurſery, the dead fibres of the roots muſt be carefully taken off, and the upper part of the ſtock which is above the bud, muſt be cut off cloſe down to the back part of it: the bud muſt be placed directly from the wall. Cherry-trees thrive beſt on a dry hazley loam, and in a gravelly ſoil are very ſubject to blights, and ſeldom ſtand long good. They ſhould be placed at fourteen feet aſunder, with a ſtandard tree between each two. In pruning theſe trees, their ſhoots ſhould never be ſhortened, for they moſtly produce their fruit from their extreme part. All the foreright ſhoots are to be diſplaced, and the others trained horizontally; and, where there is a vacancy in the wall, the branches, being ſhortened, will throw up a ſhoot or two to fill it. *Miller's Gard. Dict.*

CERATO'NIA, *the carob-tree*, commonly called St. John's bread, in botany, a genus of plants whoſe characters are: it hath male and female flowers on diſtinct plants: the male flowers have an empalement of one leaf, which is cut into five parts: the female flowers conſiſt of one leaf, having a ſingle ſtyle, which afterwards turns to a fleſhy hard pod, including kidney-ſhaped ſeeds; each being divided by an iſthmus, in the pod.

We have but one ſpecies of this plant; viz. 1. Ceratonia. H. L. The carob-tree or St. John's bread.

This tree is very common in Spain, and in ſome parts of Italy, as alſo in the Levant, where it grows in the hedges, and produces a great quantity of long flat brown-coloured pods, which are thick, mealy, and of a ſweetiſh taſte. Theſe pods are many times eaten by the poorer ſort of inhabitants, when they have a ſcarcity of other food: but they are apt to looſen the belly, and cauſe gripings of the bowels. Theſe pods are directed by the College of Phyſicians to enter ſome medicinal preparations; for which purpoſe they are often brought from abroad.

In England the tree is preſerved by ſuch as delight in exotic plants, as a curioſity: the leaves always continue green; and, being different in ſhape from moſt other plants, afford an agreeable variety, when intermixed with oranges, myrtles, &c. in the green-houſe.

Theſe plants are propagated from ſeeds, which, when brought over freſh in the pods, will grow very well, if they are ſown in the ſpring upon a moderate hot-bed; and, when the plants are come up, they ſhould be carefully tranſplanted, each into a ſeparate ſmall pot filled with light rich earth, and plunged into another moderate hot-bed; obſerving to water and ſhade them until they have taken root; after which you muſt let them have air in proportion to the heat of the weather. In June you muſt inure them to the open air by degrees, and in July they ſhould be removed out of the hot-bed, and placed in a warm ſituation, where they may remain until the beginning of October, when they ſhould be removed into the green-houſe, placing them where they may have free air in mild weather: for they are pretty hardy, and require only to be ſheltered from hard froſts. When the plants have remained in the pots three or four years, and have gotten ſtrength, ſome of them may be turned out of the pots in the ſpring, and planted into the full ground, in a warm ſituation, where they will endure the cold of our ordinary winters very well, but muſt have ſome ſhelter in very hard weather.

CERA'TUM *epuloticum*, a name given in the late London Diſpenſatory to the compoſition commonly called Turner's cerate, and there ordered to be made in this manner: take oil of olive, a pound; yellow wax and prepared calamy, of each half a pound; melt the wax in the oil, and, when the mixture begins to congeal again, ſprinkle in the powder, and continue ſtirring it till the whole is cold. *Pemberton's Lond. Diſpenſ.*

Ceratum *mercuriale*, a form of medicine preſcribed in the late London Pharmacopœia, and ordered to be made in the following manner: take yellow wax and purified hogs lard, of each half a pound; quickſilver, three ounces; ſimple balſam of ſulphur, a drachm: melt the wax and lard, and then add to them gradually the quickſilver, firſt well divided by the balſam of ſulphur. *Pemberton's Lond. Diſpenſ.*

CERAU'NIA, Ceraunias, or Ceraunius *lapis*, in natural hiſtory, a ſort of flinty figured ſtone, of no certain colour, but of a pyramidal or wedge-like figure; popularly ſuppoſed to fall from the clouds in thunder ſtorms, and to be poſſeſſed of divers notable virtues, as of promoting ſleep, preſerving from lightning, &c.

The generality of naturaliſts take the Ceraunia for a native ſtone, formed among pyrites, of a ſaline, concrete, mineral juice. Mercatus and Dr. Woodward aſſert it to be artificial, and to have been faſhioned thus by tools.

CE'RUSE (*Dict.*)— The manner of preparing Ceruſe in quantities at Venice is deſcribed by Sir Philip Vernatti. The plates for this purpoſe are large, and about the thickneſs of a knife's back, and rolled up, but ſo as that the ſurfaces no where touch. Each roll is put into a ſeveral pot, wherein it is upheld by a little bar from the bottom, that it may not touch the vinegar, which is alſo put into the pot, to effect the

the converſion. The pots are then covered with a plate of lead, as cloſe as may be, and over this with a board; after which they are let down into a bed of horſe-dung, big enough to contain four hundred pots. After three weeks continuance, the pots are taken up, the plates unrolled, laid on a board, and beaten with battledores, till all the flakes come off, which, when they prove good, are hard, thick, and weighty; when otherwiſe, porous and light, and ſometimes black, or burned, if the dung proves not well ordered: ſometimes alſo there will be no flakes, or Ceruſe at all. From the beating-table it is carried to the mill, ground with water between two ſtones, to an almoſt impalpable fineneſs. Laſtly, it is molded into ſmall parcels, and expoſed to the ſun to dry, and harden for uſe. *Vernatti in Phil. Tranſ. N.* 138.

Ceruse, *in the manufacture of China.* The Chineſe make Ceruſe of this preparation of lead, which it is eaſier to ſee the advantages of, than to comprehend the manner in which they are brought about. The China veſſels, when they have been baked, and finiſhed, as to the matter, and even covered with their varniſh, will yet receive, into their very ſubſtance, the colours which thoſe people mix up, with an addition of Ceruſe, and, as ſome of the old accounts ſay, of copperas and ſaltpetre; but, though theſe latter ingredients had uſed to be added, the Ceruſe alone ſupplies their place at this time, at leaſt in very many things. It would be worth while to try an admixture of Ceruſe with the colours uſed in painting on glaſs; and this, after a ſecond baking, might, perhaps, be found to incorporate itſelf in the ſame manner that it does into China-ware, and to recover the long loſt ſecret of letting in the ſtrongeſt colours, without hurting the tranſparence. *Obſerv. ſur les coutum. de l' Aſie.*

Ceruse *of antimony*, a preparation of the regulus of that mineral, powdered, mixed with ſpirit of nitre, and diſtilled in a retort, till no more fumes will riſe. What remains at the bottom, being pulverized, and waſhed ſweet, makes the Ceruſa antimonii, a medicine preſcribed as a diuretic, and by ſome reckoned equal to the mineral bezoar. Some prepare the Ceruſe by fuſing and fulminating the regulus with nitre in ſubſtance; the produce of which is a fixed powder, called the Ceruſe of antimony.

CE'RVUS *volans*, in natural hiſtory, a name given by authors to the ſtag-fly, or ſtag-horned beetle, a very large ſpecies of beetle with horns ſloped, and ſomewhat like thoſe of a ſtag.

CE'SARE, *in logic*, a mode of ſyllogiſms in the ſecond figure, wherein the major propoſition, and concluſion, are univerſal negatives, and the minor an univerſal affirmative. Such is, CE, No man who betrays his country, deſerves praiſe. SA, Every virtuous man merits praiſe. RE. Therefore, no man who betrays his country is virtuous. *Walch. Lex. Phil.*

CETA'CEOUS, in a proper ſenſe, denotes only thoſe large fiſh which are viviparous, or breed their young within their own bodies, and have no gills, but lungs, with which they breathe, like quadrupeds, having but one pair of fins, and giving ſuck to their young.

Theſe ſcarce differ in any thing from quadrupeds, except the want of feet. They have no air-bladder, but are enabled, by the air they receive into the lungs in reſpiration, to render their bodies equiponderant to water.

Cetaceous, in the ordinary uſe, is alſo extended to all larger fiſh, called by the Latins belluæ marinæ, or ſea-beaſts.

In which view, Cetaceous fiſhes are divided into greater, including the whole kind properly ſo called; and leſſer, to which belong the porpoiſe, ſhark, dog-fiſh, &c.

CE'TUS, *the whale*, in zoology. See the article WHALE.

CHAFERCONNEE'S, printed linens, manufactured in the grand Mogul's dominions. They are imported by the way of Surat. They are of the number of thoſe linens, the trade of which is prohibited in France.

CHA'FERY, in the iron works, the name of one of the two principal forges. The other is called the finery. When the iron has been wrought at the finery, into what is called an ancony, or ſquare maſs, hammered into a bar in its middle, but with its two ends rough, the buſineſs to be done at the Chafery is the reducing the whole to the ſame ſhape, by hammering down theſe rough ends to the ſhape of the middle part. *Ray's Engliſh Words.*

CHAIN, in mechanic arts, a ſeries of ſeveral rings, or links, fitted into one another.

Chain alſo denotes a kind of ſtring, of twiſted wire, ſerving to hang watches, tweezer-caſes, and other valuable toys, worn by the ladies, upon.

The invention of this piece of curious work is owing to the Engliſh; whence, in foreign countries, it is denominated the Engliſh Chain. It is but of very late years that foreigners have undertook to imitate them, and hitherto with no extraordinary ſucceſs: thoſe of Paris have come neareſt. Theſe Chains are uſually either of ſilver or gold, ſome of gilt copper; the thread, or wire, of each kind to be very fine.

For the fabric, or making of theſe Chains.—A part of the wire is folded into little links of an oval form; the longeſt diameter about three inches; the ſhorteſt one. Theſe, after they have been exactly ſoldered, are again folded into two; and then bound together, or interwove, by means of ſeveral other little threads of the ſame thickneſs; ſome whereof, which paſs from one end to the other, imitate the warp of a ſtuff; and the others, which paſs tranſverſe, the woof. There are at leaſt four thouſand little links in a Chain of four pendants; which are, by this means, bound ſo equally, and withal ſo firmly together, that the eye is deceived, and takes the whole to conſiſt of one entire piece.

Chain-*pump*. See PUMP.

Chain-*ſhot*, in war, two bullets, or rather half-bullets, linked together by a Chain: their uſe at ſea is to ſhoot down yards, or maſts; or to cut the ſhrouds, or any other rigging of a ſhip.

Chain-*wales*, in a ſhip, are the broad timbers which are made jetting out of her ſides, to which, with Chains, the ſhrouds are faſtened, and by them ſpread out, the better to ſecure the maſts.

CHALCE'DONY. See Calcedony, in the Dictionary.

CHALDE'AN *philoſophy*. It is no eaſy matter to give a juſt idea of the Chaldean philoſophy; the monuments which remain of it are much leſs ancient than the ſect itſelf: what we can gather from the Greeks ſeems but of ſmall authority, and will give us but little inſight; for the Greeks had a turn of genius quite different from the Orientals. They altered every thing they received from other nations, whom, with an air of contempt, they called barbarous. Another reaſon which ſhould make us doubtful in determining what were the real opinions of the Chaldeans, is this, that they kept the dogmas of their ſect a ſecret among themſelves; none were admitted to the knowledge of them, but privileged diſciples; they never publiſhed them but under the veil of allegories, or ſymbols. Thus we can only form conjectures from what the Greeks and Arabians have tranſmitted to us. Hence that diverſity of opinions among the learned on this head, who, inſtead of explaining, have rendered it more obſcure and myſterious. Witneſs a ſect of philoſophers which appeared in Aſia much about the time of our Saviour's birth. Theſe men, to give weight to their dreams and idle doctrines, reſolved to colour them with the air of great antiquity, and made them paſs under the name of Chaldean and Perſian, the precious remains of the doctrines of thoſe philoſophers. In conſequence of which, they forged a great number of works in the name of the famous Zoroaſter, who was then looked on in Aſia as the chief and maſter of all the Magi in Perſia and Chaldea. Many men of eminent learning, both ancient and modern, have taken a great deal of pains to diſcover who this Zoroaſter was, ſo much boaſted of in the Eaſt, but, after all their diſquiſitions, have been forced to acknowledge themſelves in the dark.

Other philoſophers, not leſs ignorant of the ſacred myſteries in the ancient doctrine of the Chaldeans, choſe to ſhare the honour of ſetting up a ſeparate ſect with the former. Theſe therefore reſolved to give Ægypt the honour of Zoroaſter's birth, and were as bold as their antagoniſts, in forging works which they attributed to Zoroaſter. As Pythagoras and Plato went into Ægypt to ſtudy the ſciences, which this nation was ſaid to have carried to a very great perfection, they imagined the ſyſtems of theſe two Greek philoſophers a faithful extract of the doctrine of Zoroaſter. This boldneſs of forging books on both ſides ſufficiently ſhews what credit we ought to give to theſe two ſects of philoſophers. The Chaldeans were in great reputation among the Babylonians. They were the prieſts of the nation, and diſcharged the ſame offices as the Magi among the Perſians, as to inſtructing the people in all religious matters, ceremonies, and ſacrifices: from whence the Greek hiſtorians have often confounded one with the other; and this is a mark of their little nicety, in not diſtinguiſhing as they ought between the ſtate of philoſophy among the ancient Babylonians, and the ſtate of philoſophy after the Babylonians became ſubject to the Perſians.

It may not be amiſs juſt to remark, that among all ancient nations, namely, the Aſſyrians, Perſians, Ægyptians, Æthiopians, Gauls, Britons, Germans, Scythians, Hetrurians, the prieſts were always looked upon as ſages and philoſophers. They were, in general, men of addreſs and cunning, who made religion ſerve the political views and intereſts of princes. The Chaldeans acknowledged a ſupreme Being, author of all things, who eſtabliſhed that beautiful harmony which connects the univerſe. Though they thought matter eternal and pre-exiſtent to the operation of God, yet they did not ſuppoſe the world eternal; for their coſmogony repreſents our earth as an opaque chaos, wherein all the elements were confuſedly blended together, before it received that order and arrangement which rendered it habitable. They ſuppoſed, that monſtrous animals, of various forms, were born in the womb of this rude chaos, and were ſubject to a woman named Omerca. That the God Belus cut her in two; of one half he made the heavens, of the other the earth, and that the death of this woman deſtroyed all the monſtrous animals before-mentioned; that Belus, after having formed the world, and produced the living creatures in it, cauſed his own head to be cut off; that men and animals were produced out of the earth; that other Gods dipped men in the blood which flowed from the wound of the God Belus; and that this was the reaſon why men were endowed with intellectual faculties, becauſe they had received a part of the deity.

The fragments of Beroſus, preſerved by Syncellus, obſerve, that this coſmogony is nothing but a myſterious allegory, by which the Chaldeans expreſſed the creation of the world. This allegory indicates, that man owes his creation and birth immediately to God, and that the ſupreme Being made uſe

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of another God, for the creation of the world. This opinion was univerfally received all over the Eaft. They thought it beneath the majefty of the fupreme God to prefide immediately over the world; that all-perfect, as he was, he confined his contemplations to his own perfections, not concerning himfelf about poor mortals, but left the care to inferior local and tutelary deities. In honour of thefe only, incenfe fmoaked, and the blood of victims flowed upon the altars. But befides the good genii, who delighted in doing good to mankind, they admitted alfo of evil genii; thefe laft they fuppofed to be formed of groffer matter than the firft, and that a continual war fubfifted between them; the firft proceeded from the good principle, the latter from the bad. Hence it appears, that the doctrine of the two principles firft rofe in Chaldea, from whence it was propagated to the Perfians, and prevailed univerfally, almoft, among the Orientals. This doctrine feems to owe its rife to the facred hiftory of the fall of the firft man; for, according to them, thefe dæmons affumed all fhapes, at pleafure, to delude thofe who liftened to them. Such were the myfteries in which the Chaldeans initiated a fmall number of adepts, who were to fucceed them, and hand the tradition down from one age to another.

The doctrine they taught in public, according to Herodotus and Diodorus Siculus, was, that the fun, moon, and ftars, efpecially the planets, were deities which muft be adored. The ftars, principally in veneration among them, were the figns of the zodiac, without taking any thing from the dignity of the fun and moon, which they looked on as primary deities. They called the fun Belus, the moon Nebo, or Nergal. The common people, born to be dupes to thofe who have wit enough to gain the afcendant over them, thought a deity refided in every ftar, and, confequently, that fo many Gods deferved their adoration. As to the fages and philofophers of the country, they contented themfelves with placing their genii, or deities of a lower clafs, in them, as directors of their different motions.

This principle once eftablifhed, it was not difficult for them to perfuade the people, that the ftars had a great influence on the happinefs or mifery of mankind; and hence fprung judicial aftrology, in which the Chaldeans had the reputation of excelling, infomuch that all eminent in this fcience were called Chaldeans. Thefe quacks, like our fortune-tellers, pretended to read in the ftars human deftinies and future events: but the reality of this fcience depended upon the credulity of the people; for what connection can there be between the regular motion of the ftars and the free events of the will? The eager curiofity of prying into futurity is a diftemper as ancient as the world, but has exercifed its dominion moft among the Orientals, who are conftitutionally of a warm imagination. It is incredible to what extravagance this has prevailed, by the cunning artifices of the priefts: judicial aftrology was the ftrongeft rein by which they always ruled the people of the Eaft. Sextus Empiricus declaims, with much ftrength and eloquence, againft this trifling art, fo baneful to the happinefs of mankind, by the evils it neceffarily produces. The Chaldeans, in fhort, ruled the people with a rod of iron, which their own fuperftition impofed on themfelves; for nothing could be done without confulting the augures and aftrologers. Notwithftanding the credulity of the people, the impofture of judicial aftrology was too grofs not to betray itfelf. Under the confulate of M. Popilius and Cneius Calpurnius, it was decreed, by an edict of the Prætor Cor. Hifpallus, that the Chaldeans fhould depart from Rome, and all Italy, within the fpace of ten days; and the reafon affigned by the edict was, that they abufed weak and credulous minds, by their pretended knowledge of the ftars. Alexander himfelf, who was at firft very much prejudiced in favour of the Chaldeans, defpifed them after Anaxarchus fhewed him the vanity of judicial aftrology.

Though aftronomy was in very great efteem among the Chaldeans, and they cultivated it very much, yet they do not feem to have made any confiderable progrefs in it. What aftronomers muft they have been, to fuppofe the eclipfes of the moon to have proceeded from her turning her opaque fide towards the earth; and that the other was always luminous of itfelf, independent of the fun? Where had they learned that the terreftrial globe fhould be confumed by fire, on a conjunction in the fign Cancer, and be drowned on a conjunction in the fign Capricorn? Yet the Chaldeans have paffed for great aftronomers. Pretences to antiquity have been the foible of all nations, and a thoufand abfurdities are owing to it. The Chaldeans, in the time of Alexander the Great, pretended, that aftronomy had flourifhed in Chaldea four hundred and feventy thoufand years; but this is not probable, and only exifted in the warm imaginations of the Chaldeans. Callifthenes, who accompanied Alexander in his military expeditions, fent the account of the obfervations he had found at Babylon to Ariftotle: thefe obfervations went no farther back than one thoufand nine hundred and three years; which, if they are fuppofed to begin at the four thoufand three hundred and eighty-third year of the Julian period, when Babylon was taken, will go no higher than the two thoufand four hundred and eightieth year of the fame period. This falls very fhort of the chronological fyftem of Mofes, according to the verfion of the Septuagint, carried back no farther than the flood. If the Chaldeans had made more ancient obfervations, how came Ptolemy, who was fo exact an aftronomer, not to mention them, and fpeak of none till the firft year of Merodach, king of Babylon, which falls on the twenty-feventh year of the æra of Nabonaffar? The pretended antiquity of the Chaldean obfervations no more deferve our credit, therefore, than Porphyrius, who builds upon them. Epigenius affirms the aftronomical obfervations, found on the baked bricks at Babylon, go no farther back than feven hundred and twenty years; and, as even this is too long a fpace of time to be juftified by hiftory, Berofus and Critodemus have fhortened it to four hundred and eighty years.

After this, who would not laugh to fee the Chaldeans gravely prefenting us with their aftronomical obfervations, in fupport of their antiquity, when their own authors give them the lye? They certainly, as Lactantius fays, thought, by going fo far back as four hundred and feventy thoufand years, to give a fort of fanction to their antiquity, which make it lefs fufpected; but, in this, they were miftaken; for all chronology, not fupported by facts, is not hiftorical, and, confequently, proves nothing in favour of the antiquity of a nation. When we once know the courfe of the ftars, we can forefee, from their regular motion, the conjunctions, oppofitions, &c. which fhall happen at any future time, and may, confequently, by calculation, find out thefe phænomena, in any time paft, of the fame date; but thefe calculations, and a fyftem of fuch obfervations, purely arbitrary in point of time, no more prove the world to have exifted from eternity, than that it fhall laft to eternity. Such is the cafe of the ancient Chaldeans, with regard to their obfervations of four hundred and feventy thoufand years: if a fucceffion of hiftorical facts were annexed to thefe obfervations, credit ought to be given to them; but, as no fuch appear, they are only to be looked on as the dreams of a calculator.

CHALK, *(Dict.)*—The hard, dry, and fine Chalk is much the propereft for burning into lime; but the foft, unctuous Chalk is greatly the beft for lands; becaufe it diffolves with froft and rain, in the manner of marl. This fort of Chalk, ufed inftead of marl, by way of a manure, is a very fine improvement for fome forts of land, efpecially the firft time it is laid on. It changes the very nature of the foil, and makes it rich, for a time; but it foon exhaufts itfelf, and requires dunging, to keep it in heart afterwards. A fecond chalking will prove of very little benefit to thofe lands, which fucceeded ever fo well with the firft, unlefs they have lain a long time to recover themfelves after it. It is from hence, that the farmers have their trite faying, that "Chalk makes a rich tenant, but a poor landlord."

The beft method, therefore, of ufing Chalk, is to mix one load of it with two loads of dung, or mud; this will make it not only a temporary, but a lafting advantage to the ground. It is the beft improvement for fowre and cold lands, and is obferved always to do moft good to thofe lands that lie fartheft off from any natural beds of it; the ground near Chalk-beds partaking of their nature, though there is no Chalk diftinguifhable by the eye. The common method of chalking lands is to lay twelve or fourteen loads of Chalk upon every acre, and this will fometimes make the land bring very rich crops, for fourteen or fifteen years together.

It is beft to carry the Chalk upon a lay a year or two before it is plowed up; by this means it will fweeten the furface of the earth, and will not work fo much downwards, as it will, if plowed up at firft. It makes corn yield well; and, when laid upon grafs ground, it makes the grafs fweet and rich, and cattle that feed upon it grow fat foon. The cows alfo that feed in thefe paftures, are obferved to give better milk than ordinary.

They have a very eafy way of digging Chalk in Kent. It lies on hills, and the workmen undermine it as far as they think proper; then digging a trench at the top, as far diftant from the edge as the undermining goes at bottom, they fill this with water, and that foaks through in the fpace of one night, and the whole flake falls down at once.

In other parts of the kingdom, Chalk generally lies deeper, and they are often forced to dig for it confiderable depths, and draw it up in bafkets; yet, in thefe places, it fells cheap enough at the mouth of the pit to be worth buying, even to carry a great way, for manure. *Mortimer's Hufbandry.*

Black CHALK, a name given by the painters to a fpecies of ochreous earth, with which they draw on blue paper, and other fubftances. It is very improperly called Chalk, being more of the nature of the Cologn earth, than any other known fubftance, but containing much lefs vegetable matter than that.

Red CHALK, an earth much ufed by painters and artificers, and common in the colour-fhops of London, and elfewhere. It is properly an indurated clayey ochre, and is dug in Germany, Italy, Spain, and France, but, in the greateft quantity, in Flanders. Its characters, by which it is diftinguifhed from other earth, are thefe: it is of a fine, even, and firm texture; very heavy, and very hard; of a pale red on the outfide, but, when broken, of a deep dufky chocolate colour within. It adheres firmly to the tongue, is perfectly infipid to the tafte, and makes no effervefcence with acids. *Hill's Hift. of Foff.*

CHALK-*land.* Barley and wheat will fucceed very well on the better fort of chalky land, and oats generally do very well on any kind of it.

The natural produce of this sort of land, in weeds, is that sort of small vetch, called the tine-tare, with poppies, may-weed, &c. Saintfoin and hop-clover will generally succeed tolerably well on these lands; and, where they are of the better sort, the great clover will do. The best manure for these lands is dung, old rags, and the sheep-dung left after folding them upon it. If rain happens to fall on these lands, just after sowing, the earth will bind so hard after it, that the shoots from the seed cannot pierce through it, and the greater part of the crop will be, by this means, lost. In Hertfordshire they manure their Chalk-lands with pigeons dung, ashes, and soot, and with some horse-dung: and, in Oxfordshire, they use no other manure, than half-rotten dung, with which they mix sand; and this, they say, prevents the earth from binding. They generally sow these lands there with wheat, meslin, and barley, only, after wheat, they sow pease and vetches; in the sowing of these, they are particularly forced to wait for fair weather, because of the land's binding. *Mortimer's Husbandry.*

CHALK-*stones*, in medicine, are used for the concretions of calcareous matter in the hands and feet of people violently afflicted with the gout.

CHA'MA, in natural history, the name of a large genus of bivalve shells, the characters of which are these: it is usually smooth, though in some places a little rugose, and has in some few a number of spines. The valves of the shell are equal, elate, and convex, and the mouth gaping, not closing fast, and even in all parts, as in the oister.

The fish, contained in this genus of shells, have all a hot taste, like that of pepper, and inflame the mouth in a troublesome manner. The French have hence called them flames and flammets, and, in some parts of the same nation, they are called lavignons and pelourdes.

CHAMÆME'LUM, *camomile*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind; the disk is composed of floscules, and the outer edge of semi-floscules, all standing upon embryo seeds, and all inclosed in one common squamose cup. The embryos finally ripen into seeds, and are affixed to the thalamus of the flower. To this it is to be added, that the leaves are finely divided, and the whole face and appearance of the plant has something peculiar, which readily distinguishes it from the other plants with radiated flowers.

M. Tournefort has enumerated nineteen species of Chamæmelum.

The common camomile is digestive, laxative, and emollient; it mitigates pain, and promotes the menses and urine; the leaves dried are said to answer these purposes better than any other part of the plant; for all others, the flowers are used. These are given in infusion, as a gentle emetic, very large quantities of the infusion being drank warm. They are also used in emollient decoctions, and are a general ingredient in clysters. The people who furnish the apothecaries with them, usually sell the double flowers, but the single ones have greatly more virtue. It is very remarkable of the flowers of this plant, that, like those of the common yarrow, they yield by distillation a fine sky-blue oil.

CHAMÆPI'TYS, *ground-pine*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the one-lipped kind; this lip is divided into three segments; the middle of these is bifid, and there are small jags, supplying, in some sort, the place of an upper lip. The pistil arises from the bottom of the flower, and is surrounded by four embryos, which finally become four oblong seeds, and are contained in an open capsule, which was the cup of the flower. To this also it is to be added, that the flowers of the ground-pines grow scatteredly in the alæ of the leaves, and are not placed verticulately.

The species of ground-pine, enumerated by M. Tournefort, are five.

Champæpitys, or ground-pine, though highly extolled as an aperient, cephalic, and nervous medicine, is, however, little used, except as an ingredient of the theriaca, and some other officinal compositions.

CHAME'LEON. (*Dict.*)—The structure and motion of this creature's eyes are very surprising; they are very large, and set in large cavities, appearing to be large spheres, of which one half stands out of the head, and is covered with a thin skin, perforated with a small hole at the top, through which is seen a very vivid and bright pupil, surrounded with a yellow iris; the whole is properly a longitudinal slit, which the creature opens more or less wide at pleasure; and the eye seems fixed to this eye-lid, so as to follow all its motions, not turning round within it, as in other creatures. The motion of the eyes of this creature is not less singular than their structure, since it can turn them so as to see what passes either far backward, on either side, or directly behind it, without at all moving the head, which is fixed to the shoulders; and the creature can give one eye all these motions, while the other is perfectly still. The trunk of the body is properly all breast, for the creature has no belly, its ribs being continued to the ilia; the feet have all five toes, two behind, and three before, the hind-ones being as large as the others. This creature moves as slow as the tortoise, which appears very singular; its legs are sufficiently long, and it has no great weight of body to carry; but it is said, that on trees, in its wild state, it moves very nimbly. Its tail, when inflated, is round as that of a rat or snake; when empty, it is very lank, and has three longitudinal ridges running along it, which are owing to the apophyses of the spine. This tail is a great safety to the creature on trees, as it twists it round the branches, when in any danger of falling. The account given by the ancients, and later writers, of the long hollow tongue of the Chameleon, which it can dart with such celerity to take flies, by means of a spongy nodule at the end, is found, on experience of those who have kept the creature alive, to be true. Those among the former, therefore, who supposed the Chameleon lived on the air only, were greatly mistaken; some, of late, have also favoured this opinion, because of the long time the creature will live without food; but this is the case with all the serpent kind also, which yet we know will eat solid food, when they can get at it. *Ray's Syn. Quad.*

CHA'MOS, or CHAMOSH, the idol or god of the Moabites.

The name of Chamos comes from a root, which, in Arabic, signifies to make haste, for which reason many believe Chamos to be the sun, whose precipitate course might well procure it the name of swift or speedy. Others have confounded Chamos with the god Hammon, adored not only in Lybia and Egypt, but also in Arabia, Ethiopia, and the Indies. *Lucan. Pharsal.*

CHA'OS (*Dict.*)—The ancient philosophers understood by this term a confused mixture of particles of every kind without form or regularity, to which they supposed motion essential, and consequently attributed the formation of the universe to it. This system among them is the corollary of an excellent axiom in itself, Ex nihilo nihil fit: but this they generalize too much; instead of restraining this principle to effects, they extend it to the efficient cause, and look on the creation as a chimerical and contradictory notion.

The philosophers, poets, and priests of antiquity, among the Heathens, embraced this opinion. Chaos, according to them, was the most ancient of all beings: the eternal Being, the first principle and cradle of the universe. The Barbarians, Ægyptians, and Persians, agree in this notion: Aristophanes, Euripides, &c. the Ionic and Platonic philosophers, even the Stoics, set out with a Chaos, and look on the successive periods and resolutions of this Chaos, to have continued according to the laws of motion, till, by different combinations, it at last formed the universe in that order we at present see it.

Among the Romans Ennius, Varro, Ovid, Lucretius, Statius, &c. held the same opinion. This took its rise among the Barbarians by whom it was transmitted to the Greeks, from them descended to the Romans, and was propagated to other nations: so that it seems doubtful to determine whether this doctrine be more ancient than universal.

Though the first notion of a Chaos be very ancient, it is very difficult to determine, whom we ought to ascribe its origin to. Moses, the most ancient of all writers, in his history of the creation, describes the world before to have been an undigested heap, wherein all the elements were confused: and from hence, probably, the Barbarian and Greek philosophers borrowed the notion of their Chaos. Moses tells us, this mass was covered with water; and several of the ancient philosophers have asserted the Chaos was a mass of water, not elementary water nor ocean, but a kind of mud, the fermentation of which, in time, produced this world.

Cudworth, Grotius, Schmid, Dickinson, and others, confirm this assertion, by insisting on the analogy there is between what Moses relates of the Spirit of God moving upon the face of the waters, and the fondness of the mythologists to separate the Chaos: they add farther in support of this, that a very ancient opinion prevailed, both among the philosophers and mythologists, that there is a spirit in the waters, aqua per spiritum movetur: from whence they conclude, that the ancient philosophers originally had their opinion and notion of a Chaos from the works of Moses, which they afterwards altered to their own convenience or pleasure.

Whatever was the opinion of the ancients, concerning the Chaos and its origin, it is certain, Moses included all things in the womb of his Chaos: and that their separation, conducted by an Almighty hand, soon brought forth all this variety of creatures which embellish the universe. To imagine, after the example of some system-writers, that God at first produced only a vague and undetermined matter, out of which motion, by intestine fermentations and attractions, formed a sun, an earth, and all the ornaments of the universe: to suppose with Whiston, that the ancient Chaos was the atmosphere of a comet; that there is a conformity between the earth and comets, which demonstrates that a planet is nothing but a comet, which has acquired and assumed a regular and durable form, has placed itself at a proper distance from the sun, and turns round it in an orbit nearly circular; and that a comet is nothing but a planet which begins to destroy or form itself again, that is, a Chaos, which in its primordial state moves in an orbit very excentric: to support these and many other extravagancies which have been advanced, the enumeration of them would take up time impertinently, and be substituting opinions that want verisimilitude, in the room of those truths, which God has attested by the mouth of Moses. According to the sacred account, water was already made; then he tells us the Spirit of God moved upon the face of the waters, the

stars

ſtars of the heaven as well as our earth were already made, becauſe the heaven which contains them was already created. This philoſophy of Moſes, which repreſents eternal wiſdom regulating nature, by an expreſs will and command, proceeds on certain uniform and general laws, is undoubtedly more rational than any whimſical ſyſtems that have been propoſed by the ancient materialiſts, who form the world from a fortuitous concourſe of atoms; or ſome modern philoſophers who would account for the exiſtence of all beings, on the principle of homogeneous particles aſſembling themſelves together. Thoſe latter ſeem not to reflect, that by attributing the formation of all particular beings, the harmony, connection, and dependence apparent between them, to the impetus of a blind motion, they rob the Almighty of his greateſt glory, the fabric of the univerſe, in favour of a cauſe they are ignorant of, both with regard to itſelf, and the manner of its operation. This doctrine borders cloſely on the errors and abſurdities of Strato and Spinoza.

From what we have ſaid, the little certainty of philoſophy both in its principles and progreſs is obvious: it has aſſerted at one time that motion and matter only were neceſſary beings; if it has perſiſted in maintaining matter to be uncreated, yet it has ſubmitted that matter to the direction of an intelligent being, to make it aſſume a thouſand different forms, and diſpoſe its parts in that fitneſs and order which was neceſſary to produce the univerſe. The preſent opinion is, that matter was created, and that God gave it motion; that this motion, firſt impreſſed by the hand of God, is ſufficient of itſelf to produce all the phænomena we obſerve in the viſible world. A philoſopher who ſhould be hardy enough to explain the mechaniſm, and even the firſt formation of things, barely by the laws of motion, and ſay, Give me matter and motion, and I will make a world, ought firſt to demonſtrate, that exiſtence and motion are not eſſential to matter; for, without this precaution, this philoſopher, ſeeing nothing in the wonderful works which nature has produced, but what motion only might have effected, will be apt to fall into atheiſm.

Let us open our eyes then on the dangerous enthuſiaſm of forming ſyſtems, and believe with Moſes, that, when God created matter, the heaven and the earth out of nothing, he determined, by ſo many particular acts of his will, all the different materials, which, in the courſe of the following operations, ſerved for the formation of the world. In the laſt five days of the creation, God only diſpoſed every being in the place he had diſtined for it, to form the ſplendid picture of the univerſe. That before the fiat was a confuſed maſs, and the ſcene of the world opened, as the almighty voice of its Creator ranged the different beings in that wonderful order which conſtitutes its preſent beauty.

Far from being of opinion, that this notion of a Chaos was particular to Moſes, all nations, barbarous or civilized, ſeem to have preſerved one common tradition of a ſtate of darkneſs and confuſion prior to the creation of the world; and it is probable they imbibed this notion from the ſame common ſource, notwithſtanding the ignorance of the people, and the fictions of the poets, have ſo much diſguiſed it.

CHA'PPE, in heraldry, the partition of an eſcutcheon, by lines drawn from the center of the upper edge to the three angles below, as repreſented in *plate* XXV. *fig.* 6. in the Dictionary.

CHARGE *(Dict.)*—The common allowance for the charge of powder of a piece of ordnance is half the weight of the ball. In the Britiſh navy, the allowance for thirty-two pounders is but ſeven ſixteenths of the weight of the bullet. But a late author is of opinion, that, if the powder in all ſhip cannon whatever was reduced to one third of the weight of the ball, or even leſs, it would be of conſiderable advantage, not only by ſaving ammunition, but by keeping the guns cooler and quieter, and at the ſame time more effectually injuring the veſſels of the enemy. With the preſent allowance of powder, the guns are heated, and their tackle and furniture ſtrained, and this only to render the bullets leſs efficacious. For a bullet which can but juſt paſs through a piece of timber, and loſes almoſt all its motion thereby, has a much better chance of rending and fracturing it, than, if it paſſes through with a much greater velocity. Vid. *Robins, Propoſ. for Increaſing the Strength of the Britiſh Navy.*

CHA'RLOCK, *rapiſtrum*, in huſbandry, a very troubleſome weed among corn, being more frequent than almoſt any other. There are two principal kinds of it; the one with a yellow flower, the other with a white. Some fields are particularly ſubject to be over-run with it, eſpecially thoſe which have been manured with cow-dung alone, that being a manure very favourable to the growth of it. The farmers in ſome places are ſo ſenſible of this, that they always mix horſe-dung with their cow-dung, when they uſe it for arable land.

When barley, as is often the caſe, is infeſted with this weed to ſuch a degree as to endanger the crop, it is a very good method to mow down the Charlock in May, when it is in flower, cutting it ſo low as juſt to take off the tops of the leaves of the barley with it: by this means the barley will get up above the weed; and people have got four quarters of grain from an acre of ſuch land, as would have yielded them ſcarce any thing without this expedient. Where any land is particularly ſubject to this weed, the beſt method is to ſow it with graſs ſeed, and make a paſture of it; for then this plant will not be troubleſome, it never growing where there is a coat of graſs upon the ground. *Mortimer's Huſbandry.*

CHA'RRE, an Engliſh name for a fiſh of the truttaceous kind, of which there are two ſpecies, diſtinguiſhed by the red Charre, and the gilt Charre; the former of which is called by the ichthyographiſts umbla minor, and the latter, the carpio lacus Benaci.

Red CHARRE, called by the Welſh torgoch, is a large fiſh, longer and ſlenderer in its general ſhape than the trout. The back is of a duſky yellow colour, and is ſpotted with obſcurely white ſpots: the belly is not carried to an edge, but is about a finger broad: this, in moſt of theſe fiſhes, is of an elegant red, ſometimes deeper, and ſometimes paler; but in ſome, particularly in the female, it is white. The ſcales are very ſmall, and the ſide lines running from the gills to the tail are perfectly ſtraight; the belly fins are red: the opening of the mouth is wide, and the jaws are nearly of the ſame length, the lower being only a very little longer than the other and more pointed: the teeth are ſmall and ſharp. It is caught in the lakes of Wales, and eſteemed a very fine fiſh; but its fleſh does not boil ſo red as that of the trout. *Willoughby, Hiſt. Piſc.*

Gilt CHARRE, is ſomething like the trout in figure, but it is broader, and its belly is prominent, eſpecially when the fiſh is large: the uſual ſize is about a foot in length, which it rarely exceeds. The ſcales are very ſmall, and the back is variegated with black ſpots. Its belly and the lower parts of its ſides are of a fine bright ſilver colour: the ſkull is pellucid, and the noſe bluiſh. This is very common in ſome of the lakes of Italy, but is not peculiar to that kingdom, as has by ſome been imagined, being frequent in ſome foreign, and in ſome of the northern lakes; and there is no doubt, but that the fiſh there caught, and called the gilt Charre, and the carpio lacus Benaci, are intirely the ſame fiſh. It is a very finely-flavoured fiſh, and much valued at great tables. *Willoughby, Hiſt. Piſc.*

CHA'TELET *of Paris*, the ſupreme court of judicature in Paris, the metropolis of France. Cauſes tried there are final, unleſs in ſome caſes where an appeal may be made to the parliament.

Juſtice is adminiſtered in this court by a provoſt (whoſe office in the Chatelet is of much more authority than in any other part of the kingdom) in whoſe name all acts of this court are diſpatched, two deputies for civil and criminal cauſes, two private deputies, fifty-ſix counſellors, one king's advocate and ſollicitor.

CHEEKS, a general name, among mechanics, for almoſt all thoſe pieces of their machines and inſtruments, that are double and perfectly alike.

The CHEEKS *of a printing-preſs*, are its two principal pieces: they are placed perpendicular, and parallel to each other; ſerving to ſuſtain the three ſommers, viz. the head, ſhelves, and winter, which bear the ſpindle, and other parts of the machine.

The CHEEKS *of a lathe*, are two long pieces of wood, between which are placed the puppets, which are either pointed, or otherwiſe; ſerving to ſupport the work, and the mandrils of the workman. Theſe two pieces are placed parallel to the horizon, ſeparated from one another by the thickneſs of the tail of the puppets, and joined with tenons to two other pieces of wood, placed perpendicularly, called the legs of the lathe. See LATHE.

CHEEKS *of the glaſier's vice*, are two pieces of iron, joined parallel at top and bottom; in which are the ais, or ſpindles, little wheel, cuſhions, &c. whereof the machine is compoſed.

CHEEKS, in ſhip-building, are two pieces of timber, fitted on each ſide of the maſt, at the top, ſerving to ſtrengthen the maſts there. The uppermoſt bail or piece of timber in the beak of a ſhip, is called the Cheek. The knees which faſten the beak-head to the bow of the ſhip, are called Cheeks; and the ſides of any block, or the ſides of the ſhip's carriage of a gun, are called Cheeks.

CHEEKS *of a mortar*, or *brackets*, in artillery, are made of ſtrong planks of wood, bound with thick plates of iron, and are fixed to the bed by four bolts; they riſe on each ſide of the mortar, and ſerve to keep her at what elevation is given her, by the help of ſtrong bolts of iron which go through both Cheeks, both under and behind the mortar, betwixt which are driven coins of wood; theſe bolts are called the bracket bolts, and the bolts which are put one in each end of the bed, are the traverſe bolts, becauſe with hand-ſpikes the mortar is by theſe traverſed to the right or left.

CHEKA'O, in natural hiſtory, the name of an earth found in many parts of the Eaſt-Indies, and ſometimes uſed by the Chineſe in their porcelain manufactures. It is a hard and ſtony earth, and the manner of uſing it is this: they firſt calcine it in an open furnace, and then beat it to a fine powder. This powder they mix with large quantities of water, and, ſtirring the whole together, they let the coarſer part ſubſide, and pouring off the reſt, yet thick as cream, they leave it to ſettle, and uſe the matter at the bottom, which is found in form of a ſoft paſte, and will retain that humidity a long time. This ſupplies the place of the earth called hoache, in the making that elegant ſort of China ware which is all white, and has flowers which ſeem formed by a mere vapour within its ſurface. The manner of their uſing it is this: they firſt make the

the veſſel of the common matter of the manufacture; when this is almoſt dry, they paint upon it the flowers, or whatever other figures they pleaſe, with a pencil dipped in this preparation of the Chekao; when this is thoroughly dry, they cover the whole veſſel with the varniſh, in the common way, and bake it as uſual. The conſequence is, that the whole is white, but, the body of the veſſel, the figures, and the varniſh being three different ſubſtances, each has its own particular white, and the flowers, being painted in the fineſt white of all, are diſtinctly ſeen through the varniſh upon the veſſel, and ſeem as if traced by a fine vapour only. The hoache does this as well as the Chekao, and has beſide this the quality of ſerving for the making the porcelain ware, either alone, or in the place of the kaolin: the Chekao has not this property, nor any other ſubſtance beſides this hoache, which appears to be the ſame with our ſteatetes or ſoap-rock. *Obſervat. ſur les Coutumes de l'Aſie.*

CHELIDO'NIUM, *celandine*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, which are diſpoſed in form of a croſs: the piſtil ariſes from the cup of the flower, and finally becomes a unicapſular pod, containing roundiſh ſeeds.

The ſpecies of celandine enumerated by M. Tournefort are four; and by Mr. Miller three.

Bocconi has very ſtrongly recommended this plant as ſpecific in the cure of conſumptions: he propoſes the taking it in infuſion, or drinking its juice, and ſays enough in its praiſe to recommend it at leaſt to a fair trial, which would be eaſily made in a country where conſumptions are ſo common. *Boccon. de Plant.*

CHE'MISTRY (*Dict.*)—Rules to be obſerved in the practice of chemiſtry.

Let the firſt rule be, with care and diligence, to obſerve the proceſs uſed by nature, in the production of all thoſe things we would endeavour to imitate; for nature, as a moſt expert chemiſt, employs the very inſtruments which men alſo employ, viz. fire, water, air, and earth.

To illuſtrate this rule by an example; it appears, by numerous inſtances, that there is an acid or ſaline liquor naturally contained in the bowels of the earth; which acid, there mixing with various kinds of earthy matters, as a menſtruum, changes their natures, or makes them appear under different forms. Hence, common brimſtone, allum, the native vitriol, &c. ſeem to have their origin.

For by an exact ſcrutiny, and attentive conſideration, it appears, that, when this general acid diſſolves a certain bituminous earth, it makes brimſtone; when a chalky earth, allum; when iron or copper, vitriol, &c. And accordingly, by uſing the ſame kind of general acid (which may be procured by burning brimſtone under a glaſs-bell) in the ſame manner as nature ſeems to employ it, we can likewiſe, by art produce brimſtone, allum, or vitriol, when and where we pleaſe. And thus, if we could univerſally diſcover the proceſs and inſtruments which nature employs in the production of her effects, we ſhould have certain rules for imitating her.

Our ſecond rule is, to gain a habit of transferring, diverſifying, enlarging, and in proving an experiment, till it ends in ſome certain diſcovery, either of light to the underſtanding, or of uſe in life; one of which points all juſt experiments will end in, when duly proſecuted, and judiciouſly weighed and conſidered.

For unſucceſsful experiments are no leſs inſtructing than thoſe that ſucceed, which ought to be well remarked. The head muſt in all caſes co-operate with the hands: ſo that the mind ſhould be ever caſting about to diſcover the cauſe of failure, as well as of ſucceſs. This is a ſagacity which may be procured by uſe, and turned into a habit of invention and diſcovery: ſo that no ſingle experiment ſhall be performed, but ſome advantages will be immediately derived from it; nor no experiment be made, without ſome ſolid grounds of hope for ſucceſs.

The third rule to make this art turn to advantage, with regard to the improvement of any branch of trade that we may have in view, is, to proſecute experiments in an orderly ſeries; and to let the inquiry ſuit the genius and temper of the enquirer, ſo that it may be proſecuted by him with vigour and pleaſure. This hath been the practice of the greateſt maſters in this art.

Thus, if any one ſhould be averſe to fire and furnace, he may ſtill improve chemiſtry and arts, or perform many ſerviceable chemical operations, without much apparatus or expence, or without the utenſils and inſtruments commonly employed in that art: which may therefore be as conveniently practiſed within a ſtudy or a parlour, as in a laboratory. For there are many chemical enquiries, that may be proſecuted without the uſe of fires and furnaces: and even ſuch diſpoſitions as are more delighted with ſpeculation than practice, may greatly contribute to the improvement of chemiſtry, by ſorting, ranging, and digeſting experiments into tables; ſhewing what they prove, and how far they reach; how far they fall ſhort, and how they may be carried farther: others might, to advantage, employ themſelves upon drawing things of uſe in life, from the experiments already known and publiſhed: and, laſtly, others might, from a due conſideration of experiments, deduce new directions and rules of practice, for producing, in a ſure and

conſtant manner, much greater effects than are uſually hoped for. *Shaw's Lect.*

Commercial CHEMISTRY, is uſed to denote the application both of technical and philoſophical Chemiſtry, to the eſtabliſhing, ſupporting, or improving any branch of trade or commerce. *Shaw's Lectures.*

Oeconomical CHEMISTRY, the application of philoſophical, technical, or commercial Chemiſtry, to the ſervice and accommodation of the affairs of a family. *Shaw's Lectures.*

Philoſophical CHEMISTRY. Philoſophical Chemiſtry conſiſts of three parts, viz. invention, rationale, and experiment; whence we may define it to be a particular exerciſe of the rational and inventive faculties of the mind, leading to experiments, and thence to the diſcovery of cauſes, ſo as to form axioms that ſhall rationally account for phænomena, and diſcover rules of practice for producing uſeful effects. And thus philoſophical Chemiſtry is not only the key to all the other parts, but it diſcovers of itſelf the cauſes of many natural phænomena, as, particularly, earthquakes, volcanoes, vegetation, the growth of minerals, and the like.

This branch of Chemiſtry alſo explains the general forms and qualities of bodies, whereon their properties and effects depend; as volatility and fixedneſs, fluidity and firmneſs, colours, taſtes, odours, efferveſcences, fermentation, ſolution, precipitation, congelation, extraction, and the like.

To this part of Chemiſtry it alſo belongs to bring new inventions to the teſt, to diſcover their validity or inſufficiency. Thus when any hint is ſtarted for a new trade, or method invented for the improvement of an old one, before any attempt is made to ſupply it in the larger way, it ſhould be experimented in miniature; as the aſſay maſter tells the owner of an ore, whether it will be worth the erecting large works for it, or not. *Shaw's Lectures.*

Technical CHEMISTRY. By Technical Chemiſtry is meant the application of philoſophical Chemiſtry to the immediate ſervice of arts, ſo as by its means to invent, form, aſſiſt, promote, or perfect them in the large way of buſineſs. *Shaw's Lectures.*

CHE'RRY-*tree*. See CERASUS.

CHERT, in natural hiſtory, a name given by ſome of our miners to a peculiar fine kind of ſtone found in ſtrata, but of the hardneſs and ſmoothneſs of flint. It is called alſo in ſome places whern, and by ſome authors nicomia.

CHE'RVIL, *chærephyllum*, in botany, the name of a genus of umbelliferous plants, the characters of which are theſe: the flower is of the roſaceous kind, compoſed of ſeveral leaves irregular in ſize, and diſpoſed in a circular form on a cup, which afterwards becomes a fruit compoſed of two ſeeds, reſembling the beak of a bird, not ſtriated, but ſometimes rough, ſometimes ſmooth, and gibboſe on one ſide, and flat on the other.

The common garden Chervil flowers in May or June. Its leaves and ſeeds are uſed in medicine; the ſeed contains the principal virtue of the plant, and is eſteemed a great medicine in jaundices and dropſies. It is very certain that it is a very powerful diuretic, and a promoter of the menſes. It reſolves coagulated blood, and generally diſpoſes the perſon to ſleep. It is uſed alſo externally in fomentation, in cholicky pains and retention of urine.

The leaves of this plant are what the good women call ſweet fern, from which they diſtil a water, and eſteem it a very great remedy for cholicks.

CHE'SNUT-*tree*, See CASTANEA.

CHEVRE'TTE, in artillery, an engine to raiſe guns or mortars into their carriages; it is made of two pieces of wood of about four feet long, ſtanding upright upon a third, which is ſquare; they are about a foot aſunder and parallel, and are pierced with holes exactly oppoſite to one another, having a bolt of iron, which, being put through theſe holes, higher or lower at pleaſure, ſerves with a hand-ſpike, which takes its poiſe over this bolt, to raiſe any thing by force. *Guill. Gent. Dict.*

CHE'WING-*balls*, a ſort of balls contrived for horſes to chew, not ſwallow at once; not intended as a food, but as incentives to appetite, and on other medicinal occaſions very uſeful to the creature. The receipt now moſt eſteemed for theſe balls is this: take liver of antimony, and of aſſafœtida, of each one pound; wood of the bay-tree, and juniper-wood, of each half a pound; pellitory of Spain, two ounces: let all theſe be powdered together; then add as much fine grape verjuice as is neceſſary to make the whole into a paſte. This is to be formed into balls of about an ounce and an half in weight, which are to be dried in the ſun. Theſe are the Chewing-balls, and theſe are to be uſed one at a time in the following manner: the ball is to be wrapped up in a linen rag, and a thread is to be faſtened to this, in ſuch manner that it may be tied to the bit of the bridle, and kept in the mouth: when the bridle is taken off, the horſe will immediately eat, and, when one ball is conſumed, another is to be tied up, and put in its place, till the intent is anſwered.

CHIN-COUGH. In the Chin-cough, Dr. Huxham uſes the common evacuations, and propoſes to correct the lentor of the blood, and to ſtrengthen the nerves and ſtomach by mercurials,

curials, the cortex, and proper ſtomachics. *Obſ. de Aere & Morb. Epid.*

Dr. Burton declares againſt bleeding, vomiting, and purging in the Chin-cough, except in very urgent caſes; the medicine which he ſays has had great ſucceſs, is a ſcruple of fine powder of cantharides, and as much camphor, mixed with three drachms of the extract of jeſuits bark. Of this mixture he gives eight or nine grains to children every third or fourth hour, in a ſpoonful of ſome ſimple water, or ſome julep, in which a little balſam of capivi had been diſſolved. He ſays this method is not proper in ſuch Chin-coughs as proceed from thin ſharp rheum, but he believes, that, in the Chin-cough from a tough viſcid phlegm, it will ſcarce ever fail, at leaſt it has not failed yet. *Med. Eſſ. Edinb.*

CHINESE *Philoſophy.* The Chineſe are univerſally owned to have ſurpaſſed all other nations of India, in their antiquity, learning, politeneſs, the improvement of the ſciences, a taſte for philoſophy, and their political principles. And, according to ſome eminent authors, they may diſpute the pre-eminence, in theſe particulars, even with the politeſt nations in Europe.

If credit be given to theſe authors, the Chineſe had philoſophers in the firſt ages of the world. A plan of ſublime morality was current among them ſoon after the flood. Iſaac Voſſius, Spezelius, and a crowd of miſſionary jeſuits, who have travelled into China to propagate Chriſtianity, have given us this account of them: others, as Budæus, Thomaſius, &c. ſpeak leſs favourably of the Chineſe. The only method therefore of coming at the real truth is to take a ſhort review of the writings aſcribed to them; but unhappily it is a matter of doubt whether theſe are authentic, and the exactneſs of the tranſlation is very much diſputed.

The collection publiſhed at Paris in 1687, by the fathers Intorcetta, Hendric, Rougemont, and Couplet, preſents us with the Ta-hio or Scientia magna; a work of Confucius, publiſhed by his diſciple Cemcu. The Chineſe philoſopher in this work propoſes to teach princes the art of governing well; which he makes to conſiſt in that of knowing and acquiring all the qualities neceſſary for a ſovereign; ſuch as to command himſelf, to know how to form his council and court, and bring up his family in a proper manner.

The ſecond work in this collection is intitled Chumyum, or, de Mediocritate in rebus omnibus tenenda, the golden mean; but contains nothing more than may be met with in Seneca's Morals.

The third is a collection of dialogues and apophthegms concerning vices, virtues, moral duties, and good behaviour, intitled Lun-yu. At the concluſion of this article we ſhall give our readers the moſt ſtriking of theſe apophthegms, which are indeed the only valuable part of this book of Confucius.

The learned editors promiſed the public the works of Mencius, a Chineſe philoſopher, which Francis Noel, a miſſionary of the ſame company, performed in 1711, by publiſhing ſix Chineſe claſſics, in which are contained ſome fragments of Mencius. We ſhall not enter into the diſputes which theſe collections have raiſed among the literati, with regard to their authenticity.

The Chineſe chronology and philoſophy are not very conſiſtent. Fohi, the founder of the empire of China, reigned, according to them, in the 2954th year before Chriſt. The Chineſe cycle begins in the 2647th year before Chriſt, the eighth year of the reign of Hoangti. Hoangti's predeceſſors were Fohi who reigned 140 years, and Xinung who reigned 110 years. But, to follow the ſyſtem of Petavius, the birth of our Saviour falls in the year of the world 3889, the deluge in 1656; from whence it follows that Fohi reigned ſome ages before the flood: ſo that we muſt either give up the chronology of the ſacred writings, or that of the Chineſe. Neither a Chriſtian, nor a ſenſible European, will heſitate a moment which to prefer, when he reads in the Chineſe hiſtory, that Fohi's mother was impregnated by the rainbow, and a thouſand other ſuch extravagant ſtories, which make the epoch of his reign uncertain, notwithſtanding the unanimous teſtimony of a nation.

In whatever age Fohi reigned, he ſeems to have been rather an Orpheus or Hermes, than a great philoſopher or learned divine. For they tell us he invented the alphabet, two inſtruments of muſic, one of twenty-ſeven, the other of thirty-ſix ſtrings. They aſſert the book Ye-kim, attributed to him, contained the moſt profound ſecrets; that he taught the people, whom he had civilized, the exiſtence of a God, and the manner in which he ought to be worſhipped.

This Ye-kim is the third of the U-kim, or collection of the moſt ancient writings among the Chineſe: it is compoſed of whole lines and hemiſtichs, or rather lines ſtopped at different lengths, the combination of which exhibits ſixty-four different figures. The Chineſe looked on theſe as an emblematic hiſtory of nature, the cauſes of its phænomena, the ſecrets of divination, and of many other ſublime ſciences, till Leibnitz decyphered the ænigma, and demonſtrated that Fohi's two lines were only the elements of binary arithmetic.

The emperor Fohi tranſmitted his philoſophy to his ſucceſſors. They applied themſelves to improve what he had begun, to civilize the manners of the people, and accuſtom them to the uſeful bonds of ſociety. Xin-num went a ſtep farther; he taught agriculture, the virtues of plants, and the firſt attempts in the art of medicine. It is uncertain whether the Chineſe at that time were idolaters, atheiſts, or deiſts. Thoſe who pretend to prove they admitted the exiſtence of a God, from the ſacrifice Ching-tang made in the time of a famine, ſeem to want ſufficient grounds for the ſupport of their aſſertion.

The philoſophy of the kings of China ſeems to have been for a long time intirely political and moral, if we may form a judgment from the maxims of their kings Yao, Xum, and Yua. This collection is intitled U-kim, the firſt book of which, called Xu-kim, contains theſe maxims. The ſecond book, called Xy-kim, is a collection of moral poems and odes. The third is Fohi's lineary work already mentioned. The fourth is the Chum-cieu, or ſpring and autumn. This is an hiſtorical abridgment of the lives of ſeveral of their princes, wherein their vices are not concealed. The fifth is the Li-ki, which is a kind of ritual, to which was joined an explanation of what ought to be obſerved in ceremonies, profane and ſacred, and the duty of man in all ſtations of life, under the reign of the three imperial houſes, Hia, Xam, and Cheu. Confucius boaſted that he drew from the writings of the antient kings, Yao and Xum, the moſt ſublime ſcience and greateſt wiſdom.

The U-kim is the moſt ſacred, authentic, and moſt reſpected literary hiſtory in China. We may look on the reigns of their kings who were philoſophers, as the firſt age of the Chineſe philoſophy. The ſecond age which we are now entering upon, begins with Rooſi, or Li-lao-kiun, and ends with the death of Mencius. China had many philoſophers of note, long before the time of Confucius. Particular mention is made of Rooſi, Li-lao-kiun, or Lao-tan, who was born 346 years after Xekia, or 504 before Chriſt, at Sokoki in the province of Soo. They tell you he was an adept in the knowledge of the gods, of ſpirits, the immortality of ſouls, &c. Till this period the philoſophy of the Chineſe was only moral. But now metaphyſics, a number of ſects, and various opinions ſtarted up.

Confucius ſeems not to have greatly cultivated this philoſophy, but held that of the firſt kings in higher eſteem. He was born 451 years before Chriſt, at the village of Ceu-ye, in the kingdom of Xantung. His family was illuſtrious, and, according to the Chineſe, his birth miraculous, for they tell us that celeſtial muſic was heard round his cradle; that two dragons gave him pap; that at ſix years of age he arrived at the ſtature of manhood and gravity of old age. At the age of fifteen he applied himſelf to the ſtudy of literature and philoſophy. He was married at twenty, and his merit raiſed him to the higheſt preferment; but the luxury of a voluptuous and debauched court was diſagreeable to him, and he to the court. Being diſmiſſed from his employment, he retired into the kingdom of Sum, where he opened a ſchool of moral philoſophy, and had many diſciples, who were men of ability, and honeſt citizens. His philoſophy conſiſted more in deeds than words, in actions than expreſſions. His diſciples reverenced him when alive, regretted him when dead, and held him in ſo great veneration, that they inſtituted a kind of ſacrifices to his memory.

It is very difficult to determine whether Confucius was the Anaxagoras or Socrates of China, as the anſwer to this queſtion depends on a great knowledge of the language; but it is plain from the account we have given of his principal works, that he applied himſelf more to the ſtudy of humanity and morality than to the ſtudy of nature and its cauſes.

Mencius appeared in the next age. We ſpeak of this philoſopher next, becauſe Rooſi, among the Japaneſe, is the ſame with Li-lao-kiun among the Chineſe, whom we have mentioned before. Mencius has the reputation of having been ſuperior to Confucius in ſubtilty and eloquence; but at the ſame time is owned to be much his inferior, with regard to moral rectitude and ſimplicity of heart. All kinds of literature and philoſophy were almoſt extinguiſhed by Xi-hoam-ti who reigned about three ages after Confucius. This prince who was jealous of the glory of his predeceſſors, an enemy to men of learning, and an oppreſſor of his ſubjects, cauſed all the writings he could collect to be burned, except thoſe wrote on agriculture, medicine, and magic. Four hundred and ſixty ſages, who had retired to the mountains, with what part of their libraries they could carry along with them, were taken and expired in the flames, with the books they had preſerved: near as many who were confined in an iſland by the orders of this prince, fearing the ſame fate, choſe to throw themſelves from precipices into the ſea. The ſtudy of literature was prohibited by ſevere penalties, and the books that remained were diſregarded, and not looked into, till the princes of the race of Han ſet about the revival of learning, when it was with difficulty they recovered ſome of the works of Confucius and Mencius. They found a copy of Confucius buried in the ruins of a wall, but this copy was half rotten; and it is from this mutilated copy that his works now extant are taken.

The revival of learning may ſerve for a date of the third period of the antient Chineſe philoſophy.

The ſect of Foc then ſpread all over China, and, with it, idolatry,

dolatry, atheism, and superstition of all kinds; so that it is uncertain whether the ignorance, into which the brutality of Xi-hoam-ti had plunged these people, was not preferable to the false doctrines they were now infected with.

Three centuries after the birth of Christ, a sect prevailed throughout the empire of China, who imagined themselves more perfect by being inactive, and thought they resembled the aerial beings more, by their inert philosophy. These, as much as in them lay, forbad the natural use of the senses. But this sect grew into disrepute on the appearance of the Fan-chin. These Epicureans appeared in the fifth century, and maintained that virtue, vice, providence, immortality, &c. were only arbitrary terms, without a meaning. This philosophy is unhappily too palatable not to be received by the bulk of mankind, and is so much the more dangerous, as it becomes more universal.

The middle age of the Chinese philosophy commences about the tenth or eleventh century, under the two philosophers Cheu-cu and Chim-ci. These according to some were polytheists; according to others atheists. The sect of literati immediately followed those of Cheu-cu and Chim-ci. This sect, under the name of Ju-kiao, divides the whole empire with the sects Foe-kiao and Lao-kiao, which are in truth no other than three different combinations of superstition, idolatry, polytheism, and atheism.

At length the Europeans carried our sciences into the East; and this event is the epocha of the modern philosophy among the Chinese. The singular esteem with which they honoured the first Europeans who travelled into China, gives us no very high idea of their skill in mechanics, astronomy, and other parts of the mathematics. These Europeans were not men of any distinguished merit, but such whom zeal carried thither, to propagate the Christian religion at the hazard of their lives, in unknown regions, which indeed befel some of their successors. They were well received by the Chinese; superstition, apt to take offence and be alarmed, gave them no opposition; they opened schools, had many disciples, and their learning was admired. The emperor Cham-hy about the end of the last century admitted them at court, learned our philosophy and sciences of them, studied mathematics, anatomy, astronomy, mechanics, &c. but his son Yong-Tching banished all the virtuosi of Europe to Canton and Macao, except those which resided in Pekin, who continued there. Kien-Long the son of Yong-Tching was a little more indulgent to them; he however forbad the Christian religion, and even persecuted his soldiers who had embraced it; but permitted the jesuits to continue their instructions at Pekin.

We shall now give some account of the Chinese ethics; these depend, among them, on the study of what Confucius has wrote on this subject; we cannot therefore give a clearer idea of their morality than by exhibiting some of his maxims.

1st. Political ethics have two principal objects, the cultivation of the mind and the government of the people.

2d. The former requires the understanding to be adorned with all knowledge, to enable it to distinguish good from evil, truth from falsehood; to moderate the passions, to strengthen the love of truth and virtue in our hearts, to behave ourselves with decency and honesty towards other men.

3d. The latter object of ethics requires the citizen to know how to conduct himself, govern his family, and fill his own station of life properly.

4th. He merits the title of a philosopher, who has a profound knowledge of things and books, who weighs every thing wisely, submits to reason, and goes on boldly in the paths of truth and justice.

5th. When the intellectual faculty is brought to such a degree of perfection as to dive into the nature of things, the intentions and will purify themselves, bad affections depart from the soul, the body is preserved in health, domestic affairs are well managed, every duty of life discharged, private government is well administered, the empire well regulated, and enjoys peace.

6th. What has man from heaven? An intelligent nature, a conformity to which constitutes a rule of actions. The wise man exercises himself in keeping up to this rule.

7th. There is an unerring reason or celestial rectitude given to all; there is an human supplement to this gift, when it is lost. The celestial rectitude is in possession of the saint, the supplement is attained by the philosopher.

8th. There is only one principle of moral conduct, which is, to behave in all things with sincerity; to conform, with all our souls and all our strength, to this universal maxim, Do as you would be done unto.

9th. A man is known by examining his actions, considering their end, the passions in which he indulges himself, and the things with which he contents himself.

10th. We should immediately publish all things of universal benefit and utility; to conceal any part, to make any reserve is to despise virtue and drive her from us.

11th. Let the disciple learn the reasons of things, let him examine them, meditate on them, reason concerning them, consult the wise and learned, inform himself, banish confusion from his thoughts, and irregularity from his conduct.

12th. Virtue is not only constant in external appearances.

13th. Virtue, regardless of the partiality on earth, has not a thought which may not be avowed in the open face of heaven.

14th. We must not apply ourselves to virtue, but to be virtuous.

15th. The perfect man always keeps sight of himself.

16th. There are three degrees of wisdom, to know what virtue is, to love and to possess it.

17th. Uprightness of heart is the foundation of virtue.

18th. There are five rules to be observed for the conduct of the universe: justice between the prince and subject, affection between father and child, fidelity between man and wife, subordination among brothers, agreement between friends. There are three cardinal virtues, prudence to discern, universal benevolence which binds, and fortitude supports the whole. Uprightness of heart implies these.

19th. The motives of the mind are unknown to others; be wise therefore, and be particularly careful about those things which are known to yourself only.

20th. Virtue is placed between two extremes; he that has past the middle point, has done no better than he that has never attained it.

21st. One thing alone is valuable, that is, virtue.

22d. A nation is more powerful by virtue, than water and fire. I have never seen a people perish who have taken that for their support.

23d. Example is more necessary than precept for the people.

24th. A wise man is his own most severe censor, his own witness, accuser, and judge.

25th. To conquer ourselves, and recover the ancient and primary state of celestial rectitude, is to attain innocence and perfection.

26th. Slothful indolence and precipitate rashness are equally enemies to success.

27th. The upright man takes no by-path, but keeps on in the high road.

28th. The honest man is a citizen of the world.

29th. Charity is a certain and rational affection which sacrifices us to mankind, as if it made but one individual with us, and associated us to the adversity and prosperity of the whole human race.

30th. The honest man only has a right to love and hate.

31st. Repay injuries with aversion, and benefits with acknowledgment; for this is justice.

32d. To fall and not to rise again is properly to abandon virtue.

33d. It is a species of trouble of mind to wish to others what is not in our power to give them.

34th. The upright man acts according to his station, and covets nothing out of his reach.

35th. He who studies wisdom has nine visible qualities, clearness of eye, fineness of ear, serenity of countenance, gravity in deportment of body, veracity of intention, punctuality in performance, counsel in doubtful matters, consideration of consequences in vengeance and anger.

The morality of Confucius is vastly superior to his physics or metaphysics. We shall conclude this article with two or three remarks that may not perhaps be disagreeable to our readers.

Though the antiquity of the Chinese falls greatly short of their pretensions, yet the date of their empire certainly takes place soon after the flood; but, the greater antiquity we allow them, the more reason we shall have to reproach them with the little improvement they have made in their language and writings. It is inconceivable that a people to whom so much wit and sagacity is in general attributed, should have multiplied accents instead of words, and characters ad infinitum, instead of combining a small number of them to form a language. We have heard of no poets or orators among them; their dramatical performances are extremely imperfect, they contain all the actions of the person's life represented from the cradle to the grave, and the performance takes up several months. It is no wonder indeed they have neither had poets nor orators; for their language is neither capable of poetry nor eloquence.

CHIPPING, a phrase used by potters and China-men to express that common accident both of our own stone and earthen ware, and the porcelain of China, the flying off of small pieces, or breaking at the edges. Our earthen wares are particularly subject to this, and are always spoiled by it, before any other flaws appear in them. Our stone wares escape it better than these, but less than the porcelain of China, which is less subject to it than any other manufacture in the world. The method by which the Chinese defend their ware from this accident, is this: they carefully burn some small bambou canes to a sort of charcoal, which is very light, and very black; this they reduce to a fine powder, and then mix it into a thin paste, with some of the varnish which they use for their ware: they next take the vessels, when dried, and not yet baked, to the wheel, and, turning them softly round, they, with a pencil dipped in this paste, cover the whole circumference with a thin coat of it: after this, the vessel is again dried, and the border made with this paste appears of a pale greyish colour, when it is thoroughly dry. They work on it afterwards in the common way, covering both this edge and the rest of the vessel with the common varnish. When the whole is baked on, the colour given by the ashes disappears,

pears, and the edges are as white as any other part; only, when the baking has not been sufficient, or the edges have not been covered with the second varnishing, we sometimes find a dusky edge, as in some of the ordinary thick tea cups.

It may be a great advantage to our English manufactures to attempt something of this kind. The willow is known to make a very light and black charcoal, but the elder, though a thing seldom used, greatly exceeds it. The young green shoots of this shrub, which are almost all pith, make the lightest and blackest of all charcoal; this easily mixes with any liquid, and might be easily used in the same way that the Chinese use the bambou charcoal, which is a light hollow vegetable, more resembling the elder shoots than any other English plant. It is no wonder that the fixed salt and oil, contained in this charcoal, should be able to penetrate the yet raw edges of the ware, and to give them in the subsequent baking a somewhat different degree of vitrification from the other parts of the vessel, which, though, if given to the whole, it might take off from the true semi-vitrified state of that ware, yet at the edges it is not to be regarded, and only serves to defend them from common accidents, and to keep them entire.

The Chinese use two cautions in this application; the first in the preparation; the second in the laying it on. They prepare the bambou-cane for burning into charcoal, by peeling off the rind. This might easily be done with our elder shoots, which are so succulent, that the bark strips off with a touch. The Chinese say, that, if this is not done with their bambou, the edges touched with the paste would burst in the baking: this does not seem indeed very probable; but the charcoal will certainly be lighter made from the peeled sticks, and this is a known advantage. The other caution is, never to touch the vessel with hands that have any greasy or fatty substance about them; for, if this is done, they always find the vessel crack in that place. *Obs. sur les Cout. de l' Asie.*

CHIRU'RGERY (*Dict.*)—Chirurgery is divided into speculative and practical; the latter executes what the former directs. The theory of Surgery, as it is commonly called, should be distinguished into general and particular. The general theory of Chirurgery is the theory or science of medicine itself: the theory is inseparable; one part cannot be known thoroughly, or applied without knowing both. The only difference between medicine and Chirurgery seems to be with regard to their different objects, and the different classes of maladies in which each is employed. Chirurgery comprehends every science which teaches the art of healing, but applies them only in external cases. Medicine also requires this science equally, but has for its more immediate object internal cases; so that the science is the same; the application, not the science, making the difference.

By considering the objects of both these arts, their connection is very visible, and their theory the same. External disorders, the object of Chirurgery, are essentially the same, as internal maladies, the object of medicine; they differ only in their situation: they are of equal importance, offer the same indications, and equally require a cure.

Though the theory of medicine and Chirurgery be the same, yet we must distinguish between the physician and surgeon. A man acquainted only with the general theory in these arts will be neither the one nor the other. A physician, besides the knowledge of pharmacy, must have skill to apply the rules of his science to the cure of internal diseases; a surgeon, by practice, must acquire a readiness and ease in performing operations, and apply the same rules of science to the cure of external disorders.

Bare science, or knowledge alone, does not enable us to apply its rules, it only dictates them: practice only teaches to apply them properly, and that practice too under a master: study gives knowledge, but we cannot arrive at the art of applying that knowledge we have attained by study without experience; we gain readiness by often seeing the same objects, and custom only enables us to acquire a facility.

Anatomy, physiology, pathology, the doctrine symptoms, and the knowledge of the animal oeconomy, are in Chirurgery, as well as physic, the principia of universal knowledge. Anatomy displays the structure of the organs which compose the human body. Physiology explains their actions, mechanism, and uses. By this we know the human body in a state of health. Pathology teaches the nature and causes of diseases. The doctrine of symptoms acquaints us with the signs and complications of distempers, the particular indicia of which the surgeon ought to attend to. The knowledge of the animal oeconomy indicates a proper regimen with regard to air, diet, the passions of the mind, evacuation, exercise, rest. Therapeutics teach the surgeon the different methods of cure, to know the nature and property of his medicines, and in what manner they act.

All this kind of knowledge, however necessary, is yet insufficient; though it be the basis of physic and Chirurgery, yet it has not an essential connection with them; though these studies are the best preparations to initiate any one in these arts, ingenious men may chuse to improve their minds with a knowledge of anatomy, without ever attaining the art of physic or Chirurgery.

Beside the general praecognoscenda we have been speaking of, the surgeon must acquire the particular talent of manual operation; this can only be attained by a long course of practice and observation. He must first know what cases require an operation, the best manner of performing it, the difficulties which arise from the structure of the parts, and the proper remedies to be applied; he must also know the animal oeconomy, and attend to every motion of nature; for, without these precautions, a surgeon will make a blind operator, and be more apt to kill than cure.

To form the complete surgeon, something more is still wanted; operation which generally strikes the vulgar, is but one part of the cure in diseases which come within the sphere of Chirurgery; the accidents which may attend it, the various treatment these accidents may require, are all essential objects of Chirurgery. Let us suppose, for example, a fracture accompanied with a dangerous contusion; the reduction of the fracture, though often very difficult, is but a small part in the treatment of this disorder; the inflammation, gangrene, abscesses, suppurations, excessive discharges, fever, delirium, and convulsions, which frequently follow in such cases, require a more extensive knowledge than is necessary to reduce the bone; a small degree of knowledge, joined to practice and address, may perform the simple operation, but the accidents which may attend fractures are not to be cured or prevented, without understanding the animal oeconomy, the nature of the fluids and juices, and how medicines are to operate upon them. This can only be acquired by experience, the best source of certain knowledge after a due study of the theory.

Royal academy of CHIRURGERY.—This academy was first established at Paris, in the year 1731, and confirmed afterwards by letters patent, in 1748. It is under the direction of the secretary of the king's houshold, like other establishments of this kind: their meetings are held in the hall of the college of St. Come, every Thursday. On the Thursday after Low Sunday they annually have a public meeting, at which they declare what memoir has merited the prize left by the late M. de la Peyronie. This prize is a golden medal, value five hundred livres. The impression struck on this medal is the bust of Lewis the Well-beloved.

CHORD (*Dict.*) — To find the number of vibrations made by a musical Chord or string, in a given time, its weight, length, and tension being given. Let N represent the weight of the Chord; L its length; P the tension, or weight equivalent to it, by which the Chord is extended; and D the length of a given pendulum; p the circumference of a circle, the diameter of which is 1; then will the number of vibrations made by the given Chord, while the pendulum vibrates once, be expressed by $p \sqrt{\frac{DPa}{LN}}$. If we take L for the number of inches and decimals contained in the length of the Chord, and the proportion of the tension to the weight of the Chord, as n to 1, then will the number of vibrations of the Chord in one second be $\frac{355}{113} \sqrt{\frac{39.2n}{L}}$. Where $\frac{355}{113}$ denotes the proportion of the circumference to the diameter of the circle; and 39. 2 the length of a pendulum vibrating seconds, in inches and decimals of an inch, English measure. This last expression coincides with Mr. Euler's rule, only we here expressed in English what he gives in Rhinland measure. To illustrate this rule by an example; suppose the length of the Chord to be 18. 7 inches, its weight 6 $\frac{1}{5}$ grains, and the tension or weight extending this Chord to be 8 *lb* troy, or 46080 grains. Then $a =$ 18. 7, and $n = \frac{46080}{6.2} = 7432$. The number of vibrations therefore by the rule will be $\frac{355}{113} \sqrt{\frac{39.2 \times 7432}{18.7}} = 392$.

By logarithms, the rule may be thus expressed $\frac{L + W}{2} + C = V$. When L is the logarithm of the ratio of a pendulum, vibrating seconds, to the length of the given string; W the logarithm of the ratio of the tension to the weight of the string; C the logarithm of the ratio of the circumference of a circle to its diameter, or 0,4971500; and, lastly, V = logarithm of the required number of vibrations in one second.

In every Chord, the number of vibrations in a given time will be as $\sqrt{\frac{n}{a}}$, that is, as the square root of the extending weight, divided by the weight of the Chord, and its length. If therefore Chords be of the same length, their vibrations in a given time will be as the square roots of the extending weights, divided by the weight of the Chords. If Chords be equal in length and weight, their vibrations will be as the square roots of their extending weights or tensions; and if the tension be equal, and the Chords differ only in length, their vibrations will be as the square roots of their lengths, multiplied by their weight: that is, reciprocally as the lengths of the Chords, because the weights of the Chords will in this case be proportional to their length. *Euler.*

Mr. Euler informs us, that he found the Chord, making 392 vibrations

vibrations in a second, to beat unison with the key called *a* in instruments, that is, an octave and sixth major above the lowest C, being to *a* as 3 to 10, will make 118 vibrations in one second. And the highest C, or *c'''*, as Mr. Euler calls it, being four octaves above the lowest *c*, will vibrate 1888 times in one second of time. Mr. Euler supposes the limits of a human ear to be, with respect to gravity, two octaves lower than C; and, with respect to acuteness, two octaves higher than *c'''*.

CHOREʹGRAPHY, the art of writing down dances, like tunes, in characters and demonstrative figures.

This is an art which the ancients were ignorant of, or at least has never been transmitted to us. No author has mentioned it that we know of, before Furetiere, who in his Dictionary tells us of a curious treatise, wrote by Thoinet Arbeau, printed at Langres in 1588, intitled Orchesography. Arbeau was in all probability the first who thought of representing dances by characters, but he carried this art to no great perfection; he has however a just claim to the honour of having been the inventor of it. His method was to write down the tune on ruled paper, as usual, and over every bar to write in words what kind of step and figure was to be observed, throughout the whole tune. He never thought of describing the figure by lines, and dividing those lines into equal parts, corresponding to the measure, the time and notes, in every kind of time; or of expressing every different movement by a distinct character, and placing these characters over every division, corresponding to the lines of the figure, which has been done since with great exactness and perspicuity.

CHRIʹSTIANS *(Dict.)*—It has been the opinion of several, that the name Christian was derived originally from the Greek chrestos, good, useful: and Suetonius, speaking of Claudius, and of his expelling the Jews out of Rome, says that he banished them thence, because they were continually quarrelling about Christ: Judæos, impulsore Chresto, assidue tumultuantes Romà expulit. Tertullian says, the name Christian comes from the unction received by Jesus Christ; and that of Chrestianus, given by mistake, signifies that gentleness and benignity, whereof the Christians make profession.

When Christianity was first planted in the world, those who embraced it, were known among themselves by the names of disciples, believers, elect, saints, and brethren; nor did they assume the name of Christians, till the year of Christ 43, at Antioch, where St. Paul and Barnabas jointly preached the Christian religion. This was the name they afterwards so much gloried in, that, before the face of their enemies, they would acknowledge no other title, though hated, reviled, tormented, and martyred for it. Eusebius records a memorable story of one Sanctus, a deacon of the church of Vienna, who, being put to the rack, and examined by the magistrates, concerning his name, his country, his city, and his quality, made answer, I am a Christian; which, he said, was to him both name, and city, and kindred; nor could his persecutors extort any other answer from him.

The primitive Christians were known by several denominations. Epiphanius says, they were called Jesseans, either from Jesse, the father of David, or, which is more probable, from the name of Jesus, whose disciples they were. Eusebius says, they were likewise stiled Therapeutæ, i. e. worshippers of the true God, or spiritual physicians; and St. Jerom confirms it. And, because the Christian life took its original from the waters of baptism, because they were regenerated, or born again into Christ's religion, by water, the Christians were wont to please themselves with the name pisciculi. Sometimes the Christians stiled themselves Gnostics, i. e. men of understanding and knowledge; which name being afterwards abused by a perverse sort of heretics, they added the title of Christian to it, and gave themselves the title of Christian Gnostics. Another name which frequently occurs in the writings of the ancients, is that of Theophori, i. e. temples of God, and is as old as Ignatius. We sometimes meet with the name Christophori, used in the same sense. It is very observable, that the Christians, in all the names they chose, had a particular regard to Christ and God, abhorring all party names, and human appellations; insomuch that Epiphanius says, "The church was never called so much as by the name of any apostle: we never heard of Petrians, or Paulians, or Bartholomæans, but only Christians, from Christ." The Christians likewise took the name of catholic. The heathens used to confound the names of Jews and Christians together, often giving the name of Jews to Christians. Thus Dio, in the Life of Domitian, speaking of Acilius Glabrio, a man of consular dignity, says, he was accused of atheism, and put to death for turning to the Jews religion; which, as Baronius and others observe, must mean the Christian religion, because he was a martyr to it.

The Christians had also many names of reproach cast upon them by their enemies; such as Nazarenes, Galileans, Greeks, Impostors, Atheists, &c. which last name was common, upon account of their deriding the worship of the heathen gods. The reason why they called them Greeks was this; because many of the Christian philosophers wore the Grecian pallium, or cloak; and the Romans, taking offence to see them quit the Roman gown for that habit, took occasion from thence to deride them with the name of Greeks. The heathens also declaimed against the Christians, as magicians and sorcerers, because Christ and his disciples worked many miracles. St. Austin says, it was generally believed among the heathens, that our Saviour wrote some books of magic, which he delivered to Peter and Paul, for the use of his disciples. The new, the wicked, and unreasonable superstition, the barbarous, the new, and strange religion, were other names of reproach they call upon the Christian religion. These, with many other suchlike, may shew the inveteracy and malice of the heathens against the Christians.

The Jews were the first and most inveterate enemies the Christians had. They put them to death as often as they had it in their power; and, when they revolted against the Romans, in the time of the emperor Adrian, the most rigorous punishments were employed against them, to compel them to blaspheme and renounce Jesus Christ. And we find, that, even in the third century, they endeavoured to get into their hands Christian women, in order to scourge and stone them in their synagogues; where they cursed them solemnly, three times a day; and their rabbins would not suffer them to converse with Christians, upon any occasion: nor were they contented to hate and detest them, but they dispatched emissaries all over the world, to defame the Christians, and spread all sorts of calumnies against them. They accused them, among other things, of worshipping the sun, and the head of an ass. They reproached them with idleness, and being an useless race of people. They charged them with treason, and endeavouring to erect a new monarchy against that of the Romans. They affirmed, that, in celebrating their mysteries, they used to kill a child, and eat its flesh. They accused them of the most shocking incests, of impudence, avarice, and sometimes of prodigality, and of intemperance in their feasts of charity. But the lives and conduct of the first Christians were sufficient to refute all that was said against them, and evidently demonstrated, that these calumnies were merely the effect of the most inveterate hatred and malice.

We will now take a short view of the ten grand persecutions of the Christians.

The first who raised a general persecution against the Christians, was the emperor Nero, of whom Tertullian tells the Gentiles, and, for the confirmation thereof, appeals to their public records: "We glory, says he, in such an author of our persecution: any body who knows him, may understand, that nothing but what is eminently good, could be condemned by Nero." He was a prince of such brutish and extravagant manners, that their own writers scruple not to call him a brute in human shape; the very monster of mankind. He wanted, says Eusebius, this to be added to his other titles, to be called the first emperor who persecuted the Christian religion. He published laws for suppressing it, and put to death those who professed it; as appears by an inscription found in Spain, for he seems to have carried his persecution even to that country. This persecution continued a full year, even that after the burning of Rome, A. D. 66.

The second persecution was began by Domitian, a man eat up with pride and insolence; nay, so wickedly ambitious was he, as to affect divinity in all his public edicts, assuming to himself, and requiring others to give him the titles of Lord and God. This persecution began in the ninety-second year of the Christian æra, 26 years after that by Nero; and continued to Domitian's death, which happened about 3 years after.

The third persecution commenced under Trajan, a prince of excellent virtues, but sullied by his severe proceedings against the Christians. He looked upon the religion of the empire as undermined by this new way of worship; that the number of Christians grew formidable, and might endanger the tranquillity of the Roman state; and that there was no better way to secure himself the favour of the Gods, especially in the wars, than to vindicate himself against the Christians. Accordingly he issued out orders to proceed against them as illegal societies, erected and acting contrary to the laws. This persecution is placed by Eusebius, and by many after him, in the tenth year of Trajan, and the one hundred and eighth of the Christian æra; though Spanhemius thinks it began five years sooner.

The fourth persecution was set on foot by Hadrian, successor of Trajan. We do not find, indeed, that this emperor made any laws against the Christians, but only continued those of his predecessors. As to the duration of this persecution, Spanhemius reckons it commenced in the second year of Hadrian's reign, and was stopped in the tenth, which is A. D. vulg. 126.

The fifth persecution was in the reign of M. Aurelius Antoninus Philosophus. He ascribed the Christians resolute undergoing death to mere stubbornness and obstinacy; and accordingly made new laws and edicts against them, exposing them to all the malice of their enemies. The persecution commenced in the eastern parts, about the seventh year of his reign, A. D. 167, and continued for several years. It spread into the west, especially France, where it raged with great severity; and many received the crown of martyrdom. But the emperor at length greatly mitigated this severity, on account of a wonderful deliverance from his enemies, procured by the prayers of the Christians.

The sixth persecution was raised by Septimus Severus, who began to reign A. D. 195. The edicts which this prince gave out against the Christians, were executed with so much rigour and

and inhumanity, that they verily believed the time of antichrist was then come.

The seventh persecution was began by Maximinus, a man of base and obscure original, and of a mean and sordid education; having been first a shepherd, then a highwayman, and lastly a soldier. This persecution is placed A. D. 237.

The eighth persecution was raised by Decius, who was an implacable enemy to the Christians. This persecution was began A. D. 250; and, though it did not last two years, yet proved the hottest of any that had hitherto oppressed the church. The Christians were every-where driven from their houses, spoiled of their estates, and tormented in their bodies. Whips and prisons, fire and wild beasts, scalding pitch and melted wax, sharp stakes and burning pincers, were but some of the methods of their treatment; when the old ones were run over, new ones were daily invented. The laws of nature and humanity were broken down; friend betrayed friend, and the son his own father: every one was ambitious to promote the imperial edicts, and thought it meritorious to bring a Christian to the stake.

The ninth persecution commenced in the reign of Valerian, A. D. 257, and continued three years and a half: but, notwithstanding all the severity hitherto used, above one half of the vast Roman empire was become Christian.

The tenth persecution was begun, about the year 303, by Dioclesian. When he resigned the crown, Galerius Maximian carried on the persecution. It is, indeed, impossible to conceive, much more to express, the cruelties of that time. Eusebius, who was an eye-witness of them, tells us, that they were innumerable, and exceeded all relation. Monsieur Godeau reckons, that, in this persecution, there were no less than nine thousand martyrs killed in one month's time; and he observes, that, during the continuance of it, there were, in the bare province of Egypt, no less than one hundred and forty-four thousand persons massacred, and seven hundred thousand, who died through the fatigues of banishment, or of the public works to which they were condemned. This persecution seems to have been the first of the ten that affected the island of Great Britain. It lasted no less than ten years. The emperors thought they had finished their work, and told the world, as in some ancient inscriptions found in Spain, "That they had utterly destroyed the name and superstition of the Christians, and had restored and propagated the worship of the Gods." It seems they grant, that Paganism was at a low ebb before they attempted to restore it, and destroy Christianity: but they were far deceived in their vain boasting assertion; Christianity was not destroyed, but farther propagated; and, where they had done their utmost to ruin it, even there it had a glorious resurrection out of its grave, and Paganism hastened to its ruin.

Thus the Christian religion, in a most miraculous manner, expanded herself, growing up like a palm-tree, under the heavy weight of persecution; for, as we have shewn, no religion had more powerful oppositions, by various kinds of punishments, oppressions, and tortures, which have been said to have decked her with rubies, in her very cradle. Now, as the Christian religion hath the purest and most abstracted, the noblest and highest spiritual notions, so has it been most subject to differences of opinions, and distractions of conscience: the purer the wheat is, the more subject to tares, and the most precious gems to flaws. The several sects of the Christian religion are taken notice of in their proper places.

If we consider the Christian religion, with regard to its principles, it cannot be denied, but that they are very obscure and difficult to be understood; and that its mysteries are above the reach of human comprehension. The obscurity of them, no doubt, is owing in a great measure to the subtilties introduced by several philosophers, who became proselytes to Christianity in the first ages of the Church; and who, afterwards becoming doctors, endeavoured to explain the mysteries of the Christian religion, by arguments borrowed from the Platonic, and other Pagan systems of philosophy. Their successors likewise, by their laboured explanations, added new obscurities to those which they found before; and, the human passions insensibly blending with these symptoms, nothing more was wanting to render the Christian religion an impenetrable mystery. To this, no doubt, is owing that infinite number of sects and heresies, which have sprung up in the Church; each of which lays claim to a primitive purity of doctrine, the characteristic of divine inspiration, a right of superiority, and a perfect knowledge of the way to heaven; and there is not one which, indirectly at least, can forbear damning the rest who desist from it.

The excellency of its morals is a demonstration of the divine original of the Christian religion. It consists not in idle philosophical speculations, or perpetual grimace and affectation, but in a steady practice of the duties it requires, without the least view of recompence from men: it neither seeks their admiration, nor attempts to dazzle their eyes, and deceive them; and this practice, being grounded on God's positive commands, is entirely conformable to the conduct which its divine founder observed, whilst upon earth. There is no religion which excites men more to the love and practice of virtue, and hatred of vice; or that prescribes greater rewards for the one, and punishments for the other.

The Christian religion, in regard to the practice of it, consists in the most exact imitation, that possibly can be conceived, of the infinite perfections of the supreme Being. From hence we may derive that solid virtue, that power which it gives us to subdue our passions, and that satisfaction which we receive from the observance of those laws, to the utmost of our abilities, which God has prescribed mankind. The characters of Christianity are perfectly conformable to the attributes of the divine Majesty: the moral part never indulges men's passions; it has no other view than the preservation and happiness of mankind; nor have the most inveterate enemies of the Christian faith ever invented any thing but what was very much inferior to it, both in practice and speculation.

CHRONO'LOGY (*Dict.*)—The farther we go back into antiquity, the greater is the uncertainty of the æra's, or epocha's; wherefore, men of learning have applied themselves principally to the Chronology of the earliest times. M. Fontenelle, in his Panegyric on M. Bianchini, compares the first times to a vast ruinated palace, the materials of which lie all together in confusion, and a great part of them destroyed. The more these materials are deficient, so much the more room is there to form different plans, which have no correspondence, out of those which remain. Such is the state of ancient history. Besides, materials are not only wanting on account of the vast number of books which have been lost, but those which remain frequently contradict each other.

We must therefore either reconcile these, or resolve to make a choice of what we think probable; which, however, must always be suspected of being arbitrary. All the chronological enquiries, hitherto made, are more or less successful combinations of these indigested materials; and who can be assured the number of the combinations is exhausted? Are not new systems of Chronology published every day? Moreri, in his Dictionary, tells us, there are seventy different opinions concerning the Chronology from the beginning of the world to our Saviour: we shall content ourselves with mentioning the most celebrated authors. Julius Africanus, Dionysius the younger, Eusebius, St. Cyril, Bede, Scaliger, Petavius, Usher, Marsham, Vossius, Pagi, Pezron, M. Desvignoles, Mr. Freret, and Sir Isaac Newton: illustrious names! How difficult is the ancient Chronology, since, after the labours of so many eminent men, we seem rather to have seen, than cleared up, the obscurity of it. It is a kind of immense perspective, and out of sight; the bottom being interspersed with thick clouds, through the intervals of which some glimmerings of light appear.

If it only related to some particular events, we should not be surprized at the disagreement between these great men; but the points in question are concerning the most remarkable events in history, both sacred and profane; namely, the number of years since the creation; the distinction between the sacred and civil years among the Jews; the sojourning of the Israelites in Ægypt; the Chronology of the judges and kings of Juda and Israel; the beginning of the years of the captivity, and of Daniel's seventy weeks; the history of Judith and Esther; the birth, mission, and death of the Messiah, &c. the origin of the Chinese empire; the dynasties of Ægypt; the epocha of the reign of Sesostris; the beginning and end of the Assyrian empire; the Chronology of the kings of Babylon and Media; of the successors of Alexander, &c. not to mention the fabulous and heroic ages, wherein the difficulties are still more numerous, as the Abbé Artigni has well observed, in his Memoir concerning Literature and History. From whence the judicious author, last quoted, concludes it needless to set about reconciling the old systems, or devising new; it is sufficient, says he, to pitch upon one, and stick to it; and this opinion seems to coincide with that of other learned men, whom we have consulted on this occasion. As, for example, take Usher's system, which is at present in great repute, or that of Petavius, in his Rationarium Temporum. In writing ancient history, we are to mention whose Chronology we follow, for fear of leading our readers into an error; for, according to some authors, there are, from the beginning of the world to the Christian æra, but 3740 years; according to others, 6934; which makes a difference of 3194 years.

It seems a matter of no great importance to mention, at large, the various sentiments of chronologers, or enumerate the proofs they bring in support of their different opinions; the reader may apply to their different works. Besides, we design below to give an extensive view of the sacred Chronology, which is of the greatest moment. The following are the most famous opinions concerning the age of the world, from the creation to the birth of our Saviour.

According to the Vulgate,

			Years.
Usher	——	——	4004
Scaliger	——	——	3950
Petavius	——	——	3984
Riccioli	——	——	4184.

According to the Septuagint,

		Years.
Eusebius	—— ——	5200
The Alphonsine Tables	——	6934
Riccioli	—— ——	5634.

The

The birth of Christ is very much disputed: authors vary, even in this point, seven or eight years. But, since that time, Chronology begins to be much more certain, by the number of monuments we have left, and the differences we meet with in authors being much less considerable.

According to Sir Isaac Newton, the world is not so old by five hundred years as other chronologers have made it: the proofs he produces are of two kinds.

The first turn on the valuation of generations. The Ægyptians reckoned three hundred and forty-one generations from Menes to Sethos, and accounted three generations one hundred years. The ancient Greeks reckoned forty years a generation. In which Sir Isaac thinks them both mistaken. It is true, three ordinary generations may be computed at about one hundred and twenty years, but generations are longer than reigns; because it is evident, that men in general live longer than kings reign. According to Sir Isaac, every reign, one with another, is about twenty years: this he proves from considering the reigns of the kings of England, from William the Conqueror to George the First; from the reigns of the first twenty-four, the second twenty-four, and fifteen following kings of France; and from the whole sixty-three taken together. The ancients, therefore, erred in their calculation, by computing a generation at forty years.

The other kind of his arguments is yet more singular, and drawn from astronomy; which the reader will find in the Dictionary, under this article.

Upon the strength of these two arguments, taken together, Sir Isaac concludes, that the expedition of the Argonauts ought to be placed 909 years before Christ, and not 1400; which lessens the age of the world almost 500 years.

M. Freret, by comparing and considering the history of known times, apprehends Sir Isaac to lie under a mistake, in computing every generation of kings at twenty years. He finds, on the contrary, by different calculations, that they ought to be reckoned at least at thirty years, or, rather, between thirty and forty. He proves his assertion by the 24 generations, from Hugh Capet to Lewis XV. which make 770 years, or 32 years to a generation. It is very singular, that the calculations of Sir Isaac and M. Freret should both be right, and yet the result be different. The difference arises from hence, Sir Isaac counts by reigns; M. Freret by generations. As, for example, from Hugh Capet to Lewis XV. there are only 24 generations, but 32 reigns; and by allowing about twenty years for every reign, and above thirty for every generation, it follows, that, if Sir Isaac's calculation be too little, M. Freret's is too much. Reigns in general must not only be shorter than generations, but the generations of kings must be shorter than those of private persons, because kings are married younger.

With regard to the astronomical proofs, M. Freret observes, that the position of the stars and points of the equinox is by no means exact, in the writings of the ancients; that authors of the same age differ very much on this head. It is very probable, according to this learned chronologist, that Meton, by placing the summer solstice in the eighth degree of Cancer, rather conformed to the received opinion of his age, than the truth; it being the common custom among us to place the vernal equinox in the first degree of Aries, though its situation has long been far from it. M. Freret corroborates this conjecture, by many arguments, the principal of which are these: Achilles Tatius tells us, that several astronomers placed the summer solstice in the first degree of Cancer, others the 8th, others the 15th; Euctemon made an observation of the solstice with Meton, and Euctemon placed the autumnal equinox in the first degree of Libra; which is a proof, says M. Freret, that Meton, when he fixed the summer solstice in the 8th degree of Cancer, subscribed to the popular acceptation, not to truth. To follow the laws of the precession of the equinoctial points, the equinox must have been in the 8th degree of Aries 964 years before the Christian æra; and this is much about the time, that the calendar followed by Meton must have been published. Hipparchus places the equinoctial points at fifteen degrees distance from that of Eudoxus; from whence there would follow the difference of an interval of 1080 years between Hipparchus and Eudoxus, which is by no means to be maintained. M. Freret to these proofs adds several others, but too long for us to insert: and the reader would do well to read Sir Isaac's short answer to these remarks of M. Freret, published in 1726; in which are some articles that merit the greatest attention.

Chronology is not confined to past times, and fixing ancient epocha's; it extends itself to other uses, particularly in the church. By the help of this, we fix the moveable feasts; and, among others, that of Easter; and, by the means of the epacts, periods, and cycles, &c. we form the calendar. So that there are properly two kinds of Chronology; one purely historical, founded on facts transmitted to us by antiquity; the other mathematical and astronomical, which settles the different epocha's by calculations and observations, and serves to regulate the seasons of celebrating the feasts in the church.

Sacred CHRONOLOGY. By the Chronology of the first ages, is understood, in general, that order, in which all the events that preceded the flood, and immediately followed it, ought to be placed, with regard to time. But what course shall we take in settling this order? Shall we, with some of the ancients, look upon the world as eternal, and say, that the succession of beings was without beginning, and will be without end? Or, with some authors, admitting of a creation in time, shall we think its date to be carried so far back, that no thread of history or tradition remains to guide us in tracing up its high original? Or, rejecting the absurdity of these systems, and applying ourselves to the historical accounts given by some nations, shall we prefer those of the inhabitants of Bethica in Spain, who produce annals of 6000 years? Or, shall we reckon, with the Indians, 6461 years from Bacchus to Alexander the Great: or yet, more fond of antiquity, shall we subscribe to the Chronology of the Egyptians, who boast an history of twelve or fifteen thousand years, and, with them, ascribing to the reigns of gods and heroes 18,000 years more, make the world 30,000 years old? Or, asserting with the Chaldeans, that they had made astronomical observations above 400,000 years before Alexander's march into Asia, shall we grant them ten kings before the flood, from the beginning of their monarchy? Shall we reckon these reigns to have subsisted 120 sares? and, according to Eusebius, allowing 3600 years for the time of every sare, admit there were 432,000 years from their first king to the flood? Or, denying the truth of Eusebius's estimation of the sare, and willing to allow the Chaldeans all the antiquity they pretend to, shall we restore them the 410,000 years they seem to have lost by this calculation, and grant them the 473000 years in which they pretend to have made astronomical observations before Alexander's march, according to Diodorus Siculus?

Or, looking on all these Chronologies as fabulous, or reducible, by some light received from antiquity, to the Chronology of the sacred writings, abide by that? Both reason and religion direct us to embrace the latter opinion. Our first business is, therefore, to shew that these extravagant calculations of the Chaldeans and others may be reduced to some one of the systems of our authors in sacred Chronology; secondly, as these systems differ considerably, to reconcile them in order to fix some of the principal epocha's.

The Babylonian, Egyptian, or Chaldean annals reduced to our CHRONOLOGY. We are obliged to M. Gibert for our information in this important and difficult subject, in a letter he published at Amsterdam, in 1743, which the reader may consult. The ancients meant, by a year, the revolution of any planet in the heavens: see what Macrobius, Eudoxus, Varro, Diodorus Siculus, Pliny, Plutarch, St. Augustin, &c. have wrote on this subject. Thus the year consisted of two, three, four, six, or twelve months; and, according to Palæphatus and Suidas, sometimes of one day only. What sort of revolutions did the Chaldeans mean, by pretending to have made observations 473,000 years? Those of the solar day, answers M. Gibert; the solar day was their astronomical year; from whence it follows on this supposition, that the 473,000 years of the Chaldeans are reducible to so many days, or about 1297 years nine months of our solar annual revolutions. Now, this is exactly the number of years Eusebius reckons, from the first discoveries of Atlas in astronomy to Alexander's march into Asia: and he places these discoveries at the 384th year of Abraham: but the march of Alexander was in the year 1682; the interval, therefore, between the one and the other is exactly 1298 years, nearly the same as before.

This discovery is so much the more striking, as Atlas is accounted the inventor of astrology, and, consequently, his observations are those of the greatest antiquity. History furnishes sufficient conjectures to persuade us that the observations of Atlas and the Chaldeans were the same. But let us consider the consequence of this hypothesis of M. Gibert.

Berosus added 17,000 years to the observations of the Chaldeans. This author's history, dedicated to Antiochus, was, in all probability, brought down to the last years of Seleucus Nicanor, the predecessor of this Antiochus. This was much about the time that Babylon lost its name, and its inhabitants went into the new city built by Seleucus, that is, in the 293d year before Christ, or rather the 289th; for Eusebius tells us, that Seleucus then peopled the city he had built. Now, the 17,000 years of Berosus, according to the computation of M. Gibert, make 46 years and 6 or 7 months, or the exact interval between the march of Alexander and the first year of the 123d olympiad, that is, to the very time Berosus had carried his history.

The 720,000 years which Epigenius attributes to the observations preserved at Babylon, no longer make any difficulty; for, being reduced to Julian years, they make about 1971 years three months, which come very near to the 1903 years which Callisthenes allowed to these observations; the 68 years difference proceeds from this, that Callisthenes ends his calculation at the taking of Babylon by Alexander, as he ought; and Epigenius carried on his to the time of Ptolemy Philadelphus.

Another proof of the truth of M. Gibert's hypothesis and calculations may be deduced from what Alexander Polyhistor

hiſtor ſays, after Beroſus, that hiſtorical records of events were preſerved at Babylon for the ſpace of 150,000 years; but every one accuſes Beroſus of impoſture, who recollects that Nabonaſſar deſtroyed all hiſtorical monuments of preceding ages, and that Nabonaſſar lived only 410 or 411 years before Alexander: however, if we reduce this 150,000 years into days, the product is 410 years, 8 months, and 3 days, which time correſponds exactly to the interval between the 26th of February of the 747th year before Chriſt, when the æra of Nabonaſſar begins, to the firſt of November of the 337th year, that is, to the year and month from whence the Babylonians dated the reign of Alexander, after the death of his father. This computation carries us to the true epocha's; the 30,000 years which the Egyptians attribute to the reign of the ſun, the ſame with Joſeph, are reduced to 80 years, the time of ſervitude attributed to this patriarch by holy writ; the 1300 years, and more, as ſome reckon from Menes to Nitochris, are only years of ſix months, which make 668 Julian years, the ſame ſpace of time, which the canon of the Theban kings, by Eratoſthenes, puts between the ſame two reigns. The 2936 years which Dicæarchus reckons from Seſoſtris to the firſt olympiad, are only years of three months, which are reduced to 734 years, the time between Danaus, the brother of Seſoſtris, and the olympiads. According to M. Freret, in his Eſſays, the Chineſe date the epocha of Yao, one of their firſt emperors, about the year 2145 or 7 before Chriſt, and reckon their firſt aſtronomical obſervations, and the compoſition of a famous calendar, to have preceded Yao 150 years: now, in this caſe, the firſt aſtronomical obſervations of the Chineſe and Chaldeans will coincide; which is very ſingular. The Chineſe, as well as all other people, certainly came out of the plains of Shinar: the higher we trace the origin of all nations and people, the more reaſon we find to believe they have proceeded from hence: the more ſtrictly we examine their Chronology and clear up the errors we diſcover in it, ſo much the nearer it approaches to the ſacred Chronology; this Chronology is therefore true; they are the moſt ancient people who are in poſſeſſion of it, and, conſequently, what we ought to embrace.

We have three different copies which vary, with regard to the Chronology of the firſt ages of the world; the Hebrew text, which ſhortens the time, only reckoning about 4000 years from Adam to Chriſt; the Samaritan, which is thought leſs correct, makes this interval longer; the verſion of the Septuagint, which carries back the creation of the world to 6000 years before Chriſt. The Hebrew text reckons 1656 years from Adam to the flood; the Samaritan 1307. According to Euſebius and the Septuagint, this interval is reckoned at 2242 years; according to Joſephus and the Septuagint, 2256; according to Julius Africanus, Epiphanius, Petavius, and the Septuagint, it is reckoned at 2262 years.

If chronologers are divided, both with regard to which text they ought to follow, and the interval between the creation and the flood, they are not leſs divided in their opinions concerning the times ſince the deluge, as may be ſeen by comparing the ſyſtems of Marſham and Pezron.

Marſham's Syſtem.	years
From the flood to the call of Abraham ——	426
From the call of Abraham to the coming out of Egypt	430
From the coming out of Egypt to the building of the temple —— —— —— ——	480
The duration of the temple —— ——	400
The captivity —— —— ——	70

Pezron's Syſtem.	
From the flood to the calling of Abraham ——	1257
From the calling of Abraham to the coming out of Egypt —— —— —— ——	430
From the coming out of Egypt to the building of the temple —— —— ——	873
From the building of the temple to its deſtruction	470
The captivity —— —— ——	70

Other ſyſtems, to which we muſt refer our readers, have more or leſs the ſame difference. The diverſities, as well between the texts themſelves, as the commentators on them, ſuggeſted an opinion to the Abbé de Prades, which we ſhall examine, becauſe it has made a great noiſe in the world.

The Abbé ſets out with aſking this queſtion, How can it be, ſays he, that Moſes ſhould have wrote a Chronology, which is ſo different in the three different texts, that it is impoſſible to know which Moſes wrote, or whether he is the author of any one of them? He obſerves this contradiction in Chronology had given birth to innumerable various ſyſtems; that the authors of theſe ſyſtems had ſtuck at nothing to deſtroy the authority of the texts which did not favour their own particular ſyſtem; that the chronologers themſelves ſeem to have had no great opinion of the certainty of this Chronology, becauſe they have made ſo many additions, alterations, and corrections in it, ad libitum; that the Chineſe annals are not conſidered in any of theſe ſyſtems, and yet thoſe annals are not to be rejected without an hiſtorical ſcepticiſm; that this had furniſhed the infidels with arguments againſt the account of Moſes, who makes all men to have deſcended from Noah, whereas the chronicles of the kings of China go farther back than the flood. The Abbé is of opinion, on the whole, that Moſes was not the author of any one of theſe three Chronologies, and that whatever pains father Tournemine and others had taken to reconcile them, were to no purpoſe: that the three ſyſtems were of a more modern invention than Moſes; that the differences between them could not have proceeded from the careleſneſs of copyiſts; for, if the errors of copyiſts are ſuppoſed to have produced different Chronologies, there would in all probability have been many more than three; that the Chronologies would only differ as three copies of the ſame Chronology; that, if the Chronology of the Hebrew text, from which the Septuagint made their verſion, had paſſed for authentic, ſo reſpectable a body of men, as thoſe tranſlators were, would not have preſumed to alter it; that it cannot be ſuppoſed the Septuagint preſerved the Hebrew Chronology. That there is an error ſome where is plain; but is it in the Hebrew text, or the verſion of the Septuagint, or both? The anſwer to this queſtion is, ſays he, that neither Chronology is true. It is ſomewhat amazing, that the ignorance of the copyiſts ſhould never have been perceived, till after the Septuagint; that the interval between Ptolemy Philadelphus and the birth of Chriſt ſhould be the only ſpace of time expoſed to this uncertainty; that profane and ſacred hiſtory abſolutely diſagree in this point; that the ſuperſtitious carefulneſs of the Jews ſhould have been ſo groſsly deceived; that, the numbers being wrote in all the texts at length, not in cyphers, an alteration muſt have been extremely difficult; but, however eaſy it might have been, yet it will by no means follow that ſuch an alteration would have introduced different ſyſtems of Chronology. We cannot, ſays he, ſuppoſe the Chronology of Moſes to lie diſperſed in all the three texts, and therefore we ought to conſult them all on every fact, and uſe that which is moſt agreeable to truth, all circumſtances conſidered.

According to this ſyſtem of the Abbé's, the objection indeed of the infidels to the account of Moſes, drawn from the diverſity of the Chronologies, falls to the ground; but does not this ſyſtem greatly weaken the authority of the ſacred writings? Does it not greatly take away from the credit of the facts related in them, which is founded on the carefulneſs of the Jews in preſerving their writings? The Abbé aſſerts that theſe Chronologies are three different ſyſtems; but he only proves that their alteration is very extraordinary: how then are we to take theſe three Chronologies for connected and correſponding ſyſtems, when we ſee every epocha inſerted throughout the whole Hebrew text, but omitted, with regard to all the patriarchs, in the text of the Septuagint? A connection of facts is preſerved, becauſe they are leſs liable to error than chronological calculations; and however groſs the errors may be in theſe, they ought not to aſtoniſh us. Nothing, therefore, hinders us from admitting the three texts, and trying to reconcile them, becauſe they collectively contain what may clear up many difficulties. But how ſhall we reconcile them? By conſidering the Chronology and the events; ſometimes the Chronology alone is ſufficient; and, by comparing both together, will very often clear up many difficulties; and with regard to thoſe parts of hiſtory, where both theſe fail, we are of opinion they will always remain obſcure.

This ſyſtem is very different from that of the Abbé de Prades, but appears preferable, becauſe the Abbé denies Moſes to have been the author of the Chronology, and thereby invalidates the authenticity of ſcripture. The variation of the Chronology, with regard to the firſt ages of the world in the ſeveral texts, creates the uncertainty; but the Chriſtian neither imitates the puſillanimity of the Jew, nor the prejudice of the Muſſulman, in conſidering thoſe books which contain the fundamentals of his faith; but ſubmits them to the trial of reaſon, without fear of incurring the cenſure of impiety.

The Hebrew and Samaritan texts, as well as the verſion of the Septuagint, have each their ſeveral pretenſions; the Hebrew ſeems to be written in the ſame language as the firſt original; the Samaritan lays claim to the ſame advantage, and pleads, beſides, in its own behalf, the preſervation of the true ancient Hebraic characters. The verſion of the Septuagint was made from the Hebrew of the ancient Jews. The Chriſtian churches adopted it, the ſynagogue acknowledged it, and Joſephus in his Hiſtory has in general conformed to it. If ſome faults have crept into the verſion, may not ſome alſo have crept into the Hebrew text, and may we not entertain the ſame ſuſpicion of the Samaritan? Are not all copies ſubject to theſe, and many other accidents? Tranſcribers are not leſs incorrect in copying from the Hebrew, than in tranſcribing from the Greek. The purity and correctneſs of the text depends upon the ability, attention, and honeſty of the copier, not the language in which it is written.

As the authority of the three texts is ſupported on pretenſions nearly equal, it ſeems our buſineſs to enquire what reaſons there may be for preferring one to the other in places where they contradict each other, without partially adhering to either. We ought, in juſtice, to think the three texts copies of one original; and conſequently ought not to be prejudiced in favour of any one, but try to reconcile them. Theſe principles being premiſed, we proceed to propoſe ſome rational conjectures concerning the Chronology of the three texts, with

with regard to the lives of the old patriarchs, and the time of their birth: we mean, since the flood, for the distribution of the people, the establishment of empires, and succession of princes, depend on that period; and in doing this we shall keep our eye on Josephus, whose authority is considerable; and either follow him, or correct him, when his sentiments of Chronology vary from that of holy writ.

As neither the texts themselves nor this historian agree in point of Chronology, there must necessarily be a fault somewhere; let us therefore examine where it lies.

First, the Samaritan text and version of the Septuagint seem right in giving the patriarchs 100 years more than the Hebrew text; partly, because two of them agree, and partly, because Josephus strengthens this opinion by his consent. By reckoning the lives of each patriarch separate, it may be objected the sum total agrees with the Hebrew; but this is a fault in the addition. The Hebrew text, in the first ages after the flood, speaks of wars and tributes imposed on conquered people; this time, compared with the number of events it contains, appears very short. Noah's three sons beget an immense posterity, forget their common origin, treat each other as enemies, and this in the interval of 367 years, which is all the time the Hebrew text allows from the flood to Abraham's going out of Mesopotamia; and Shem, according to the same text, lived 502 years after the flood. The life of man in the ages immediately succeeding the flood was 400 years. Noah himself survived the flood 350 years. Thus Abraham must have lived in the time of Noah, Shem have seen Isaac, and children of the same father must have been ignorant their father was alive; which seems almost incredible. But the objections drawn from the preceding facts are not the only reasons for enlarging the space of the second age. In Genesis we have an account of current coin as a thing common, and of ancient original, on occasion of the tomb which Abraham bought of the sons of Heth. Whoever reflects, must think that a long series of time must have passed from the discovery of the mine to the use of metal for this purpose. It must be acknowledged these are things very hard to be accounted for; however, let us not abandon reason and experience, like some who have done no true honour to the cause of religion, by getting over every thing with miracles; but let us apply reason and experience to the discovery of truth. What will be the result? These suggest, that, according to the authority of scripture, men after the flood lived together in one society, till they grew numerous enough to separate; when God said to the children of Noah, People the earth and divide it, he did not order them to disperse themselves solitarily here and there, and leave the patriarch Noah alone; when he blesses them to increase and multiply, his will was, that they spread themselves over the face of the earth in proportion as they increased. Wherefore, those who before the confusion of languages send Shem into Syria or Chaldea, Cain into Egypt, and Japhet we know not whither, and from thence date the Chronology of kingdoms, give us the history of their own imaginations, not of the times. Men after the flood chose a convenient and proper place to dwell in; this was the plain of Shinar. Here they settled; as they grew numerous, they extended themselves; at last they became so numerous as to be able to divide into large colonies, and, as they saw themselves under a necessity of separation, said to one another, Let us, before we part, erect a common work, which may transmit the memory of our union to posterity; let us build a tower whose top may reach to heaven. The extravagance of the design was like the success of it; scarce had they began their work, when God confounded their language, and forced them to forsake this monument of pride. They formed colonies, went into different countries, and by degrees overspread the face of the earth: thus far good sense, experience, and scripture concur to carry us. These events seem naturally to require a longer time than the Hebrew text allows. Shall we, to lessen the force of the objections made on account of the number of the people, the wars, arts, religions, languages, &c. as some have done, to account for the prodigious increase, reply, that the women regularly brought forth twins, a male and a female, every nine months? Or, shall we rather, to remove the difficulty, adhere to the Samaritan text and version of the Septuagint, against the Hebrew text, and allow 100 years more to the patriarchs? If the foregoing reasons are not sufficient to make us declare on this side the question, the dynasties of Egypt, the kings of China, and other Chronologies which are not to be looked on as fabulous, and go higher than the flood, according to the Hebrew text, leave us no room to doubt. The birth of Terah, the father of Abraham, should have been placed at the 129th year of Nahor the grandfather of Abraham, though the Samaritan text places it in the 79th, the Septuagint in the 179th, the Hebrew in the 29th, and Josephus in the 120th. This great diversity gives us reason to presume there is a fault in the whole. The Samaritan may have omitted the hundred, which fault is to be corrected by the Septuagint and Josephus, who have retained it; as to the figures that follow the hundred, the Hebrew may be most exact; Josephus comes nearest to it; a view of them together may set this in a clearer light.

	years.
The Samaritan text ——— ———	79
The Septuagint ——— ——— ———	179
Josephus ——— ——— ——— ———	120
The Hebrew text ——— ——— ——— ———	29
A new conjecture ——— ——— ———	129

The Septuagint makes Cainan the third patriarch from Shem, or fourth from Noah; but this is a mistake according to the Hebrew text, the Samaritan text, and Josephus; and he is omitted in the first chapter of the first book of the Paralipomena in the Septuagint itself, where the succession of the patriarchs mentioned in Genesis is repeated. Origen had not admitted it into his Hexapla, which seems to prove that it was not in the best copies of the Septuagint. Origen, in his twentieth Homily on St. John, makes Abraham the twentieth from Adam and tenth from Noah, which agrees with the account in the Antiquities of Josephus. Theophilus of Antioch, Julius Africanus, and Eusebius are of the same opinion. A passage of the third chapter of St. Luke's gospel, which mentions Cainan, seems to make against this; but the passage is omitted in the Cambridge MS. and may have proceeded from a mistake of the transcriber, both in the Septuagint and St. Luke; it is highly probable this Cainan is the same with him before the flood, and has by some mistake been inserted in both genealogies, exactly in the same rank; that is, the fourth from Adam, and the fourth from Noah.

The sum total of the lives of the patriarchs in the Hebrew and Samaritan texts seems right; they only differ about Heber and Terah. The Hebrew makes Heber live 464 years, the Samaritan 60 years less; but this is not very material; for we want to fix the time of his birth, not the duration of his life. The Septuagint agrees with the Samaritan text, and we are inclined to think that more correct than the Hebrew, partly for this reason, and partly, because it is observed, men's lives shortened, as they lived more distant from the flood; but Heber's life, according to the Hebrew text, is longer than either that of his father or his uncle; as to the difference between the Hebrew and Samaritan texts concerning the time Terah lived, as it makes a more essential difficulty, and relates to the birth of Abraham, we shall consider it more at large.

It appears from what we have said, that, of the three texts, the Samaritan is the most correct, with respect to the parts of Chronology we have considered; it is only defective, with respect to the time when Nahor begat Terah; and there the hundred has been omitted. We must now enquire the time of the birth of Abraham, and the death of Terah. Though Josephus and all the texts agree to place the birth of Abraham at the 70th year of Terah, yet several chronologers fix the birth of Abraham at the 130th year of Terah.

According to the book of Genesis, say they, Abraham went out of Haran at the age of 75 years; and, according to St. Stephen, in the seventh chapter of the Acts, he did not go out of Haran till after the death of his father. Now Terah, according to the Hebrew text and Septuagint, lived 205 years, wherefore Abraham must have been born when his father was 130 years old; for, if we subtract 75 from 205, we shall have 130 years remaining.

When you object to them that it is said in Genesis chap. xi. v. 26, 'Terah lived seventy years and begat Abraham, Nahor, and Haran', they reply, this means no more than in general, that Terah had lived seventy years, had three sons at different times, and by mentioning them all together, say they, the author of Genesis had plainly no design of determining the exact time of their birth; if Abraham is named first, it is out of honour, not as being the oldest.

These considerations appeared sufficient reasons to Marsham, Pezron, and others, for fixing the nativity of Abraham at the 170th year of the age of his father Terah; but Petavius, Calvisius, and others, persist in fixing the birth of Abraham at the 70th year of Terah: the latter insist upon it, as contrary to all probability, that Moses should have neglected to set down the exact time of Abraham's nativity, who seems to have wrote the Chronology of the ancient patriarchs, principally with a view of coming down to the father of the faithful; and, in other respects, is so exact with regard to the years of this patriarch. They say it is more likely that St. Stephen was less exact in points of Chronology and geography, which were not important in the first martyr, but would be unpardonable negligences in Moses, who wrote as an historian. The geographical error of St. Stephen they say is this, that God appeared unto Abraham in Mesopotamia before he dwelt in Charran, whereas Charran is in Mesopotamia; the geographical error will be rectified by a very small transposition in the text, which runs thus: Deus gloriæ apparuit patri nostro Abrahæ, cum esset in Mesopotamia, priusquam moraretur in Charran, & dixit ad illum Exi, &c. only put the et, which is before dixit, before priusquam, and the sense will be that Abraham was in Mesopotamia before he dwelt at Charran; this difficulty may even be got over without correcting the text, by saying that St. Stephen thought Abraham dwelt in some other part of Mesopotamia before he dwelt in Charran. Petavius, in his Rationarium Temporum, to reconcile St. Stephen and Moses's account, supposes a twofold going forth of Abraham from the city of Charran;

Charran; the first, in his 75th year, by the command of God into the land of Canaan, that he a long time afterwards returned to Charran; and carried with him those of his family he had left behind and all his effects; but Moses expresly says, speaking of this going out off Charran, which Petavius acknowledges for the first, that Abraham took with him his wife Sarah and Lot his nephew, and all the substance that they had gathered, and all the souls that they had gotten in Haran. Wherefore, we must leave the dreams of Petavius, and reconcile Moses with St. Stephen some other way. To solve the difficulty, we propose the following conjectures.

First, Abraham never returned into his own country after leaving it, and departed not from Haran till after the death of his father Terah. St. Stephen expresly says so, and Genesis plainly insinuates it. In the book of Genesis we read concerning the going forth of Chaldea, that Terah carried with him Abraham, Lot, and Sarah, to go and dwell in Canaan; that they came as far as Haran, where they stopped, and Terah died there; which proves that the design of Terah was to have gone into Canaan, though he was prevented by death at Haran. Immediately after Moses relates the departure of Abraham out of this city with Lot his nephew and all their substance.

Secondly, The authority of St. Stephen does not determinately fix the year of Abraham's nativity, but obliges us to place the death of Terah before the 75th year of Abraham's age; but, as Terah might have died long before his son arrived at that age, St. Stephen's speech gives no light to the Chronology.

Thirdly, Moses has exactly pointed out the time of Abraham's nativity, which was the design and end of this Chronology: Abraham is the hero of his history, and he begins from him to distinguish the Hebrews from all other nations.

Fourthly, We might conjecture that Terah did not beget children till he was 170 years old, and that the 100 years which are reckoned in the lives of all his ancestors, are omitted in his; but this conjecture is weak, for it is said of Sarah, even before she went out of Chaldea, that she was barren, though she could not then be above twenty-five years old, and Abraham at most five and thirty; it is said also of Abraham that he looked on it as a thing impossible to beget children at an 100 years old, which he never could have thought, if he had not been born before his father was 170 years old.

Fifthly, It appears that Abraham was born at the 70th year of the age of Terah. The Hebrew and Samaritan texts, the Septuagint and Josephus, agree in rescinding the hundred. Now, as the birth of this patriarch is carried no farther back, it is evident, the only means of reconciling Moses with St. Stephen will be to shorten the life of Terah; the Hebrew text and Septuagint agree this patriarch lived 205 years. The Samaritan text says he lived but 145 years. And the latter seems more correct than the other two. The clearing up the difficulty before us is, we apprehend, a sufficient proof of it. The 70 years which Terah lived before he begat Abraham, and the 75 years which Abraham lived before he went out of Haran, make up the 145 years of the Samaritan text; and thus Abraham's departure out of this city will be after the death of his father according to St. Stephen's account, and his nativity at the 70th year of Terah according to Moses.

Some critics suspect a corruption in the Samaritan text, and ground their suspicions on its consonance with the events, which must certainly be a proof of the contrary: for the criterion of truth in history is clearness. The Samaritan text is more ancient than that which Eusebius has inserted in his Chronological Canons. Before Eusebius who would have changed it? The Christians? They only made use of the Septuagint or common Hebrew. The Samaritans? What interest of theirs was it to allow 145 years for the life of Terah rather than 205? Wherefore it follows the error is not in the Samaritan text. All the texts agree that the ages of the patriarchs shortened successively after the flood; the father of Terah lived no more than 148 years, and it is by no means probable, therefore, that Terah lived 205 years: besides, God had promised Abraham a long life; this promise, at least, should have extended to the days of his father Terah, which were 205 years, according to the Hebrew text and Septuagint, whereas Abraham lived no more than 175 years, as we read in Genesis. It is therefore more probable, that God prolonged the life of Abraham 30 years more than the life of Terah: that the Samaritan text is right; that Moses is exact in his history and Chronology; that St. Stephen spoke according to the truth of some Hebrew text which was more correct than any that have been handed down to us.

Thus we have endeavoured to remove this grand difficulty in the sacred Chronology; and, with regard to the rest, must refer our readers to the authors already mentioned, who have wrote very largely on this subject.

CHRONO'METER, a machine contrived by the late ingenious Mr. George Graham, and made so exact as to measure a small part of time very nicely, even to the 16th part of a second. To one end of an horizontal axis is fixed a contrate wheel of 120 teeth, and, at the other end, there is a little barrel which on its outside receives the string of a little weight to turn the wheel round; the wheel with its teeth moves an horizontal pinion of 15 leaves (or teeth) fixed to the bottom of a vertical axis on whose top is the balance wheel, which is a contrate wheel of 15 teeth cut askew; that is, one side of every tooth is perpendicular to the plane of the wheel, and the other cut obliquely with a curve. Just over this last wheel, there is a little axis or rod of steel placed horizontally, which has two little pallets at right-angles to each other, so placed as to be alternately struck by the upright part of the skew teeth on the opposite sides of the balance wheel, in such manner that not one of the teeth of that wheel can pass by without a stroke be made against each pallet to give a quarter of a turn to the axis above-mentioned. At the other end of this axis is fixed a wire, at whose end is a brass bob, whose center of gravity is distant from the horizontal axis 2,45 inches, that is, near two inches and a half, or the 16th part of the length of a pendulum vibrating seconds. Therefore, as the weight carries the wheel-work round, the skew teeth of the balance wheel must strike the pallets fixed to the horizontal axis about which the little pendulum moves; and as that pendulum, on account of its length, vibrates four times in a second, and there must be two strokes against the pallets for every tooth that passes by in the balance wheel, so there must be two swings of the pendulum, or half a second in time, for every tooth of the great wheel that is brought forward by the piviot (whose number of teeth is equal to that of the balance wheel) and, as the great wheel has 120 teeth, there will be performed 240 vibrations of the pendulum, whilst the great wheel goes round; therefore, an hand or index fixed to the great wheel will go round in one minute pointing to 60 large divisions for seconds on the dial plate, which divisions are again subdivided into four to shew the quarters of seconds. But then, besides this, there is a quadrant of a circle of a radius equal to the length of the pendulum, which is divided into four parts by five little brass pins, fixed to an horizontal axis; which quadrant serves not only as a detent to set the machine a going in a sixth part of a second, but also to stop it in the same time, the pins stopping the pendulum in any fourth part of its vibration; for, in fixing the pins, regard was had to the time of every fourth part of the vibration, the two spaces between the pins next to the lowest part of the quarter of the circle, which the pendulum vibrates in $\frac{1}{4}$ of a second, being so much greater, as the pendulum moves swifter in that part of its vibration.

This Chronometer is of great use for measuring small parts of time in astronomical observations, the time of the fall of bodies, the velocity of running waters, and fit for many other purposes, where a small space of time is to be measured nicely, as from three or four seconds to a minute or two; but it is not adapted to measure long spaces of time very exactly; because, though it seems to vibrate exactly a quarter of a circle every vibration, yet it does not really do so, and the difference of the lengths of the vibrations in such large arcs makes a difference in time; and, however small that difference is, yet a great many of them create a sensible error. In this machine, there is sometimes an error of $\frac{1}{4}$ of a second in fourteen seconds. This is a fault which all clocks are liable to, that have short pendulums which swing large arcs of a circle.

CHRYSA'ETOS, *the golden eagle*, a large and beautiful bird of prey. Its weight is usually twelve pounds; his general colour a chesnut brown, with a number of white spots; there are but few of them on the back, but a larger number on the belly; his feet are feathered to the toes, and yellow. He is extremely bold and fierce, and will seize upon almost any thing for prey; his voice is clear and shrill, and often makes a moaning noise.

That species of eagle which we call simply the eagle, without any addition, is of this kind, and is properly charactered by the name of Chrysaetos cauda annulo albo cincta; a transverse white line on its tail being its most obvious distinction. *Willughby's Ornithol.*

CHUBB, the English name for the fish called the capito and cephalus by authors, and by some of the ancient Romans squalus.

The resorts of this fish are easily found, for they are generally holes overshaded by trees, and the fish will be seen floating in such, almost on the surface of the water, in a hot day in great numbers. They are but a poor fish for the table, and are very full of bones; but they entertain the angler very much, and are of the number of those that are easily taken. The best manner of fishing for him is thus: prepare a very strong rod of a sufficient length; fix to the hook a grasshopper; place yourself so as to be perfectly out of sight of the fish, and drop in the bait about two feet from the place where a large Chubb lies; if he does not see the angler, he very seldom fails biting, and is immediately taken; but he is so strong a fish that he should be taken out carefully, after a great deal of playing, otherwise the tackle will be in danger; a beetle, or any large fly, will answer the purpose in the place of a grasshopper, and, if there are none of them to be had, the method of fishing must be altered, and the line be long enough for fishing at the bottom. In March and April this fish is to be caught with large red worms: in June and July with flies, snails, and cherries; but in August and September the proper bait is good cheese, pounded in a mortar, with some saffron, and a little butter; some make a paste of cheese and Venice turpentine for the Chubb in winter; at which season this fish is better than at any other; the bones are less troublesome in this

this season, and the fish is more firm and better tasted; the roe is also well flavoured in general. The angler must keep his bait for this fish at the bottom in cold weather, and near the top in hot, and the fish will bite eagerly.

CICATRIX *(Dict.)*—In large wounds, where there has been a loss of substance, an even Cicatrix is not to be expected without great care in the surgeon. When an even, thick, and white matter appears in the wound, it is to be dressed either every day, or every other day, as occasion shall require: the superfluous matter must at every dressing be wiped away with a very light hand; and it is indeed much better to leave some of it in the wound, than to treat that roughly in the taking it away; for wiping the wound too roughly hinders the growth of a new flesh; but a little matter, being left, only performs the office of oil or balsam, in keeping the parts moist. These rules being observed, new flesh will presently spring up, and the wound unite: but, that an even Cicatrix may be procured, the surgeon must endeavour, by degrees, to harden the new flesh, by the application of a dry lint, covered with a light bandage. When this does not prove sufficient, it may be proper to use some of the drying balsams, or drying powder, such as tutty, lapis calaminaris, mastich, colophony, &c. Rectified spirit of wine is frequently used for this purpose also, with great success, for it carries a very great astringent and drying virtue with it. *Heist. Sur.*

CICHORIUM, *succory*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the semi-flosculous kind, being composed of a great many semi-floscules, which stand upon the embryo fruits, and are contained in a common cup, which afterwards contracts itself so as to form a sort of capsule, containing a number of angular, umbilicated, and somewhat wedge-like or cuneiform seeds.

The species of succory enumerated by M. Tournefort are fourteen, and by Mr. Miller, five.

The common succory stands recommended by most of the medical writers, as one of the best known aperients and detergents: it is prescribed in all diseases of the liver, and is a powerful diuretic. Schroder tells us, that it has also great virtues attributed to it against hæmorrhages; but it is not much regarded at present in that light.

CIMEX, in natural history, the name of a genus of insects, the characters of which are these: the head is small: the back towards the shoulders is broad, and is covered with a crustaceous substance: its shoulders are of an angular make, and its wings partly crustaceous, partly membranaceous, and are so formed, that they exhibit the figure of a cross, where they meet at the middle of the back; and they have a long proboscis, which is bent under the belly, and always lies straight, not in a spiral form.

Mr. Ray divides the Cimices into two kinds, those of a shorter, and those of a longer and narrower make. Of the first kind he describes eight species.

Besides these, there are two species of water Cimices: the first has a long body, and its shoulders are black; the wings and the triangle under the shoulders are of a shining brown, and the hinder pair of legs are very long, and serve as oars. The other is smaller, and is of a rounded, but depressed figure. Its colours are black and a shining yellow: the antennæ are very short, and the legs do not seem made for swimming.

Beside all these, which are properly of the Cimex kind, there is another set of insects mentioned by Mr. Ray, as nearly approaching to them, and described under the name of cimiformes muscæ. *Ray's Hist. Insect.*

CIMOLIA *alba*, the officinal name of the earth of which we now make tobacco pipes. Its distinguishing characters are, that it is a dense, compact, heavy earth, of a dull white colour, and very close texture; it will not easily break between the fingers, and slightly stains the skin in handling. It adheres firmly to the tongue; melts very slowly in the mouth, and is not readily diffusible in water. It is found in many places. That of the isle of Wight is much esteemed for its colour. We have vast plenty of it also near Poole in Dorsetshire, and near Weddensbury in Staffordshire. *Hill's Hist. of Foss.*

CIRCULATION. *(Dict.)*—Dr. Nichols has contradicted the received doctrine of the motion of the heart, and of the Circulation of the blood, both in adults and fœtus's. The Circulation of the blood, according to him, depends on six motions: 1°, of the right auricle. 2°, right ventricle. 3°, pulmonary artery. 4°, left auricle. 5°, left ventricle; and 6°, of the aorta. Of these, the first, third, and fifth are synchronous, as are likewise the second, fourth, and sixth; but the first, third, and fifth are a syncronous to the rest: and, therefore,

The two auricles The two ventricles The two arteries	are alternately	relaxed contracted.

See *Nichols, Compend. Anat. & Prælect.* 15. *ap. Med. Ess. Edinb.* vol. III.

CISTERN. If the farmers of England would fall into the method used in Spain, and at Amsterdam, Venice, and other places, of saving the rain water of the whole year, or at least so much of it as would be necessary, in cisterns, they would have always water for their cattle in the summer droughts, and many thousand acres of land, now left useless, might be turned to profit.

The best way of preserving the water, for the service of the house, is in Cisterns in the cellars. These may be made with brick or stone, joined with plaister of Paris, which will keep out the wet very well; or with a kind of mortar made of slaked lime, with linseed oil, and tow or cotton. A bed of good sound clay may be laid at the bottom, and on this the bricks for the floor, and then the walls may be raised in the same manner, only leaving spaces behind them, into which clay is to be rammed in the like manner. Thus it will be a clay Cistern, faced with brick; and the bricks will keep the clay moist, and prevent it from cracking, though it be not full of water. This will do in any shady place, as well as in cellars: and thus may a Cistern be made in a garden, in some shady place, and covered over, which may receive the water running from the walks, and will retain it for the service of the garden, all the year.

Where there is want of water for the cattle in the fields, the way is to dig a pond in some place into which there is a descent; then to cover the bottom and sides with a double coat of tough clay, each six inches thick, and each very well rammed: then to cover the bottom with large stones, which will keep the clay moist, and prevent its cracking, when not covered with water. But this is a troublesome thing; for, if there happen to be a crack in any part, it is often found necessary to go over the whole work again, before the pond will hold a drop of water.

Another method of making a pond hold water, is to daub it over with clay and mortar mixed together, and then with mortar alone. This has an advantage over the other way, in that, if any crack happens, it may be mended by a cement of clean hair and tallow, mixed with slaked lime, and the yolks of eggs, well beat together. This, applied to the crack, will close it safely, without the necessity of undoing the whole work, as in the other case.

In chalky countries it is common to find a low place on the downs, and, digging a hole by way of a pit there, they cover the bottom evenly with the chalk rubbish, and, when it is wetted by the rain, they ram it well, and afterwards drive cattle into it, and fold sheep in it: the consequence of all which trampling is, that the bottom at length becomes so firm, that it holds the water perfectly well. By one or other of these means, Cisterns or reservoirs may be made in all countries: and our farmers, if they would carefully try one or the other of them, as their land most required, would not have so much to complain of from droughts. *Mortimer's Husbandry.*

CISTUS, in botany, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, composed of several petals, arranged in a circular form. The pistil arises from the cup of the flower, and, finally, becomes a roundish or pointed multicapsular fruit, which, when ripe, opens at the top, and generally contains a number of small seeds. See *plate* IX. *fig.* 3, which represents a branch of the sweet Cistus of candy, *i* the flower, *k* the seed vessel, *l* the seed vessel open, *m* the seed.

The species of Cistus, enumerated by M. Tournefort, are twenty, and by Mr. Miller, seventeen.

The several species of this beautiful shrub are to be propagated by sowing their seeds on a gentle hot bed, or on a warm border of common rich earth in March. When the plants are grown to be three inches high, they should be transplanted either into small pots, or into a border of rich earth, placed at ten inches distance. They will require some screening from hard weather for the first winter, and must be watered at times. In the spring following, they must be carefully removed, with as much as possible of their own earth about them, and be placed where they are to remain. They are very bad plants to remove, when old.

They may also be propagated by cuttings, planting them in a rich bed, and shading them with matts, and watering them carefully for two months: they will by that time have taken root, and may be treated as the seedling plants of the same age. *Miller's Gard. Dict.*

CITREÆ *Mensæ*, in antiquity, tables made of the wood of the citron-tree, very beautiful, and greatly esteemed by the ancient Romans.

CITRINUS, in natural history, the name of a peculiar species of sprig crystal, which is of a beautiful yellow.

It is very plentiful in the West-Indies, and is found in some parts of Bohemia. Our jewellers have learned from the French and Italians, who are very fond of it, to call it citrine, and often cut stones for rings out of it, particularly out of the pyramid, which is always finer than the column; and these, after they have passed through two or three hands, are generally mistaken for topazes. *Hill's Hist. of Foss.*

CITRON *(Dict.)*—The several sorts of Citrons are cultivated much in the same manner as the orange-tree; to which we shall refer the reader to avoid repetition: but shall only remark, that these are somewhat tenderer than the orange, and should therefore have a warmer situation in winter, otherwise they are very subject to cast their fruit. They should also continue a little longer in the house in the spring, and be carried in again sooner in the autumn; as also have a warmer and better defended situation in the summer, though not so much exposed to the heat of the sun, in the heat of the day.

And

And as their leaves are larger, and their ſhoots ſtronger, than thoſe of the orange, they require a greater plenty of water in the ſummer; and in winter they ſhould have but little water at each time, which muſt be oftener repeated. The ſoil ought to be much the ſame as for the orange-tree, but not quite ſo ſtrong.

The common Citron is much the beſt ſtalk to bud any of the orange or lemon kinds upon, it being the ſtraighteſt and freeſt growing tree: the rind is ſmoother, and the wood leſs knotty, than either the orange or lemon, and will take either ſort full as well as its own kind; which is what none of the other ſorts will do: and theſe ſtocks, if rightly managed, will be very ſtrong, the ſecond year after ſowing, capable to receive any buds, and will have ſtrength to force them out vigorouſly; whereas it often happens, when theſe buds are inoculated into weak ſtocks, they frequently die, or remain till the ſecond year before they put out: and thoſe that ſhoot the next ſpring after budding, are often times ſo weak as hardly to be fit to remain, being incapable to make a ſtraight handſome ſtem, which is the great beauty of theſe trees. *Miller's Gard. Dict.*

CITRON-*wood*, ſo named by the Europeans, on account of its ſcent and colour; and what the Americans call candle-wood. What is uſually brought in billets of more than a thouſand pounds weight, is the trunk of a great tree, which grows commonly in the American iſles, and to a very great height. Its leaves, which reſemble thoſe of the laurel in ſhape, are very large, and of a bright green. Its flowers have the ſcent of jaſmine, and are like orange-flowers. Its fruit is black, and the bigneſs of pepper. It is this wood which ſome authors take for the true citrine ſantal, which is an inſufferable fraud, the difference, both in price and quality, of theſe two woods being very great.

The cheat is diſcoverable, not only in that the billets of the true ſantal weigh not more than a hundred pounds, whereas thoſe of the Citron-wood, as we have ſaid, weigh upwards of a thouſand pounds: but alſo, becauſe the ſantal is of a ſoft and agreeable taſte and flavour, reſinous, and moderately heavy; and, on the contrary, the Citron-wood is weighty, compact, oily, and of a ſtrong ſmell, inclining to that of the fruit from whence it takes its name. This wood is fit for turners and in-laid work, it taking an excellent poliſh.

CI'TRUL, *the water melon*. This plant hath trailing branches, as the cucumber, or melon, and is chiefly diſtinguiſhed from the other cucurbitaceous plants, by its leaf, which is deeply cut, and jagged, and by its producing an eatable fruit. See *plate* XIII. *fig.* 1. where *a* is the flower, *b* the fruit, *c* the ſeed.

You muſt, in order to cultivate this plant, firſt provide yourſelf with ſome ſeeds, which ſhould be two or three years old; for new ſeeds are apt to produce vigorous plants, which are ſeldom ſo fruitful as thoſe of a moderate ſtrength. Having provided yourſelf with good ſeed, you ſhould prepare an heap of new dung the beginning of February, which ſhould be thrown in a heap, for about twelve days, to heat; then you ſhould make a hot bed for one ſingle light, for which one good load of dung will be ſufficient; this dung ſhould be well wrought in making of the bed, and muſt be beaten down pretty cloſe with a dung fork, that the heat may not be too violent, and of longer continuance. When the dung is thus laid, you ſhould cover it about four inches thick, with good light earth; and, having ſpread it very even, you ſhould put the frame and glaſs over it, leaving it to warm four or five days, before you put the ſeeds into it; obſerving, if the ſteam riſes pretty much, to raiſe up the graſs with a ſtone, to let it paſs off. Then, if you find your bed in proper temper, you may ſow your ſeeds therein in drills, covering them over with earth, about half an inch. After this, if you find your bed very warm, you muſt give it air in the day-time, by raiſing the glaſſes; but, if the bed is cool, you muſt cover it well with matts every night, as alſo in bad weather. In four or five days after, you muſt prepare another hot bed, to receive theſe plants, which will be fit to tranſplant in ten days, or a fortnight, at moſt, after the ſeeds are ſown. This bed need not be very large; for a few of theſe plants will fill a large quantity of frames, when they are planted out for good: and, while the plants are young, there may be a great quantity kept in one light; ſo that thoſe perſons who raiſe early cucumbers and muſk-melons, may alſo raiſe their plants in the ſame bed; for two or three lights will be ſufficient to raiſe plants of all three kinds, to ſupply the largeſt families, until they are planted out for good. In the management of theſe plants, while young, the chief thing to be obſerved is, to let them have a large ſhare of air, whenever the weather will permit, otherwiſe the plants will draw up weak, and be good for little. As theſe plants require two or three hot beds, to bring them to perfection, it will be the better way to put the plants into baſkets, as ſome do in raiſing of early cucumbers; but you ſhould not plant more than two plants in each baſket; for, if one of them lives, it will be ſufficient: therefore, when both the plants ſucceed, you ſhould draw out the weakeſt and moſt unpromiſing of them, before they begin to put out their ſide-ſhoots, otherwiſe they will entangle, and render it difficult to be performed, without greatly injuring the remaining plant.

The baſkets in which theſe plants are to be planted, need not be more than a foot diameter; ſo that one light will contain eight of them, which will be ſufficient for twenty-four lights, when they are planted out for good; for, where the plants are vigorous, one ſingle plant will ſpread ſo far as to fill three lights; and, if they have not room, they ſeldom ſet their fruit well. Theſe baſkets may remain in the nurſery beds until the plants have ſpread, and put out many runners; for, when the heat of this bed declines, it is ſoon revived, by adding a proper lining of warm dung to the ſides of the bed, quite round; ſo that when they are taken out of this bed, and placed in the ridges where they are to remain, the heat of the beds will laſt ſo long as to ſet their fruit, which is of great conſequence; for, when the plants are ridged out very young, the beds are generally made of a great thickneſs in dung, in order to continue their heat; ſo that, for ſome time after they are made, they are ſo extreme hot, as to endanger the ſcalding of the plants; and, by the time the fruit begins to appear, there is little heat left in the beds, which often occaſions the fruit to drop off, and come to nothing.

After theſe plants are placed in the beds where they are to remain, you muſt carefully lead the ſhoots as they are produced, ſo as to fill each part of the frame, but not to croud each other; and be careful to keep them clear from weeds, as alſo to admit freſh air, whenever the weather will admit: they muſt alſo be frequently watered, but do not give it them in great quantities. *Miller's Gard. Dict.*

CI'TRUM. The ancient Romans had a ſort of tables made of an elegant wood, and called Citrum; theſe have been ſuppoſed, by ſome, to be made of the wood of the citron-tree, and by others, of the cedar; but it appears plainly, that they were made of neither, but of a wood peculiar for its fineneſs, and very different from both.

The more modern writers of the Mooriſh hiſtory tell us, that about mount Atlas, and in ſome of the iſlands on the coaſts of Africa, there grow cedars, which much reſemble the cypreſs-tree; and of the wood of their trunk they at this time make very beautiful tables, and of a large price. The name cedar is become very uncertain in its ſignification, and we at preſent call the junipers of the Weſt-Indies the Virginia and Bermudas cedars. It is poſſible that this cedar of the Africans, which grows like the cypreſs, may be the Citrum of the Latins, and thya of the Greeks; and that the citreæ and thyinæ menſæ may have been made of its wood. Vitruvius alſo tells us, of trees reſembling the cedar in their growth, and the cypreſs in the leaves. Theſe muſt be different from both, and muſt have a peculiar name, and might probably have been the trees called thya by the Greeks, and Citra by the Latins, of which theſe famous tables were made.

CI'TY. It has been obſerved that large Cities are more liable than other places to peſtilential and putrid diſorders, which is owing to the ſtagnation and corruption of the air. This is always the caſe in thoſe which are low and unprovided with common ſewers; where the ſtreets are narrow and foul, the houſes dirty, water ſcarce, and jails and hoſpitals crowded: alſo, when in ſickly times, the burials are within the walls, or when dead animals and offals are left to rot in the kennels or on dunghils; when drains are not provided to carry off any large body of ſtagnating water in the neighbourhood; when fleſh meats make the greateſt part of the diet, without a proper mixture of greens, bread, wine, or fermented liquors; from the uſe of old mouldy grain. In proportion to the number of theſe and the like cauſes concurring, a City will be more or leſs ſubject to peſtilential diſeaſes, or to receive the leaven of the true plague brought into it by any merchandize. *Pringle, Obſerv. on the Diſeaſes of the Army.*

CI'VES, in botany, a very ſmall ſpecies of onion, which never produces any bulbs, and ſeldom grows above ſix inches high in the blade, which is very ſmall and ſlender, and grows in tufts and bunches. This uſed to be in great requeſt for ſallads in ſpring, as being milder than other onions which had ſtood the winter, but at preſent it is not much regarded. The way of propagating it is by parting the roots in autumn, and planting them, at ſmall diſtances, three or four in a hole; they will ſtand the winter very well, and be fit for uſe early in the ſpring.

CLA'NGULA, in zoology, the name of a ſpecies of duck found about the ſea-coaſts, and called in Engliſh the golden eye. Its body is ſhort and thick; its head large, and its neck ſhort; its beak is ſhort and broad, and is all over black; its head is of a very obſcure and duſky green, yet gloſſy, and there is a large white ſpot at each angle of the beak; the iris of the eyes is of a beautiful yellow; the neck, ſhoulders, breaſt, and belly are white, and the back black; the wings are black and white, and the tail is wholly black; the legs are very ſhort, and the feet very broad, and both are of a ſaffron colour; the hinder toe is ſmall, but is edged on each ſide by a membrane, which adds much to its breadth.

CLAP-*net*, among ſportſmen, a ſort of net contrived for the taking of larks with a looking-glaſs, by the method called daring, or doring. The nets are ſpread over an even piece of ground, and the larks are invited into the place by other larks faſtened down, and by a looking-glaſs compoſed of five pieces, and fixed in a frame, ſo that it is turned round very ſwiftly, back-wards

wards and forwards, by a cord pulled by a person at a considerable distance behind a hedge.

CLAR, or CLAER, in metallurgy, bone-ashes perfectly calcined, and finely powdered, kept purposely for the covering the inside of coppels.

CLARIGA'TIO, in Roman antiquity, a ceremony that always preceded a formal declaration of war. It was performed in this manner; first four heralds crowned with vervain were sent to demand satisfaction for the injuries done the Roman state. These heralds, taking the gods to witness that their demands were just, one of them, with a clear voice, demanded restitutions within a limited time, commonly thirty-three days; which being expired, without any restitution made, then the pater patratus, or prince of the heralds, proceeded to the enemies frontiers, and declared war.

CLATTE' in heraldry, a term borrowed from the French, to express such lines as are sometimes found in the old paintings, and engravings of arms. These lines are of an irregular kind, and not reducible to any other proper lines of heraldry, as the engrailed, indented, embattled, or the like. *Nesbit's Heraldry.*

CLAVA'RIA, in botany, the name given by Vaillant, and continued by Linnæus, to a genus of fungus's, the characters of which are, that they grow perpendicularly, and have a simple and uniform surface; these have been called also, by the same Vaillant, under some small varieties in the species, corallo-fungus, and by Tournefort coralloides.

CLA'VICLE (*Dict.*)—*Fracture of the* CLAVICLE. The Clavicle is extremely subject to be fractured, both from its transverse position, and from its smallness. Whether it happens to be broken near the humerus, or near the sternum, its end that is next the humerus always descends lower than the other, from the weight of the arm which was before sustained by the Clavicle and head of the sternum; and, notwithstanding that part of it next the sternum remains immoveable by the descent of its other end, it can scarce happen, but they will in some degree collapse over one another.

The reduction of a fractured Clavicle is not very difficult, especially when the fracture is transverse; nor is it usual for the humerus, with the fragment of the Clavicle, to be so far distorted as not to be easily reduced by the fingers. The difficulty, however, is much greater to keep the bone in its place when the fracture has been reduced, and that most of all when the bone has been broken obliquely. For this there are two reasons; for the circular bandages, with which the bones of the arms and other extremities are usually held very firm, cannot be applied here, by reason of the form and disorder of the part, and then the weight of the depending arm soon pulls to pieces what the surgeon has been replacing.

This fracture is to be reduced in the following manner: the patient must be placed on a low seat, and an assistant is to thrust his knee against the middle of the patient's back, between his two shoulders; then laying hold of both the patient's arms with his hands, he must pull them gently and gradually backwards, by which means the Clavicles will be properly extended: while this is doing, the surgeon must stand before, and endeavour to replace the bone with both his hands, ordering the assistant to hold the bone in that position; he is then to apply a narrow and thick compress, so as to fill up the cavities above and below the Clavicle; upon these he is to lay two more narrow compresses made in the form of an X; over all these he is to apply a piece of paste-board, accommodated to the shoulders and neck, and first steeped in spirit of wine, or oxycrate; then he must place a ball under the arm, or else bind it several times with a thick roller, to prevent the humerus from subsiding; and lastly the whole is to be properly bound up, and the arms suspended by a sash or sling hung across the shoulder, about the neck. The plaisters that have been used to be employed on this occasion, have, of late years, been found to be wholly useless. When ever there are any loose splinters of the bone that are entirely separated, which, though they should not wound, or hurt the flesh, yet will obstruct the meeting of the Clavicle, it seems altogether requisite to open the skin, and remove them before the reduction of the bone, treating the wound as usual: but, if there be any splinters which still adhere to the bone, and prick the adjacent parts, and impede the reduction, they must be also either taken off with the forceps, or else forced back into their places, by which they may be again united to the bone. But to divide the parts, and remove the fragments, requires great caution, lest some of the large subclavian veins, or arteries, be wounded in the operation, and thereby a fatal hæmorrhage be produced. *Heister, Surg.*

CLA'VUS *hystericus*, in medicine, a name given to a peculiar species of a head-ach, more frequently attacking women than men, and with them usually owing its original to a suppression of the menstrual discharges. In some cases, the pain is less violent, and only attends people during the three or four first days of the menstrual discharge. In others, the pain is more violent, and almost continual; and when to the common causes of it there is added a venereal taint, which is no uncommon case, it becomes then the most terrible of all pains in the head.

Signs of it. These are a piercing pain about the fore head or temples, resembling that of a nail driven into the head: this pain sometimes also extends itself over the whole head: with this there generally is a sensation of pain about the sagittal suture in particular, and a remarkable coldness there: often there is an inflation and redness of the face, with a noise and ringing in the ears. To these there are not unfrequently added a slight fever, a chilness of the extremity, a remarkable lassitude, and want of appetite, with frequent eructations and nauseas, and costiveness of the bowels. It generally returns about the time of the menses; or, in cases where it is continual, it rages with more than ordinary violence at that time. Among the women, those are most subject to it who lead sedentary lives, and feed high, and who are naturally passionate, and of a hasty temper.

Method of cure. The first care in this respect is to keep the bowels lax, for they are almost always naturally costive in this disease: emollient clysters are the most proper means of this; and, where purges are required besides, they must always be of the most gentle and least vellicating kind. After these, the violent emotions of the blood are to be quieted by powders of nitre, antimony diaphoretic, crabs eyes, and cinnabar; and, if there be a spissitude in it, the natural and diuretic salts are to be given, in a scruple at a time, every day. Tartarum vitriolatum alone, given in this manner, frequently has a very great effect. If it be found necessary, besides this a gentle opiate may be sometimes given, such as a small dose of the storax pill: and, externally, spirit of wine and camphor is not a little serviceable. By way of prevention, it is extremely proper to bleed at spring and autumn every year: and, above all things, to keep regular in regard to the menstrual discharges. Gentle purges are to be given at times, and necessary exercise above all things to be advised; and this should always be the more insisted upon, the more averse the patients are to it, and the more they love to indulge in a sedentary course. *Junker's Consp. Med.*

CLEAT, in ship-building, a piece of wood fastened to the yard arm of a ship, to keep the ropes from slipping off the yard. *Manœuvring.*

CLEW, of the sail of a ship, is the lower corner of it which reaches down to that earing where the tackles and sheets are fastened; so that when a sail is made going, or sloping by degrees, she is said to have a great Clew: and a ship is said to have a great Clew, when she has a very long yard, and so has much canvas in her sails.

CLEW-*garnet*, among seamen, a rope fastened to the Clew of the sail, and from thence running in a block seized to the middle of the main and fore-yard. Its use is to hail up the Clew of the sail close to the middle of the yard, in order to its being furled.

CLEW-*line*, is the same to the top-sails, top-gallant sails, and sprit-sails, that the Clew-garnet is to the main-sail and fore-sail, and has the very same use. In a gust of wind, when a top-sail is to be handed, they first hale home the lee Clew-line, and by that means the sail is handed much easier.

CLINCH *of a cable*, is that part of it which is bent about the ring of the anchor, and then seized or made fast.

CLINCH-*bolts*, in a ship, are such as are clinched with a riveting hammer at those ends which come through.

CLI'NCHING, in the sea language, a kind of slight caulking used about the ports on a prospect of foul weather: it is done by driving a little oakum into their seams, that the water may not come in at them.

CLOCK (*Dict.*)— To adjust the period of a Clock, it is not necessary that the line of sight through the telescope should describe the meridian. If it always describes the same vertical circle at every transit of a star, it is sufficient. For the intervals of time between the successive appulses of a fixed star to the same vertical, are equal to the intervals between its appulses to the meridian. But, lest the uncertainty of the air's refraction should cause any difference in the times, it is better to have the vertical circle near the meridian; and to observe a star near the equator, because its transit is quicker. Now, the line of sight may be kept in the same vertical circle at every observation, by examining the level of the transverse axis every time; and by observing also, whether the cross hairs always cover the same mark upon a distant object, which in the night time must be illuminated by a lanthorn. For then the line of sight will describe the same vertical, notwithstanding any warping of the materials or even of the building to which it is fixed. Now, we learn from astronomy, that the period of the Clock will be exactly equal to a solar day of a mean length, if the same fixed star come to the cross hairs 3 minutes 56 seconds sooner every subsequent night than the night before it. For the interval of time between the apparent appulses of a fixed star to the same point of the heavens, is the same as the period of the earth's motion about its axis, which is called a sidereal day, and is 3′. 56″. shorter than a solar day of a mean length; I say of a mean length, because solar days, or the interval between the sun's appulses to the meridian, are unequal. But the error in the Clock's period will be discovered more exactly, by comparing two remote observations rather than two successive ones. For example, suppose a star comes to the cross hairs at 9 h. 30′. 18″. by by the Clock, and seven days after at 8 h. 50′. 24″. by the Clock; the difference of these times is 39′. 54″. and a seventh part of it is 5′. 42″; which shews that the diurnal period of the Clock is 5′. 42″. longer than a sidereal day; whereas a solar day of a mean length is but 3′. 56″. longer: and by consequence the diurnal period of the Clock is 1′. 42″. too long.

CLOSE-*fights*, aboard a ship, are such bulkheads as are in a fight put up fore and aft in the ship, that the men may stand behind them secure, and fire upon the enemy; and, if the ship is boarded, scour or clear the decks.

CLOTH (*Dict.*)—The goodness of Cloth, according to M. Savary, consists in the following particulars: 1. That the wool be of a good quality and well dressed. 2. It must be equally spun, carefully observing that the thread of the warp be finer and better twisted than that of the woof. 3. The Cloth must be well wrought, and beaten on the loom, so as to be every-where equally compact. 4. The wool must not be finer at one end of the piece than in the rest. 5. The lists must be sufficiently strong, of the same length with the stuff, and consist of good wool, hair, or ostrich feathers, or, which is still better, of Danish dog's hair. 6. The Cloth must be free from knots and other imperfections. 7. It must be scowered with fuller's earth, well fulled with the best white soap, and afterwards washed in clear water. 8. The hair or nap must be well drawn out with the teazel, without being too much opened. 9. It must be shorn close, without making it threadbare. 10. It must be well dried. 11. It must not be tenter-stretched, to force it to its just dimensions. 12. It must be pressed cold, not hot pressed, the latter being very injurious to woollen cloth.

CLOVER, a species of the trifolium. See the article TRIFOLIUM.

Clover is greatly cultivated in England for feeding of cattle, and is esteemed very profitable, because the great quantity of cattle which this grass will maintain, does very much enrich all clayey lands, and prepare them for corn in two or three years, which is the length of time that this crop will continue good.

In the choice of this seed, that which is of a bright yellowish colour, a little inclining to brown, should be preferred; but the black rejected as good for little.

Ten pounds of this seed will be sufficient for an acre of ground; for if the plants do not come up pretty thick, it will not be worth standing. The land in which this is sown should be well plowed, and harrowed very fine, otherwise the seeds will be buried too deep, and thereby lost.

The best time to sow it is about the beginning of August, at which season the autumnal rains will bring up the plants in a short time; whereas, when the seeds are sown in the spring, if it be done very early, they are many times burst with wet and cold; and, if it be done late, they are in danger of miscarrying from drought: whereas in autumn, when the ground has been warmed by the summer's heat, the rains then falling greatly promote the vegetation of seeds and plants.

The seeds should be harrowed in with bushes; for, if it be done with a common harrow, they will be buried too deep.

Most people have recommended the sowing of this seed with several sorts of corn; but if it be seasoned, as before directed, it will be much better, if sown alone; for the corn prevents the growth of the plants until it is reaped, and taken off the ground; so that one whole season is lost; and many times, if there be a great crop of corn upon the ground, it spoils the Clover, so that it is hardly worth standing; whereas, in the way before directed, the plants will have good roots before winter; and in the spring will come on much faster than that which was sown the spring before under corn.

About the middle of May this grass will be fit to cut, and there should be great care taken in making it; for it will require a great deal more labour and time to dry than common grass, and will shrink into less compass; but, if it be not too rank, it will make extraordinary rich food for cattle. The time for cutting it is when it begins to flower; for, if it stands much longer, the lower part of the stems will begin to dry, whereby it will make a less quantity of hay, and that not so well flavoured.

Some people cut three crops in one year of this grass; but the best way is but to cut one in the spring, and feed it the remaining part of the year, whereby the land will be enriched, and the plants will grow much stronger.

One acre of this grass will feed as many cattle as four or five acres of common grass: but great care should be taken of the cattle when they are first put into it, lest it burst them. To prevent which, some turn them in for a few hours only at first, and so stint them as to quantity; and this by degrees, letting them at first be only one hour in the middle of the day, when there is no moisture upon the grass, and so every day suffering them to remain a longer time, until they are fully seasoned to it: but great care should be had never to turn them into this food in wet weather; or, if they have been for some time accustomed to this food, it will be proper to turn them out at night in wet weather, and let them have hay, which will prevent the ill consequences of this food: but there are some who give straw to their cattle, while they are feeding upon this grass, to prevent the ill effects of it; which must not be given them in the field, because they will not eat it where there is plenty of better food. There are others who sow rye grass amongst their Clover, which they let grow together, in order to prevent the ill consequences of the cattle feeding wholly on Clover: but this is not a commendable way, because the rye grass will greatly injure the Clover in its growth.

Where the seeds are designed to be saved, the first crop in the spring should be permitted to stand until the seeds are ripe, which may be known by the stalks and heads changing to a brown colour; then it should be cut in a dry time: and, when it is well dried, it may be housed until winter, when the seeds should be threshed out; but, if the seeds are wanted for immediate sowing, it may be threshed out before it be housed or stocked; but then it must be well dried, otherwise the seeds will not quit their husks.

It has been a great complaint amongst the farmers, that they could not thresh out these seeds without great labour and difficulty; which I take to be chiefly owing to their cutting the spring crop when it begins to flower, and to leave the second crop for seed, which ripens so late in autumn, that there is not heat enough to dry the husks sufficiently: whereby they are tough, and the seeds rendered difficult to get out; which may be intirely remedied by leaving the first crop for seed, as hath been directed.

When the cattle are fed with this hay, the best way is to put it in racks, otherwise they will tread a great quantity of it down with their feet. This feed is much better for most other cattle than milch cows, so that these should rarely have any of it, lest it prove hurtful to them: though, when it is dry, it is not near so injurious to any sort of cattle, as when green.

COAL (*Dict.*)—There are various kinds of Coal, as the hard dusky black Coal.—This is one of the species of Coal in common use in London, and many other parts of the kingdom, and is called Scotch coal, though that name is not strictly applied to this species alone; but the following kind, more distinctly called Welch Coal, is often sold under the same denomination. It is a considerably firm and compact substance, of a moderately close texture, and pretty heavy: it is naturally of a rough, rugged, and a dusty surface, and is usually seen in flat masses, though it naturally constitutes large and continued strata; but, being of a laminated structure in these, it naturally breaks into masses of this shape in digging, and these more readily split, or break horizontally, than in any other direction, though by no means regularly or evenly in that. It is rough and harsh to the touch, and of a rude and rough surface; it is of a very strong and deep black, but not at all glossy; and, when broken, is much less so than any other Coal. Examined by the microscope, it appears of a tolerably close and compact texture, of an irregular laminated structure, and considerably bright.

It is very readily inflammable, and burns briskly, giving a bright white flame, and burning away very quick into ashes, not into cinders, in the manner of the common Coal. This is owing to its being more purely bituminous, and regularly inflammable; the masses of the common Coal becoming extinct before they are half consumed, these never going out till they are wholly burned away.

It is dug in great quantities in many parts of the kingdom; about Limington there is so much of it, and such quantities sent from thence, that in every place it is called Limington Coal.

The hard glossy COAL.—This is a species of coal sometimes sold in London under the name of Scotch Coal, but known in many parts of this kingdom under the name of Welch Coal; and is much esteemed for its burning with less smoke than any other kind.

It is a very firm and compact body, of a close, even, and regular texture, and considerably heavy; it is of a tolerably smooth surface, and soft to the touch, and is usually brought to us in moderately large and irregular flat lumps. In the earth it composes very large and thick strata, which being of a laminated structure, it naturally falls into masses of this shape in breaking. It is the hardest of all the species of Coal, but is not nearly so hard as the ampelites: it breaks more easily horizontally than in any other direction, though not regularly or evenly in that, and, when fresh broken, is very bright and glossy, and of a very fine deep black.

Examined by the microscope, it appears of a very remarkable even texture, and of a laminated structure, being composed of numerous small and thin plates, or flakes, laid closely on one another, and each of these of many other, much thinner and finer; the microscope shews, however, some part of these thinner flakes to be much purer, blacker, and more glossy than the rest.

It is dug in vast quantities in Wales, and in many parts of England; it is very readily inflammable, and burns with a bright, vivid, white flame, and almost wholly without smoke, but does not consume so fast as the former species, or burn away at once to ashes, but make cinders, like the common.

It is so remarkable for its burning without smoke, that, in some parts of this kingdom, and in general in Wales, they make malt with it without previous burning.

The

The friable glossy Coal.— This is a substance extremely well known, being the common firing of London, and of the greatest part of the kingdom. It is dug in different degrees of purity and goodness in different places; and the finest of this kind is known, among the dealers in Coal, by the name of Tanfield moor Coal, the place where it is dug.

It is a friable substance, of a smooth and even texture, and but moderately heavy, being much lighter than either of the former species, though heavier than the cannel, or ampelites: it is of an irregular and uneven surface, and usually comes to us in large thick masses, in various shapes, but not remarkably flat. It constitutes immense strata in the earth, and is in those of an irregularly laminated structure, and thence is naturally raised in broad and flat, rather than any other shaped pieces; but these are so brittle, that they are easily broken transversly, and, therefore, seldom retain long their original flat form. It is smooth on the surface, and somewhat soft to the touch, and is of less hardness than any other coal; it breaks with a tolerably even, and very remarkably bright, surface, and is of a fine deep shining black.

Viewed by the microscope, it appears of an irregular laminated structure, and close texture, and of a very remarkable brightness.

It is very readily inflammable, and does not burn soon to ashes.

It is dug about Newcastle in England, whence it has its name of Newcastle Coal, and in vast plenty in a great many other parts of the kingdom.

Coal-*balls*.— In the country of Liege, they use a kind of balls made of Coal and clay, for firing. These balls are made with one third of clay, without sand or gravel, and two thirds of Coal-dust, well mixed, and formed either into round balls, or into bricks. This Coal dust, being the refuse of the mine, makes this sort of firing cheap. See *Philos. Trans.* N°. 460. *Sect.* 3.

COA'MINGS, in ship-building, are those planks, or that frame, which raise up the hatches higher than the rest of the deck. Loopholes, for muskets to shoot out at, are often made in the Coamings, in order to clear the deck of the enemy, when a ship is boarded.

CO'BALT (*Dict.*)— Cobalt put into a coated retort, and set over a strong fire, yields thick fumes, which by degrees assemble themselves in the neck, and upper part of the vessel, in form of a solid substance. This is white arsenic, or ratsbane, but the ore is seldom so pure as to yield these flowers white and perfect from the beginning; they are often blackish at first, and, after this, red, which shews that there is some portion of common sulphur in the Cobalt, which, mixing with the arsenic, turns it red, as it will common white arsenic, especially if a little scoriæ of copper be added, or in the first case, if a little copper be contained in the Cobalt.

These red flowers form themselves into a solid substance of a laminated structure, and have much the appearance of a regulus of some kind; but they alter on being exposed to the air, and, though very bright and glossy at first, they become opake and dull afterwards. When roasted, as the miners term it, in a reverberatory oven, in which the flame of the wood is beat back upon the ore, it yields a white dusty substance like meal, which sticks to the top of the oven, and is collected for the making of common white arsenic, and the other kinds. The remaining substance, after all these white flowers are raised, is only the fixed earth which turns into that blue glass called smalt.

Bismuth ores, treated in the same manner, yield their metal for the common uses, as the Cobalt yields its arsenic; and the remainder, like that of the Cobalt, is an earth easily fusible into the same blue glass.

CO'CCUS *Polonicus*, an insect which may properly enough be called the cochineal of the northern part of the world. As the cochineal loves only the hot climates, this creature affects only the cold ones. It is collected for the use of dyers, but the crops of it are much smaller, more difficultly made, and the drug itself greatly inferior to the true cochineal. It is commonly known by the name of Coccus polonicus, or the scarlet grain of Poland. Poland is indeed the place where it is gathered in the greatest abundance, but it is not the only one; it is found in many other of the northern countries, and may very possibly be produced in some of the more temperate ones, where it is not known, as it is very much hid by nature from the eyes of common observers.

This kermes of Poland, if it may be so called, is found affixed to the root of a very small plant, and usually to the same plant, which has been thence called the polygonum cocciferum. Authors have informed us of the same berry, as it is often called, also growing at the roots of the mouse-ear, rupture wort, pimpernel, and pellitory of the wall; that it is in no other than dry sandy places, and that it is found at the roots of these plants. Breynius, in 1731, printed, at Dantzick, a very curious account of this production, which proves it incontestably to be an animal, and gives us many reasons for knowing it to be of the progall-insect class. *Reaumur, Hist. Ins.*

Toward the end of June, the Coccus polonicus is found in a state to be gathered. Every one of the creatures is then nearly of a spherical form, and of a fine violet colour; some of them, however, are not larger than poppy seeds, and others of the size of a pepper-corn; and each of them is lodged either in part, or intirely in a sort of cup, like that of an acorn. More than half the surface of the body of the animal is usually covered by this cup. The outside of this covering is rough, and of a blackish brown; but the inside is smooth, polished, and shining. On some plants they find only one or two of these, and on others more than forty; and they are sometimes placed near the origin of the stalks of the plant.

CO'D-FISH, is the largest of the genus of the aselli, called asellus maximus by authors, and, sometimes, asellus varius, sive striatus. The characters by which this is distinguished from other fishes of the same genus are these: its colour on the back and sides is a dusky olive, variegated with yellow spots; its belly is white; its sides have a long white line running their whole length, from the gills to the tail, which, at the abdomen, is curved, but elsewhere straight; its scales are very small, and adhere firmly to the skin; its eyes are large; at the angle of the lower jaws there hangs a single beard, which is short, seldom exceeding a finger's length; its tongue is broad; it has several rows of teeth, one of which is much longer than all the others. Among these there are some moveable teeth, as in the pike; and in the palate, near the orifice of the stomach, and near the gills, it has small clusters of teeth. It has three back fins, two at the gills, and two at the breast, and two others behind the anus; and the tail is plain. *Willughby's Hist. Pisc.*

COIN (*Dict.*)—*Flemish* Coins.— Those of gold are imperials, rides, or philips, alberts, and crowns.

Those of silver are phillips, rixdollars, patagons, scalines, and gulden: and those of copper, patards.

Patard, or penny.

								l. s. d.
8	Groat.							
16	2	Single stiver, equal to						0 : 0 : $1\frac{1}{4}$
96	6	6	Shilling,					0 : 0 : $7\frac{1}{2}$
288	18	20	3	Gulden,				0 : 2 : 0
720	90	50	$2\frac{1}{2}$	$2\frac{1}{2}$	Rixdollar, dollar, patag.			0 : 4 : 6
2104			$7\frac{1}{3}$		$2\frac{2}{3}$	Imperial.		0 : 11 : 3

Note, The rixdollar, dollar, and patagon, are nearly on the same foot with the crown, or piece of eight.

German Coins.— Those of gold, are ducats, which are of various kinds; oboli of the Rhine, and florins: of this last kind there are some likewise of silver; besides rixdollars and izelottes, which are all of that metal.

Those of copper, are the creux, or kreutzer, and fenin.

Fenin, equal to $\frac{2}{3}$ of a farthing sterling.

								l. s. d.
8	Creux, or kreutzer.							
192	24	Dollar.						
348	$43\frac{1}{2}$	$1\frac{8}{10}$	Obolus.					
432	54	$2\frac{1}{4}$	$1\frac{2}{10}$	Izelotte.				0 : 2 : 9
480	60	$2\frac{5}{10}$	$1\frac{3}{10}$	$1\frac{1}{10}$	Gulden, or florin.			0 : 3 : 0
650	100	$3\frac{8}{10}$	$2\frac{1}{10}$	$1\frac{9}{10}$	$1\frac{6}{10}$	Rixdol. or dollar.		0 : 4 : 6
1068	133	$5\frac{8}{10}$	$2\frac{8}{10}$	$1\frac{8}{10}$	$2\frac{1}{10}$	$1\frac{3}{10}$	Ducat.	0 : 7 : 6

Swiss Coins, are ratzes and blazes; of Billon.— The ratze, equal to $\frac{1}{2}$ and $\frac{1}{3}$ of a penny sterling.— Blaze of Bern, nearly on the same footing with the ratze.

Polish Coins.— Besides the rixdollars struck here, which are common to other countries; the Poles strike silver roups, abras, and groats.

		s. d. Sterl.
Roup	—— ——	0 : $4\frac{1}{2}$
Abra	—— ——	1 : $0\frac{1}{4}$
Groch	—— ——	0 : $0\frac{1}{2}$ and $\frac{1}{4}$

Danish Coins, are the horse, the marc lubs, and the schesdal of silver.

		s. d. Sterl.
Horse	—— ——	1 : $1\frac{1}{2}$
Marc lubs	——	1 : 6
Schesdal, two marcs, or lubs		3 : 0

Swedish Coins.— Those of silver are the christines, carolines, and cavaliers. Those of copper the roustique, alleuvre, mark and money.

s. d.

	s.	d. Sterl.
Christine ——	1	1½
Caroline — —	1	5½
Mark —— ——	0	2½
Roustique, ⅛ of the mark —	0	0½ and ⅜ of ½
Alleuvre, ⅛ of the roustique	0	0⅛ and $\frac{1}{16}$ of ½

The Swedish money, properly so called, is a kind of copper, very soft and malleable, cut in little square pieces, or plates, about the thickness of three English crowns, and weighing five pounds and a half; stamped at the four corners with the Swedish arms; and current in Sweden for a rixdollar, or piece of eight.

Muscovite Coins.—There are two kinds of copecs in Muscovy, the one of gold, the other of silver; the last called also denaing, or pence. Their

	s.	d.	
Copec, or kapeke of gold, worth	1	$6\frac{1}{5}$	Sterl. but current in
the Czar's territories for	1	9	
Copec of silver, or denaing of an oval form, worth	0	1	Sterl. but current for somewhat more.
Polusk, ¼ of the copec	0	0¼	
Mostoske, ½ of the copec	0	0½	

Turkish Coins.— The only gold species struck in the grand seignior's territories, is the sultanin, called also scheriff, or sequin.

Their small monies are the para, or parasi, called also parat, and meidein, and the aspre, both of silver.

	s.	d. Sterl.
Sultanin scherif, or sequin, equal to the ducat of gold, or	9	0
Para, parat, or parasi ——	0	1½
Shakee of Aleppo and Scanderoon	0	3½
Aspre —— —— ——	0	0⅝ but ordinarily,
by reason of the base alloy, no more than		½

For the other Coins of Europe; see the article Exchange, in the Dictionary.

Coins *of the coasts of Barbary*.— The current Coins struck here are rubies, medians, ziams, and metecals; all of gold: the last of which are struck at Morocco, the rest at Fez, Algiers, and Tunis; which beside have doublas of silver, and burbas of copper.— Tunis, has its nasaras of silver, its blanquilles likewise of silver, and felours of copper.

Other Coins of Africa, are the merigal of gold, current in Sofala, and the kingdom of Monopotapa; and the pardo of silver, current in Mosambica.

	s.	d. Sterl.
Rubie, equal to 35 aspres, or ——	1	9
Menian, 50 aspres, or ——	2	7
Ziam, zian, or dian, two menians, or	5	2

Metecal, a kind of ducat of different fineness, consequently of different value; whence very considerable difficulties in commerce. The difference arises hence, that there is no mint fixed, or regular coiners at Morocco, but every Jew and goldsmith strikes ducats after his own manner in open shop.

	s.	d. Sterl.
Double, equal to 80 aspres, or	4	6
Burba, $\frac{1}{12}$ of an aspre, or ——	0	$0\frac{1}{16}$
Blanquille, —— ——	0	2½
Felours, ⅛ of the blanquille, or —	0	0¼ and $\frac{1}{16}$
Merigal, worth about —— —	18	0
Pardo, —— —— ——	1	3

Persian Coins.— These are either silver, or copper; gold they have none: of the first kind are the abassi, mamodi, shahee, and bisti: of the second the kabesqui, and half kabesqui; the tela, or cherasis, indeed is gold; but it is less a money than a medal, though it has some course in commerce.

	s.	d. Sterl.
Abassi, equal to —— ——	1	4½
Mamodi, ½ the abassi — —	0	8¼
Shahee, ½ the mamodi, ——	0	4 and ⅛

Bisti, some relations make this a Coin worth about one penny half-penny; but others only a term of accompt, signifying 10 dimars, or $\frac{1}{1000}$ part of a toman.

Casbequi, or cabesqui, equals $\frac{1}{4}$ of a penny sterling.—Tela, or cherasis, usually struck at the accession of a new king, and at the beginning of each new year; its weight and worth various.

Chinese Coins.—Throughout the kingdom of China and Tonquin, there are not properly any Coins struck; instead of these, they cut their gold and silver into little pieces of different weights; those of gold, the Dutch, from their figure, which resembles a boat, called golchuts: those of silver, the natives call leam; the Portugueze, taels.— Their small money is of copper; ten of these make their shilling, and ten of those their crown, or leam.

Beside these, they have a small money of lead, mixed with the scum of copper, having holes in the middle to string them on for the ease of numbering: this species is called caxa, cas, and pitis; and the string, which usually holds 200, is called santa. They are so very brittle, that they never fall without breaking into a great number of pieces; and, if left all night in salt water, stick so close together that they cannot be separated.

There are two kinds of golchuts, great and small.—Golchut, an ingot, which, at 3l. 3s. per ounce, usually amounts to 101l. 5s. sterling.—Other golchuts only weigh half as much; their value in proportion.

Tael, or leam, equal to 6s. 8d. sterling.

Copper money $\frac{1}{1000}$ part of the teal, or somewhat more than ½ of a farthing.

Caxa, cases, or pitis, ⅓ of a farthing sterling, 300,000 of these are nearly equal to 56 Dutch livres.

Caxa larger, $\frac{1}{1000}$ of a piastre, or piece of eight.

Coins *of Japan*—The Japonese strike coupants, both of gold and silver, and copper pieces with holes in the middle, like those of China; six hundred of these make the tael. Their other monies, or quasi monies, are ingots, which they cut like the Chinese of different weights, chiefly three; the largest of the weight of six rials, viz. forty-eight taels, the tael equivalent to seventy-five Dutch styvers. The second equal to six taels and an half; and the third to ⅛ of a rial, or one tael $\frac{1}{10}$.

Besides these, they have a small silver money, in form of round beans, of no determinate weight, usually weighed by maises; the common payment being by ten maises, which make one tael.

	l.	s.	d. Sterl.
Coupant of gold, weighing one ounce six drachms; its figure a long oval, the longest diameter about four inches, and the shortest half an inch.	6	12	6
Other coupants of gold, near ⅓ of the former, amounting to about —	2	4	2
Coupant of silver, current at —	0	4	6
Copper money — — — —			$\frac{1}{12}$ of a farthing.

Coins *of Siam*.—In the dominions of Siam are struck gold pieces five or six grains heavier than the half pistole of Spain; but these are rather pieces of curiosity, than of use in commerce.

Their silver Coin is the tical, or baat; the dimensions whereof are the mayon, or seling, foang, and sompaye. These pieces are all strangely struck: in form they resemble nuts, a little flatted at the extremities; and are some of them cloven like horse-shoes; on two of the sides are some Siamese letters.—Their copper money, called bia, is round and thick: beneath this is the cauris.

	s.	d. Sterl.
Gold species of Siam — — —	7	0
Tayl, — — — — —	6	11½
Mayam, or mass $\frac{1}{12}$ of the tayl, —	0	5¼ and ½
Foang, ¼ the mayam, — — —	0	2½
Sompaye, ½ the foang, — —	0	1½ and $\frac{1}{16}$
Copper Coin, or farthing of Siam, -	0	$0\frac{3}{16}$

Coins *of the coasts and islands of the Indies*.—The principal, and those most generally current, are pagodos, rupees, larins, fanos, or fanons, and coupans, each whereof are struck both of gold and silver.

Besides these general Coins, are particular ones, viz. at Goa, St. Thomas's of gold.—Along the Persian gulf, about Mecca, and throughout Arabia, the larin.—Along the coasts of Malabar, and at Goa, the pardao and xeraphin of silver.—At Bantam, the fardos; at Malabar, the tare; at Siam the tayl, with its diminutions the mayam, foang, sompaye, and demi-foang; all of silver.— At Surate, Agra, and the rest of Indostan, the pecha, or pessa, and doudous, all of copper.—The basarucos and chedas, of tin.

	l.	s.	d. Sterl.
Pagodo, gold, denominated from its impression, and Indian idol.	0	5	0
Pagodo, silver, its value very different; the smallest eight tangas, and the tanga ninety basarucos; equal to	0	8	0
Rupee, gold, — — — —	1	11	6

Rupee, silver, its fineness and value various: there are three kinds current, viz. the rupees Siceas, the rupees of Surat, and rupees of Madras.

	s.	d. Ster.
Rupees Siceas, worth at Bengal — —	2	11
—of Surat — — — — —	2	3
—of Madras — — — — —	2	5½

Note, This is to be understood of the new rupees; for as to the old ones, of each kind, their value is less: those of Madras, v. gr. are but equal to 1s. 11d. sterling, those of Surat 2s. and the Siceas 2s. 4d.

	s.	d. Ster.
Larin, in form of a round wire, or cylinder, equal to the barrel of a pen; bent in two, and a little flatted at each end, to receive the impression of some Arabic, or Persian characters.	0	11
Fanos, or fanon, gold, is of different fineness, weight, and value; the largest worth	0	9
The smallest — — — — — —	0	2½
Fanos, silver, — — — — — —	0	1½
Coupant, see Coins *of Japan*.		
St. Thomas, equal to — — — —	9	0
Xeraphin — — — — — —	2	1
Fardos — — — — — — —	2	8½
Tare — — — — — — —	0	0½

Tical,

Tical, see COINS *of Siam*. s. d. Ster.

Pecha, or pessa, — — — — — 0 : $0\frac{1}{2}$

Doudou, $\frac{1}{12}$ of fanos, or somewhat less than 0 : $0\frac{1}{4}$

Basaruco or Budgerook, $\frac{1}{7}$ of a farthing.

Cheda is of two kinds, the one octogonal, current at — — — — — — } 0 : $1\frac{1}{2}$

The other round — — — — — 0 : $0\frac{1}{4}$

Mogul COINS.—In the dominions of the great Mogul, are roupies, mamoudas, and pechas; the first both of gold and silver; the second of silver alone, and the third of copper.

There are others struck by the princes tributary to him, and the powers bordering on him, scarce current beyond their respective territories: particularly a small silver Coin struck by the king of Matoucha, whose territories lie to the north of Agra, of the value of the pecha of Mogul, but half as heavy again.—The raja of Parta-jajamoula, to the north of Patua, likewise strikes some little pieces, both of silver and copper, of small value.—The raja of Ogden, who commands between Brampour, Seronge, and Amadabath, a small silver Coin, equal to six-pence sterling; and another of copper, equal to an halfpenny sterling. The king of Cheda and Pera, a tin-money called cheda.—The king of Achem, little slight gold pieces, worth about fifteen-pence sterling.—And tin pieces, eighty of which are equal to the English penny, current in the isles of Sumatra.—The gold Coin of the king of Macassar and Celebes is taken by the Dutch for a florin.—The king of Camboya strikes only pieces of silver and copper: his gold, wherein he abounds, is negotiated by weight.—The kings of Java and Bantam, in the same island, and those of the Molucca islands, strike only copper Coins: they allow foreign silver species to be current in their territories, but coin none.

Roupia, see COINS *of the coasts, &c. of India*.

Mamouda, or mamotha, its value is not fixed: in the kingdom of Mazarate, the great mamouda is equal to — — — } s. d. Ster. 0 : 11

The small, half the great one — — — 0 : $5\frac{1}{2}$

Pecha, see COINS *of the isles of India*.

Silver piece of Matoucha — — — 0 : $0\frac{1}{2}$

Silver piece of the king of Ogden — — 0 : 6

Copper piece of the same — — — — 0 : $0\frac{1}{2}$

Cheda, see COINS *of the isles, &c. of India*.

Gold piece of the king of Achem — — 1 : 3

Tin piece of the same — — — — 0 : $0\frac{1}{80}$

Gold piece of the king of Macassar, taken by the Dutch for a guilder, — — — } 1 : $10\frac{1}{2}$

To the number of current Coins which have distinct names to specify them, may be added many more, both in Europe and Asia, only denominated and known from their value; such are those called simply pieces, with the addition of their price; as in Spain, the piece of eight rial, in England the piece of twenty-one shillings, or guinea; in France the piece of four francs, piece of ten sols, or shillings; piece of four sols; piece of two sols; of six blanks; of 30, 15, 6, 4, &c. deniers, or pence.

Shells current for COINS.—These serve in many places for money; and are brought from the Maldives, and called in the Indies cowries: on the coasts of Africa they change their name, and are called bouges.

In America they take a third name, viz. porcelains. Indeed these last do not come from the Maldives; there being shells found in the West-Indies much like those of the East.

In the kingdom of Congo is another kind of shells, called zimbi; though some will have them the same with the cowries.

Cowries, coris, or bouges, are white shells, current particularly in the estates of the great Mogul; dug out of the ground by the Maldivians: sixty-five are usually reckoned equivalent to the pone, a small copper Coin, worth about an halfpenny sterling; which brings each cowry to $\frac{1}{130}$ of a penny sterling. Porcelains are nearly on the same footing with the cowries.

Zimbi, current particularly in the kingdoms of Angola and Congo. Two thousand zimbis make what the negroes call a macoute; which is no real money, whereof there is none in this part of Africa, but a manner of reckoning: thus, two Flemish knives they esteem a macoute; a copper bason, two pounds weight, and twelve inches diameter, three macoutes; a fusy ten, &c.

Fruits current for COINS.—There are three kinds of fruits used for Coins; two in America, particularly among the Mexicans; which are the cacao and maise: the other in the East-Indies, viz. almonds; brought thither from Lar, and growing in the desarts of Arabia.

Cacao, fifteen of these are esteemed equivalent to a Spanish rial, or seven pence sterling.

Maise has ceased to be a common money since the discovery of America by the Europeans.

Almonds are chiefly used where the cauris are not current. As the year proves more or less favourable to this fruit, the value of the money is higher or lower: in a common year, forty almonds are set against a pescha, or halfpenny sterling; which brings each almond to $\frac{1}{20}$ of a farthing.

Ancient COINS are those chiefly which have been current among the Greeks, Jews, and Romans.

For Jewish Coins, their Values and proportion stand thus:

						l.	s.	d. Sterl.
					Gerah — — — — — — —	00	00	$1\frac{17}{100}$
10					Bekah — — — —	00	00	$1\frac{5}{8}$
20	2				Shekel — — —	00	00	$2\frac{3}{8}$
1200	120	50			Maneh / Mina hebraica	05	14	$0\frac{3}{4}$
60000	6000	3000	60		Talent —	342	03	9

Solidus aureus, or sextula, worth— — 00 : 12 : $0\frac{1}{2}$

Siclus aureus, worth — — — — 1 : 16 : 6

A talent of gold, worth — — —5475 : 00 : 0

Value and proportion of the ancient Grecian Coins.

											l.	s.	d. Ster.
										Lepton ——— ——— ——— ———	0	0	$0\frac{31}{336}$
7										Chalcus ——— ——— ———	0	0	$0\frac{31}{48}$
14	2									Dichalcus ——— ———	0	0	$1\frac{7}{24}$
28	4	2								Hemiobolium ———	0	0	$2\frac{7}{12}$
56	8	4	2							Obolus ———	0	1	$1\frac{1}{6}$
112	16	8	4	2						Diobolum ———	0	2	$2\frac{1}{3}$
224	32	16	8	4	2					Tetrobolum —	0	5	$0\frac{2}{3}$
336	48	24	12	6	3	$1\frac{1}{2}$				Drachma	0	7	3
662	96	48	24	12	6	3	2			Didrachmon	1	3	2
1324	112	96	48	24	12	6	4	2		Tetr. stat.	2	7	0
1060	384	120	60	30	15	$7\frac{1}{2}$	5	$2\frac{1}{2}$	$1\frac{1}{4}$	Pent.	3	2	3

Note, Of these the drachma, didrachm, &c. were of silver, the rest for the most part of brass. The other parts, as tridrachm, triobolus, &c. were sometimes coined.

Note also, the drachma is here, with the generality of authors, supposed equal to the denarius: though there's reason to believe, that the drachma was somewhat the weightier.

The Grecian gold Coin was the stater aureus, weighing two attic drachms, or half of the stater argenteus; and exchanging usually for 25 attic drachms of silver; in our money — — — } l. s. d. Ster. 0 : 16 : $1\frac{1}{4}$

According to our proportion of gold to silver — — — — — — } 1 : 00 : 9

There were likewise the stater cyzicenus, exchanging for 28 attic drachms, or — — — — } 0 : 18 : 1

Stater philippicus, and stater alexandrinus, of the same value.

Stater diricus, according to Josephus, worth 50 attic drachms, or — } 1 : 12 : $3\frac{1}{2}$

Stater cræsius, of the same value.

Value and proportion of the Roman Coins.

						l.	s.	qrs. Sterl.
					Teruncius — — — — —	0	0	$0\frac{775}{1000}$
2					Semilibella — — — —	0	0	$1\frac{55}{100}$
4	2				Libella / As — — —	0	0	$3\frac{1}{10}$
10	5	$2\frac{1}{2}$			Sestertius — — —	0	1	$3\frac{3}{4}$
20	10	5	2		Quinarius / Victoriatus —	0	3	$3\frac{1}{2}$
40	20	10	4	2	Denarius —	0	7	3

Note, Of these the denarius, victoriatus, sestertius, and sometimes the as, were of silver, the rest of brass. See As, &c. in the Dict.

There were sometimes also coined of brass the triens, sextans, uncia, sextula, and dupondius.

The Roman gold Coin was the aureus, which weighed generally double the denarius; the value of which, according to the first proportion of coinage, mentioned by Pliny, was — — } l. s. d. Ster. 1 : 4 : $3\frac{1}{2}$

According to the proportion that obtains now amongst us, worth — } 1 : 0 : 9

According to the decuple proportion, mentioned by Livy and Julius Pollux, worth — — — — — } 0 : 12 : 11

According to the proportion mentioned by Tacitus, and which afterwards obtained, whereby the aureus exchanged for 25 denarii, its value — — l. s. d. Ster. 0 : 16 : 1½

COI'NING, in the tin works, is the marking the tin, when cast into blocks, or slabs, with the figure of the lion rampant. This is done by the king's officer. The king's custom is four shillings for every hundred weight. *Ray's Engl. Words.*

COLD (*Dict.*)—Cold is the destroyer of all vegetable life, when increased to an excessive degree; and it is hard to say how much increase of it the hardier of them are, or are not able to bear. We find many of our garden plants and flowers, which seem to be very stout and hardy, go off at a little increase of Cold beyond the ordinary standard. In the severe winter, in 1683, Mr. Bobart tells us, that the artichoaks and colliflowers all perished; and that the odoriferous suffrutices, such as thyme, sage, lavender, hyssop, and the like, were generally killed, very few escaping, except such as had been planted the preceding year, and were therefore so low as to have the advantage of a covering of snow over them; which is the defence nature has given to the natives of the coldest countries, and proves superior to any thing that can be invented by art for their preservation. In the corn fields, such parts of them as had remained covered with snow, had escaped very well, the corn all looking fresh and vigorous, after the melting of it in the spring: but, when the lands had lain so exposed that the snow had melted off, the crop was generally destroyed, and the farmer obliged to new sow the place. *Phil. Transf.* Numb. 165.

COLE-*seed*, the seed of the naphew or napus, propagated in many parts of England to great advantage, for the oil expressed from the seed. It is much sowed in the moory lands in the fen countries. The freshest mould is found best for it, or what the farmers call a lusty soil, which is newly broken up, and has been long at rest. They commonly give two tilths to the ground they sow with Cole-seed; but, if they manure it, then only one. They lay on the manure, a little before they begin to plow; and, plowing in the morning, sow that very day. The time of sowing is in June, July, and August: July is the best month. They sow the seed over furrows, a peck to an acre, and bush-harrow it; they then have a crop that time twelvemonth, which they shear or reap as they do wheat, disposing it into little heaps. When it has lain about a fortnight upon the ground, they thresh it upon a sail-cloth, with common flails; then winnow it, and afterwards send it to the mills. *Morton's Northampt.*

The land where this has grown, is very well prepared by it for wheat; though some sow oats upon it, as wheat succeeds best of all after it. When the oil is pressed out of the seeds, they use the remaining cakes in some places as firing; but in others they give them to their cows and other cattle in winter, when other food is scarce. In some places, they mix the powder of these cakes with water, and give it to their calves till they are three or four days old, instead of milk, and it does as well for them, till they are able to eat grass or hay. It is a good method to burn the stubble on the Cole-seed lands, for it is so stumpy that it is of no use to plow it in. *Mortimer's Husb.*

CO'LLAR, in ship-building, a rope fastened about her beak-head, into which the dead man's eye is seized that holds the main-stay. There is also a collar, or garland, about the main-mast head, which is a rope wound about there, to save the shrouds from galling.

COLLAR *of a plough*, a term used by our farmers to express a ring of iron, which is fixed to the middle of the beam, and serves to receive the end of two chains, the lower one called the tow chain, and the upper one called the bridle chain. The lower chain is fixed at its other end to the box, and the upper, or bridle chain, to the stake which runs parallel with the left-hand crow-staff. These chains, by means of this collar, and their other insertions, serve to join the head and tail of the plough together. In some places the bridle chain is not fixed to the collar, but to the beam itself, by means of a pin; and this is the better way on many accounts. *Tull's Husbandry.*

CO'LOGNE *Earth*, a substance used in painting, much approaching to amber in its structure, and of a deep brown. It has generally been esteemed a genuine earth, but has been discovered to contain a great deal of vegetable matter, and, indeed, is a very singular substance.

It is dug in Germany and France: the quantities consumed in painting, in London, are brought from Cologne, where it is found very plentifully; but our own kingdom is not without it, it being found near Birmingham, and on Mendip hills, in Somersetshire; but what has been yet found there is not so pure or fine, as that imported from Cologne. *Hill's Hist. of Foss.*

CO'LONY (*Dict.*) — In order to give a clear account of the causes and effects of these settlements, it will be proper to distinguish them into six separate classes.

1. About 350 years after the flood the whole human race were but one family; at the death of Noah his descendants, being too numerous to live together, separated. The posterity of each of the sons of this patriarch, Japhet, Sem, and Ham, divided into different tribes, set out from the plains of Shinar in quest of new habitations, and every tribe became a distinct people: thus, they gradually peopled the different countries of the earth, in proportion as the respective countries they went into could support and maintain them.

Such was the first kind of Colonies; necessity was the cause, and the effect was the subdivision of the tribes or nations.

2. Though men were thus scattered over the face of the whole earth, yet every different country was not so completely occupied by its antient inhabitants, but that new ones might share it with them.

In proportion as countries were at a greater distance from the common center, from which all nations set out, every separate family wandered at pleasure, without making any fixed abode; but in those countries where a larger body of men staid, nature and mutual convenience uniting them, they formed societies. Ambition, dissension, war, and even their increase, in a course of time, drove some parts of these societies to seek new habitations.

Thus Inachus, a Phœnician, came and founded the kingdom of Argos in Greece, whose posterity was driven out by Danaus, another adventurer, who came out of Ægypt. Cadmus, not daring to return to his father Agenor, king of Tyre, landed on the confines of Phocis, and there laid the foundation of the city of Thebes. Cecrops at the head of an Ægyptian Colony built the city, which afterwards, under the name of Athens, became the seat of arts and sciences. Africa with unconcern saw the walls of Carthage rise, which soon after made it tributary. Italy received the Trojans who had escaped from the ruin of their country. These new inhabitants introduced their laws and sciences into those countries, whither chance had conducted them; but they only formed little societies, and almost all erected themselves into republics.

A multiplicity of citizens, in a territory either of narrow limits or little fertility, has given an alarm to liberty; and policy has removed this inconvenience by establishing Colonies. Nay, even the loss of liberty has sometimes engaged a part of the people to quit their own country, in order to form a new society, more agreeable to their own minds.

This, among others, gave birth to most of the Greek Colonies in Asia, in Sicily, Italy, and Gaul. The views of conquest and ambition did not enter into their scheme. Although, in general, every Colony preserved the laws, the language, and religion of the metropolis, yet it was free, and depended only on its founders.

This second kind of Colonies had different motives, but the effect which distinguishes them, was to multiply independent societies among nations; to promote commerce between them, and polish their manners.

3. As soon as the earth had such a number of inhabitants, that a distinction of property became necessary, this property occasioned differences between them. These differences were decided by the laws among the members of a society, but could not be so determined among independent associations; power decided, the vanquished yielded to the victor, and the spirit of conquest invaded the minds of men.

The conqueror, to secure his frontiers, dispersed the conquered in countries under his allegiance, and gave their territories to his own subjects, or contented himself with building and fortifying new towns in them, which he caused to be inhabited by his soldiers, and the citizens of his own state.

Such was the third kind of Colonies, examples of which may be found in almost all ancient histories.

By means of these Colonies, Alexander took in such a multitude of conquered people with such rapidity. The Romans, in the infancy of their republic, made use of them to increase it; and, at the time when their vast empire extended itself in every part of the world, these were the barriers, which, for a long time, defended it against the Parthians, and people of the North. This kind of Colony was a consequence of conquest, and, indeed, its defence.

4. The excursions of the Gauls into Italy, of the Goths and Vandals into all Europe and Africa, and of the Tartars into China, form a fourth kind of Colonies. These people, driven out of their country, by more powerful people or distress, or perhaps attracted by the knowledge of a milder climate and more fruitful country, conquered to share the kindlier soil with those they had subdued, and only to make one nation with them. Quite different from other conquerors, who seem to have set out only in pursuit of enemies, as the Scythians in Asia, and the founders of the four great empires.

The effect of these Colonies of Barbarians, was to exterminate polite arts, and spread ignorance throughout the countries wherein they settled, at the same time that they increased the number of people, and founded powerful monarchies.

5. The fifth kind of Colonies is such as have been founded by a spirit of commerce to enrich their mother people, or metropolis.

Tyre, Carthage, and Marseilles are the only cities of antiquity, which laid the foundation of their power on their trade; and they only followed this plan in some of their Colonies. Utica, built by the Tyrians, near 200 years before the flight of Eliza, more known by the name of Dido, never pretended to any sovereignty in the realms of Africa, but only served as a port a port for the Tyrian ſhips to put into, in the ſame manner as the Colonies eſtabliſhed at Malta, and along the coaſts frequented by the Phœnicians. Cadiz, one of their moſt ancient and famous Colonies, only pretended to the trade of Spain, without intermeddling with the adminiſtration of its government, much leſs giving it laws. The founding Lilybæum in Sicily gave the Tyrians no notion of conquering that iſland. Commerce alone was not the object of the eſtabliſhment of the Carthaginian ſtate, though the city ſought to aggrandize itſelf by commerce. Carthage made war to extend or preſerve that trade to itſelf only, and therefore diſputed with Rome a right to Sicily, Sardinia, Spain, and Italy, even at the walls of that city. The Carthaginian Colonies along the coaſts of Africa, on both ſides the ſea to Cerne, rather augmented the riches of the ſtate than ſtrengthened the power of its dominion. Marſeilles, a Colony of Phocæans, driven out of their own country, and afterwards out of the iſle of Corſica by the Tyrians, as they inhabited a barren country, attended to nothing but their fiſhery, trade, and independence. Their Colonies in Spain, and the ſouthern coaſts of Gaul, were planted with the ſame view.

Such ſort of ſettlements were doubly neceſſary to people who applied themſelves to commerce. They who knew not the uſe of the compaſs, were afraid to venture too far from the ſhore; they made coaſting voyages, and their navigation was ſo timorous, that it made frequent ports neceſſary: the generality of the people they traded with, ſet a certain value on the commodities they intended to part with, and came down out of the inland countries, at the time of the arrival of the ſhips, to exchange them for what they wanted.

The form of theſe Colonies has a great affinity with thoſe of the European nations trading to Africa and the Indies, which have ſtore-houſes and forts for the ſecurity and convenience of their trade. Our own nation therefore make a more conſiderable figure as merchants in thoſe countries, than any other in Europe, becauſe they do not endeavour to conquer the inhabitants, and acquire the poſſeſſion of large dominions.

6. The diſcovery of America, about the end of the fifteenth century, has increaſed the European Colonies, and preſents us with a ſixth kind of them.

All theſe have had commerce and culture both at once for the object of their ſettlement. It was neceſſary for them, firſt, to conquer that part of the country they intended to poſſeſs, drive out the ancient inhabitants, and introduce new.

As theſe Colonies were only eſtabliſhed for the benefit of the mother country, it follows:

1. That theſe Colonies muſt immediately depend upon it, and conſequently be under its protection.

2. That the trade ought to be excluſive to the founders. A Colony of this nature anſwers its end ſo much the better, in proportion as it promotes the manufactures, employs a greater number of hands, and gives the balance of trade to its mother country in her commerce with other nations. Theſe three benefits may unite in ſome particular circumſtances, and one of the three may in ſome meaſure compenſate for the whole; but, if the Colony is deficient in this reſpect, it is plainly pernicious to its mother country, and weakens it.

Thus the profit of the trade and culture of our Colonies reſults from, 1. The larger product which their conſumption occaſions to the proprietors of our own lands, the expence of culture deducted. 2. What our mechanics and mariners receive, who work for them, and on their account. 3. What neceſſaries they ſupply us with. 4. What ſuperfluities they furniſh for exportation.

From theſe premiſſes many concluſions may be drawn.

Every Colony ought to be confined to ſuch arts and objects as may be uſeful to its mother country. If a Colony deals at foreign markets, and conſumes foreign commodities, the mother country is a ſufferer in proportion to ſuch dealings, and ſuch conſumption; therefore, a reſtraint in this caſe is no attempt on the liberty of the Colony, but is ſtrictly juſt. Colonies become more uſeful, by how much they are rendered more populous, and their lands are better cultivated.

The ſtate ſhould be at the firſt expence of eſtabliſhing Colonies; children ſhould inherit equally, at the death of their fathers, in order to fix a greater number of inhabitants on the ſpot. The firſt expence of the ſtate is not all; till the Colony has acquired ſtrength to ſupport itſelf, and ſettled a trade to maintain itſelf, it will continually ſtand in need of the protection and aid of its mother country. The Colonies of America having eſtabliſhed a new form of connection and commerce, it has been neceſſary to make new laws in them. Able legiſlators have principally had in view the protection and cultivation of the Colony; but, when theſe are come to ſome perfection, it may ſo happen, that ſuch laws may become contrary to the deſign of inſtituting Colonies, which was to promote trade. When a ſtate has ſeveral Colonies which may carry on a mutual trade, the way to augment their ſtrength and riches is to encourage it.

Upon the whole, it appears the liberty of Colonies ſhould be reſtrained by the mother country. But all monopolies, impoſitions, particular privileges, or exemptions, are extremely pernicious; and, though their effect may not be felt immediately, will certainly end in the deſtruction of the Colony; for whatever contributes to raiſe the price of commodities, without increaſing their real value, muſt ruin the trade of the Colony.

COLOUR (*Dict.*)—Tranſparency, whiteneſs, blackneſs, and Colours, as conſidered in bodies, depend upon certain particular ſtructures, textures, or arrangements of the parts of bodies, as the following inſtances will abundantly demonſtrate.

Glaſs, cryſtal, diamond, nitre, borax, and other tranſparent ſolid bodies, loſe their tranſparency, and appear white upon their being reduced to powder; that is, by a bare alteration of their groſs texture, or a ſimple reduction to ſmaller parts; ſo as to reflect many of the rays of light, which they before tranſmitted. And the ſame holds of the white of eggs whiſked up to a froth, frothy water, &c.

Black talc, by being made red-hot in the fire, is turned of a gold Colour; ſyrup of violets, by boiling heat, loſes its beautiful violet-Colour, ſo as at length to become pale, or colourleſs; white loaf-ſugar, being barely melted over the fire, without water, immediately changes its whiteneſs, and becomes brown; or, by a longer continuance, black; ſo that a ſingle grain of this black ſubſtance will tinge a pint or a quart of fair water, or colourleſs brandy, of a beautiful yellow, brown, or ſtraw Colour; for which purpoſe it is uſed by diſtillers, and others.

All the finer, coloured flowers, as violets, carnations, roſes, &c. loſe of their Colour, barely by being expoſed to the open air for any long time; ſo as at laſt to appear perfectly diſcharged, or white, as if they had been expoſed to that particular diſcharger of Colour in ſilks, &c. the fume of burning brimſtone. And the ſame is remarkable of the finer or lighter kinds of Colours in ſilks, or the light blues, yellows, and reds, particularly the light grain-coloured ſilks; all which Colours are gradually changed, diſcharged, or aboliſhed, in wearing, or by the ſilks being long expoſed to the action of the air. But the ſcarlet Colour is more fixed and durable. And, in general, the deeper any Colours are, the more fixed and durable they prove; as being thus not ſhades, as the pinks, light blues, &c. are, but true Colours, correſponding to the original Colours of light. Add to this, that dyers conſtantly find their Colours prove brighteſt, or ſtruck to the beſt advantage, when the air is clear. Laſtly, the blue eſſential oil of camomile-flowers loſes its Colour, and changes to a dirty green, by being expoſed to the air.

Different waters ſtrike different Colours with the ſame tinging ingredients. Thus irony waters turn black, or inky, with galls, green tea, &c. And dyers find ſome certain waters more proper for their purpoſes than others. And, in general, the pureſt and lighteſt waters ſtrike the beſt Colours with dying-ſtuffs. And hence it is that ſuch waters as have, by long ſtanding, putrified, or fermented, and purged themſelves, being not filtred through the common filtring-ſtone or ſand, are found to extract and communicate Colours to the greateſt advantage.

Salts, having a power to alter the textures of vegetables, conſequently produce changes of Colours therein. Thus moſt flowers, whether blue or red, as violets, roſes, &c. turn green with alkalies: But violets turn red, and roſes have their native redneſs greatly heightened by acids; ſo again, the yellow roots of rhubarb, turmeric, &c. are heightened, or made redder, by alkaline ſalts.

As metals have a ſtrong texture in their metalline form; ſo they preſerve their natural Colours durably, unleſs corroded or diſſolved by their particular menſtruums: after which, their ſolutions ſtrike particular durable Colours, or afford the ſtrongeſt ſtains.

Iron, diſſolved in ſtale ſmall-beer, gives the beautiful yellow uſed in callico-printing; when ſublimed with ſal armoniac, it alſo affords a yellow. And the common iron-moulds made by ink are owing to the iron diſſolved in copperas, whereof the common black writing ink is made.

Copper, melted with zink, appears of a gold-Colour; diſſolved in aqua-fortis, it affords a beautiful green; and, in any urinous ſpirit, a beautiful blue; and the ſolutions may be reduced to dry Colours by cryſtallization, or evaporation. The ſame metal precipitated with common ſalt, out of aqua-fortis, gives the turquoiſe Colour to white glaſs, when melted therewith.

Tin, a white, or colourleſs metal, affords a light blue Colour, by being fluxed with antimony and nitre. The ſame metal is neceſſary in ſtriking the ſcarlet-dye, with aqua-fortis and cochineal: its calx, by ſtrong fuſion, turns a glaſs of the opal Colour.

Lead, being corroded by the fumes of vinegar, makes the fine white called ceruſe, and the white fucus called the magiſtery of lead; by being coloured in a ſtrong naked fire, it becomes minium, or red-lead; and this, melted into glaſs with ſand, is the foundation of the art of imitating all the coloured gems: for this glaſs itſelf will reſemble the hyacinth; and, by the addition of prepared gold and tin, the ruby; the ſapphire with cobalt, the emerald with iron and copper, the amethyſt with gold, and the granat with iron, &c.

Silver, another white, or colourleſs metal, being diſſolved in aqua-fortis, if chalk is put to the ſolution, turns of a beautiful purple, or amethyſt Colour: and its own ſolution, though pale as water, durably ſtains the nails, the ſkin, the hair, and other animal ſubſtances, brown or black.

Quickſilver, mixed with brimſtone, makes a black maſs; and this, by ſublimation, affords the beautiful red pigment called cinnabar, or vermilion: and the ſolution of quickſilver, being precipitated with common ſalt, yields a ſnow-white powder; which alſo turns black, by being mixed with ſulphur.

Gold, diſſolved in aqua-regia, affords a fine yellow liquor, which ſtains animal ſubſtances beautifully purple: and, if the ſolution be ſufficiently weakened with water, and mixed with a ſolution of tin, a fine red or purple powder may be thus obtained for ſtaining glaſs moſt beautifully red.

Many mineral ſubjects are natural pigments; as native cinnabar, ochre, black-lead, &c. but particularly the yellow earth called light ochre, found in Shattover-hills, which is uſed native, as a light yellow, and by calcination makes a light red. This Colour England ſupplies Italy with; and Le Gar would frequently ſay he had been no painter without it.

Colours may alſo be produced, deſtroyed, and regenerated upon ſimple mixture: for,

Put dry red roſe-leaves into ſpirit of wine; and, by ſtanding a little therein, the roſe-leaves will loſe their red Colour, without manifeſtly tinging or altering the liquor; then add a little oil, or ſpirit of vitriol, thereto, and the liquor will appear of a red Colour. But, if a little alkaline or urinous ſpirit be poured to the mixture, the red Colour preſently changes to a green; which, by the addition of a little more ſpirit of vitriol, turns to a red Colour again.

Make a ſlight infuſion of bruiſed galls in water, ſo as not to diſcolour the water; filtre the infuſion; make alſo a weak ſolution of green vitriol in water, and filtre the liquor, ſo that they may both appear pellucid: theſe liquors being now mixed together, an inky blackneſs will immediately ariſe; but, if a little oil of vitriol be added to the mixture, the blackneſs will, by degrees, totally vaniſh, and the liquor appear pellucid again; though the blackneſs may be recalled by the addition of a little ſalt of tartar.

If a little bruiſed camphire, which is a very white ſubſtance, be put into pellucid oil of vitriol, and the containing glaſs be ſhook for ſome time, the camphire will diſſolve, and gradually change the mixture to a brown, and at length to a full black. But, upon the addition of fair water, the blackneſs entirely vaniſhes, and the camphire riſes to the top in its priſtine form, and native whiteneſs.

If the ſhavings of lignum nephriticum be infuſed for ſome time in cold water, and the clear liquor be decanted into a clean glaſs, and viewed from the light, the liquor will appear of a beautiful blue; but, if viewed towards the light, of a yellow. If a little ſpirit of nitre be put to this liquor, it loſes its power of reflecting the blue rays; but the addition of a little oil of tartar, per deliquium, recovers that power again.

If logwood be infuſed in water, it gives a red Colour; which, upon the addition of a little ſpirit of urine, turns to a fine purple: but this may be changed to a bright red, by dropping in a little ſpirit of common ſalt.

An infuſion of braſil-wood, or cochineal, in water, is much heightened, in its red Colour, by the addition of ſpirit of urine, and lowered or turned paler by the ſpirit of ſalt.

If ſpirit of wine be digeſted upon recent camomile-flowers, and diſtilled over from them in a glaſs retort, the ſpirit will thus acquire a beautiful blue Colour; which may be made deeper by being drawn over again from freſh flowers.

A beautiful blue tincture being made by digeſting ſpirit of urine upon filings of copper, the addition of a little oil of vitriol intirely deſtroys the blue Colour, as a little ſpirit of ſalt turns it to a green.

Pellucid oil of vitriol being mixed with pellucid oil of turpentine, or the eſſential oil of aniſeeds; or more particularly with oil of cloves; they thus turn into a thick, red balſam.

And ſo again, if a pellucid common oil be, by means of a little wax, and continued triture, gradually mixed with fair water; they thus unite into a very thick, white ſubſtance, balſam, or cold cream.

Oil of vitriol, being diſtilled over from quickſilver, leaves a white powder behind; to which, if water be poured, the powder preſently becomes of a beautiful yellow.

To a ſolution of quickſilver, in ſpirit of nitre, add ſpirit of urine, and a white powder will be precipitated; to another parcel of the ſame ſolution add oil of tartar per deliquium, and a yellow powder will fall to the bottom: to a third parcel of the ſame ſolution add ſpirit of urine, and the precipitate obtained will be of a fleſh-Colour.

If a clean new pen be dipped in ſpirit of vitriol, and the common deep blue paper be wrote upon therewith, the letters appear of a very bright and beautiful red: and, in the ſame manner, pellucid ſpirit of ſalt ſtains a black hat red.

A pellucid ſolution of ſaccharum ſaturni in water, being wrote with, becomes inviſible upon the paper, when dried: but the bare fumes of another tranſparent liquor, viz. an infuſion of quicklime and orpiment in water, will ſoon render the inviſible writing black and legible. And thus thoſe commonly called inviſible or ſympathetic inks are made.

The volatile ſalt of ſal armoniac, a white body, and the cryſtals of copper, a green one, will, by mixture, become purple. Salt of ſteel, a green body, and ſugar of lead, a white one, being mixed together, the ſurface of the mixed powder will appear red, whilſt the internal parts are of a dirty white.

That original and ſimple, as well as compound Colours, are producible by mixture, appears from many experiments.

If the ſun's rays paſs through two pieces of differently coloured glaſs, for inſtance, a blue and a yellow piece, laid upon each other, and theſe rays be received from the glaſſes upon white paper, they then appear of a beautiful green.

It is common, with the dyers, to dye the cloth firſt blue with woad, and turn that blue into a green by the yellow called dyers weed, or luteola.

To a fine yellow ſolution of pure gold, in aqua-regia, add a deep blue ſolution of copper in ſpirit of urine, and the mixture will appear green.

Blue and yellow ammel, being melted together, conſtitute a green one.

The painters make a great variety of compound Colours, by mixing two, three, or more different Colours together, either on their pallat, or the canvas.

A mixture of the ſeven, or even five, original Colours, will make a white; and the more perfectly, the finer and more perfect the coloured bodies are. Thus, if a large top be painted on its upper ſurface, one part red, another yellow, another green, another blue, and another violet; this ſurface whilſt the top is ſpinning briſkly (ſo that the motion ſhall confound the ſeveral Colours, or make them appear mixed to the eye) will exhibit a dirty kind of whiteneſs. And in like manner, by mixing together powders of different Colours, as vermilion, orpiment, indigo, verdigreaſe, &c. in proper proportions, the compound powder will, in a ſtrong light, appear to be white. And, if differently coloured flames could be brought to mix, this experiment might be made in greater perfection.

Flames are of different Colours, according to the bodies that produce them. Thus the flame of burning camphire is white, like the focus of a burning-glaſs; the flames of ſpirit of wine, and ſulphur, are blue; the flame of white wax is white, inclining to blue; that of tallow white, but rather inclining to yellow, &c. Whence proceeds the difference of the Colours of bodies, as viewed by day-light, candle-light, fire-light, ſulphureous light, &c. And, for making experiments to this purpoſe, oil might be impregnated with certain metals, as particularly copper and iron, by triture and digeſtion, ſo as to exhibit their particular flames.

The priſmatic or original Colours may be imitated to conſiderable perfection in liquors, where the parts of the tinging ſubſtances are rendered extremely minute or fine. Thus a ſolution of cochineal in ſpirit of urine, viewed in a ſtrong light, affords a moſt vivid and beautiful red; a ſolution of copper in ſpirit of urine yields a glorious blue; a ſolution of verdigreaſe in diſtilled vinegar is an excellent green; a ſolution of gold in aqua-regia makes a fine yellow; an infuſion of violets in hot water affords an excellent violet-Colour, &c. And, from a thorough acquaintance with theſe liquors, and the methods of varying, mixing, and heightening their Colours, many improvements in the arts depending upon Colours, dyes, and ſtains, might be rationally expected.

CO'LTIE, among the timber merchants, a word uſed to expreſs a tree which has a defect in ſome one of its annual circles, which renders it unfit for many of the uſes it might otherwiſe have been fit for. In this caſe ſome one of the annual circles, near the center, is perceived by the eye to be thicker than the reſt, and its ſap veſſels larger. It has an appearance much different from that of the others, and is ſo looſly connected both to its inveſtient and inveſted circles, that, on ſawing a tranſverſe piece of the trunk off, it will ſlip out from the others, and ſo leave the heart looſe, and the reſt hollow, ſeeming to have been only fitted, not connected, to the others. In ſplitting the wood for the other uſes, it yet more readily drops out, and the timber of ſuch a tree is therefore much leſs fit for general uſe than that of others. It is not eaſy to ſay to what accident, in the growth of the tree, this is owing: but it ſeems probable that it expoſes the tree to other accidents; in particular, Bobart ſeems to think, that among the trees which were ſplit by the hard froſt, in the year 1683, while other trees of the like ſizes and kinds eſcaped, this coltineſs might be the occaſion of the miſchief, as well as their being wind-ſhaken, or lagged. *Phil. Tranſ.* N°. 165.

CO'LUMBINES, *aquilegia*, in botany, a genus of plants much cultivated in gardens.

The manner of propagating Columbines is either by ſowing, or parting the old roots; but, the old roots being very apt to degenerate, the ſowing them is much the beſt method.

The ſeeds muſt be ſown in a nurſery bed in Auguſt or September, and, in the March following, the plants will appear above the ground, at which time they muſt be carefully cleared of weeds, and watered gently at times, if the dryneſs of the ſeaſon requires it. In the beginning of May, they will be ſtrong enough to tranſplant, and muſt then be placed at eight inches diſtance, in beds of good, freſh, undunged earth, and they muſt here be alſo kept cleaned from weeds, and watered as they may require it; at Michaelmas they may be removed into the borders of the flower-garden, and in the May following they will flower. *Miller's Gard. Dict.*

CO'LURE (*Dict.*)— It is diſputable over what part of the back of Aries the equinoctial colour paſſed in the time of Hipparchus. Sir Iſaac Newton, in his Chronology, takes it to have been over the middle of the conſtellation. Father Souciet inſiſts fifts on its having paffed over the dodecatemorion of Aries, or midway between the rim and firft of the tail. We have fome obfervations, in the Philofophical Tranfactions, N° 466, concerning the pofition of this Colure in the antient fphere, from a draught of the conftellation Aries, in the Aratæa publifhed at Leyden and Amfterdam 1652, which feem to confirm Sir Ifaac's opinion; but the antiquity and authority of the original draught may ftill remain in queftion.

COMBINA'TION (*Dict.*)—The ingenious Mr. John Smeaton has given us, in the Philofophical Tranfactions, Vol. XLVII, the following new Combination of pullies. See *Plate fig.* VX. 9.

The axis in peritrochio, and the compound pulley, are the only mechanic powers, which can with convenience be applied to the moving large weights, when the height, to which they are intended to be raifed, is confiderable. The excellence of the former is, their working with little friction; that of the latter, in their being eafy to be moved from place to place, and applied extempore, as occafion requires.

The prefent method of arranging pullies in their blocks may be reduced to two. The firft confifts in placing them one by the fide of another, upon the fame pin; the other in placing them directly under one another, upon feparate pins. But in each of thefe methods an inconvenience arifes, if above three pullies are framed in one block. For, according to the firft method, if above fix pullies are placed by the fide of one another, as the laft line, by which the draught is made (or, as it is commonly called, the fall of the tackle) muft neceffarily be on the outfide pulley or fhieve, the difference of their friction will give it fo great a tendency to pull the block away, that as much will be loft by the rubbing of the fhieves againft the block, on account of its obliquity, as will be got by increafing the number of lines.

The fecond method is free from this objection; but, as the length of the two blocks, taken together, muft be equal to the fum of the diameters of the fix pullies, befides the fpaces between for the ropes, and the neceffary appendages of the framing, were there more than three pullies in each block, they would run out into fuch an inconvenient length, as to deduct very confiderably from the height, to which the weight might otherwife have been raifed: fo that, upon thofe accounts, no very great purchafe can be made by the common tackles of pullies alone.

In order therefore to increafe its power, fometimes a fecond tackle is fixed upon the fall of the firft; but here it is obvious, that, whatever be the power of the fecond tackle, the height to which the weight might otherwife have been raifed by the firft, will be lefs in the fame proportion as the purchafe is increafed by the fecond.

Again, very frequently the fall of the firft tackle is applied to an axis in peritrochio, which increafes the purchafe very commodioufly without the inconveniencies laft mentioned; but then the machine is rendered cumberfome, and, confequently, lefs fit for a moveable apparatus.

All thofe impediments I have avoided, by combining the two methods, above defcribed, in one. The pullies are here placed in each block in two tier; feveral being upon the fame pin as in the firft method, and every one having another under it, as in the fecond; as alfo that, when the tackle is in ufe, the two tier, that are the remoteft from one another, are fo much larger in diameter than thofe that are neareft, as to allow the lines of the former to go over the lines of the latter without rubbing.

From this conftruction arifes a new method of reeving the line upon the fhieves: for here, let the number of fhieves be what it will, the fall of the tackle will always be upon the middle fhieve, or on that next the middle, according as the number of pullies on each pin is odd or even.

To do this, the line is fixed to fome convenient part of the upper block, and brought round the middle fhieve of the larger tier of the under block; from thence round one of the fame fort, next the center one of the upper block; and fo on till the line comes to the outfide fhieve, where the laft line of the larger tier falls upon the firft fhieve of the fmaller, and, being reeved round thofe, till it comes at the oppofite fide, the line from the laft fhieve of the fmaller tier again rifes to the firft of the larger, where it is conducted round, till it ends on the middle fhieve of the upper block on the larger tier, as will appear more plain, by infpection of the figure annexed.

In this method all the lines are clear of one another, and the blocks are kept parallel. The model which I had the honour to fhew the Society, and from which I made the draught, is a compofition of twenty fhieves, five on each pin. With this model, which may eafily be carried in the pocket, I have raifed 600 weight. But with a tackle of this fort, properly executed in large, one man will eafily raife a ton, and a greater number in proportion.

I have tried feveral numbers of fhieves as far as 36; but 20 feems to be the largeft number, that will anfwer well in practice.

A very commodious tackle of twelve might be executed in wood, in the fame manner that common blocks are made.

COMEDO'NES, a name given to a fpecies of worm, with which the children of Mifnia, and fome other countries, are terribly afflicted; and of which Hoffman, in his treatife of Endemial Difeafes, gives this account: children in the country are frequently feized with a fort of tabes, which fo deftroys their flefh, that they appear merely like fhadows: the common people generally fuppofe thofe children to be under the influence of witchcraft, but fuch as have enquired more narrowly into the diftempers, have found that it is owing to certain worms, refembling black hairs, or cords, lodged under the fkin. When the fkin is rubbed with honey, in a bath, or any warm place, they will appear and come out; but, when it is contracted by cold, they keep concealed within.

CO'MMA *of Pythagoras*, is the difference between fix tones major, and the octave; or between 19 octaves, and 12 twelfths. It will therefore be expreffed by the proportions $\frac{531441}{524288} = \frac{9^6}{8^6} : \frac{2}{1} = \frac{3^{12}}{2^{19}}$. The fmall figures, written above the larger, fignify the exponents of their powers.

C'OMMERCE (*Dict.*)—Commerce owes its original to our wants, real or imaginary. Nature is contented with little, but luxury and ambition have extended Commerce to fupply their wants; and the rich fupport induftrious numbers to furnifh fplendor and magnificence. Convenience introduced it; and its progrefs has been principally owing to the increafe of mankind, who have found it neceffary to extend trade for their mutual fupport. The hiftory of Commerce (fee the article in the Dictionary) affords us three important reflections.

1ft. People by induftry may fupply the defects of their native country, and poffefs more riches than thofe who are the natural proprietors of them. Gold and filver are agreed on to pay the value of commodities, but are of no more ufe than as they make us able to procure them. Induftry fupplies every country with what it wants, and by that means enriches itfelf: without induftry no people ever can be rich.

2d. The people infenfibly lofe their trade, who do not carry it to the greateft extent. Every branch of trade fuppofes a want of what is exported, and the profits arifing from merchandize enable us to extend Commerce. Nothing is more dangerous to a trading nation than to force the people they trade with to fupply their own wants, or procure them elfewhere. Wonders of induftry have come to maturity, in the womb of neceffity. The efforts of induftry are like the courfe of an impetuous torrent, whofe waters ftruggle with violence againft the banks which confine it, till at laft it overflows them, and diffufes itfelf all over the plains.

3d. Whatever nation carries on a great trade, muft be proportionally populous and opulent. The conveniences and comforts of life are the moft powerful attractions that act upon men: could we fuppofe a trading people to fubfift in a country where the neighbouring people did not apply themfelves to trade, what would be the confequence? The trading people would foon have all the foreigners, becaufe their Commerce would employ and pay them.

Thefe three reflections point out the principles of Commerce, in a body politic. Agriculture and induftry are the effence of them; they have fo neceffary a connection, that, if either has the balance againft the other, the public fuffers. Without induftry the fruits of the earth will be of no value; if agriculture be neglected, the fource of Commerce is dried up.

The object of trade in a ftate, is to employ as many hands as poffible. Agriculture and induftry are the only means of fubfifting; if thefe are both profitable to the ftate that employs them, the ftate will never want hands.

The effect of trade is to ftrengthen the ftate, which ftrength confifts in the number of people its political riches draw to it; that is, its real and relative wealth taken together.

The real riches of a nation confift in the degree of independence it has on any other to fupply its own wants, and the fuperfluity it is capable of exporting to fupply the wants of other nations. The relative riches of a nation confift in the quantity of money or value its Commerce draws to it, compared with that of other neighbouring nations. A combination of thefe real and relative riches conftitutes the art and fcience of adminiftering political Commerce.

Every proceeding in trade, contrary to thefe principles, is pernicious to trade itfelf.

Thus, Commerce may be beneficial or detrimental: to convince us of which, we muft diftinguifh between the profit of the merchant and the profit of the ftate. If the merchant imports foreign commodities which impede the confumption of domeftic manufactures, the merchant will enrich himfelf by the fale of them; but the public will be a lofer, more ways than one. 1ft. By the value paid to foreigners. 2d. By the wages paid to the different artificers employed in the different manufactures. 3d. By the value that the growth of the materials in the country or colony would have produced to the country or colony into which they are imported. 4th. By the profit which would arife from the circulation of all thefe feveral fums.

If the materials are of the growth of the colonies, the ftate will befides lofe the benefit of navigation. If the materials are

are foreign, this disadvantage subsists equally; and, instead of the loss of our own product, it will be by the exchange of the national commodities in return for these materials. The gain of a state is, therefore, exactly what we have mentioned; and the state must be a loser in case of the preceding suppositions. The gain of the merchant consists in the excess of the price of the sale above the price of the purchase.

The merchant may in some cases be a loser, and the state a gainer: if a merchant imprudently sends the manufactures of his own country abroad into countries where they are not wanted, he will lose by the sale of them; but the state will have gained by the growth of the materials, and the employment of artificers in the manufacture of them.

Commerce seems most rationally established on the nine following maxims.

1st. The exportation of superfluities is the most clear gain.

2d. The most advantageous manner of exporting superfluities of our own produce is to manufacture them first.

3d. The importation of foreign materials to be manufactured at home, instead of taking them ready manufactured, is a great saving to a state.

4th. Bartering one commodity for another is in general advantageous, except in cases where it is contrary to the foregoing principles.

5th. The importation of commodities which hinder the consumption of those of our own product, which interfere with our own manufactures, or put a stop to the culture of our lands, is pernicious.

6th. The importation of foreign goods, merely for the use of luxury, is a real loss to the state.

7th. The importation of such foreign goods as are wanted, of absolute necessity, cannot be accounted an evil, though a nation is impoverished by such importation.

8th. Importation of foreign goods, to re-export them, procures a certain benefit.

9th. To let our ships out for freight to other nations is a beneficial branch of trade.

Every operation of Commerce ought to be regulated by these principles, and formed upon this plan.

COMPA'RTMENTS, in gardening, are beds, plats, borders, and walks, laid out according to the form of the ground, and depend more on a good fancy, than on any set of rules, for their construction. They are also sometimes merely diversities of knots of flower gardens or parterres, of which there are an infinite variety, according to the fancy of the designer.

Plain Compartments, are pieces of ground divided into equal squares and flower beds, marked out by line, and made of regularly equal length and breadth. Some allow to these squares borders of two feet broad, if the plot of ground be small, and, if larger, of three feet, and edge the borders with box, or with upright hardy thyme: the alleys up between are to be laid with sand or gravel, and kept clean weeded.

CO'MPASS (*Dict.*)— Before the invention of the Compass, which is between 300 and 400 years ago, the navigating of ships was a very tedious and precarious operation: but the Compass enables the mariner to hold his course over the seas in as direct and true a tract, as the land-carrier directs his carriage in a well beaten road. Hence it might be reasonably imagined, that no necessary expence or care should ever be wanting in the construction of this most useful instrument: but it has so happened, that scarce one sea Compass in ten is fit for the use for which it is made; and this has arose from their being fabricated by unskilful and ignorant workmen, for the wholesale dealers in the shipping way; who generally pay no more regard to the construction of this instrument, whereon the success of the voyage and the lives of the men in a great measure depend, than they do to any indifferent thing of the same price.

There are, however, Compasses used in the royal navy, and some few trading ships, which are constructed with more care, and on better principles; and are therefore vastly preferable to those commonly used in the merchants service, which, from their composition, seem as though they had been contrived purposely to vary from what was to be expected of them: such as joining the outside box together with iron nails; making the needle of soft wire, and disposing it in form of a rhombus, in expectation that the magnetical forces of the sides would conspire to act in the diagonal: making the pin and socket so badly, as to prevent the traversing of the card, &c. &c.

But it must be observed, that it is only within a few years that sea Compasses have been made free from the multitude of inconveniencies to which the best constructed of them were liable to before: such as, 1. Needles having several poles, occasioned by their irregular shape, the best kind being straight bars with flat ends. 2. The needles being made of such a temper as was neither susceptible of receiving, or retaining half the virtue it was possible to give them; and, consequently, they were not with due strength and perseverance directed towards the poles of the world. 3. The want of proper means to restore their loss of magnetism, while on a voyage. 4. The troublesome and inaccurate methods of rectifying a damaged pin on which the card turned, together with the expence attending the use of agate caps or sockets, than which none are so proper. 5. The want of proper contrivances to hinder the card from being affected by the various motions of the ship. These, and several other imperfections, have been happily removed by the labours of the truly celebrated Dr. Gowen, knight, F.R.S. whose admirable invention of giving magnetism to steel bars, greatly superior to any power they could derive from the natural loadstones, joined to a multitude of experiments which he has made for the marine service, have produced the means of constructing sea Compasses so perfect, that there seems nothing farther to be wished for, as necessary to this instrument. It may be reasonably expected, that such correct Compasses will readily come into general use, as there have been several trials made of them both in men of war, and merchantmen: but, like several other useful improvements, it must wait till time has removed old prejudices. See *Magnetical* NEEDLES in the Dictionary, and AZIMUTH *Compass*, in the Supplement. *Robertson's Navigation.*

The Compass has been sometimes observed to be disturbed by the electricity of its glass cover, and this from so slight an application of the finger, as was barely necessary to wipe off a little dust. The same glass, rubbed a little more with the finger, a bit of muslin, or of paper, would attract either end of the needle, so as to hold it to the glass for several minutes, far out of the due direction, according to what part of the glass was most excited. And, when the needle, after adhering to the glass, has dropped loose, and made vibrations, those would not be bisected, as usual, by that point where the needle should rest, but either be made all on one side, or be very unequally divided, by means of some remains of electrical virtue in that part of the glass which had attracted the needle, until at length, after fifteen minutes or more, all the electricity being evaporated, the magnetical power took place. The cure for this inconvenience, is to moisten the surface of the glass: a wet finger will do it immediately and effectually. *Phil. Transf.* N°. 480.

CO'MPOSITE *Capital.—Plate* IV. *fig.* 14, in the Dictionary, represents, in a side view, a Composite capital, and *fig.* 15. a plan of the same capital inverted.

CO'MPOSTS (*Dict.*)— Composts are various, and ought to be different, according to the different nature or quality of the soil, which they are designed to meliorate; and according as the land is either light, sandy, loose, heavy, clayey, or cloddy.

A light loose land requires a Compost of an heavy nature, as the scouring of deep ditches, ponds, &c.

So, on the other hand, a land that is heavy, clayey, or cloddy, requires a Compost of a more sprightly and fiery nature, that will insinuate itself into the lumpish clods, which, if they were not thus managed, would very much obstruct the work of vegetation.

The great use of Composts is for such plants as are preserved in pots or tubs; or sometimes it is used for small beds or borders of flower gardens; but it is too expensive to make Composts for large gardens, where great quantities of soil are required: in such cases the only composition that can be made with moderate expence, is, where the land is too light and sandy, to lay marl, clay, or any other heavy dressing upon the land: the best season for this work is in autumn, when it should be spread abroad, and exposed all the winter, that the frost and rain may dissolve and separate the clods, whereby it will be rendered fine by the spring of the year, when it may be dug into the ground; and if, before this is done, there is some rotten stable dung, or neat's dung, added to it, the land will be greatly mended by it.

But where the land is heavy, and of a clayey or loamy nature, then light sharp dressings are the best Composts; such as sand, ashes, or near London, where it can be had, the soil of the streets is an excellent dressing, because these will separate the parts of the clay and loam, and prevent its binding hard in dry weather; so that all sorts of plants will thrive much better in it than they would, before this composition was added.

In the making a Compost for such plants as are kept in pots or tubs, the same thing is to be observed; for, where the natural soil of the place is stiff and heavy, there should be a sufficient quantity of sand and rotten dung added, so as to render it light, especially for all plants which do not delight in a stiff soil; and, on the other hand, where the soil is naturally too light or sandy, there should be a proper quantity of loam and rotten neat's dung mixed with it, to give it a firmer texture; and these should be proportioned to the several qualities of the plants which the Compost is designed for; this is to be understood, where large quantities of earth are wanted, in places where it may be difficult to get the sorts of earth proper for the plants it may be designed for; which, in some countries, cannot be had, unless it is fetched from a great distance; therefore, where that is the case, there will require some skill in making a Compost of such materials as can be more easily procured, which may answer the purpose as nearly as possible; but, where a small quantity only is wanted, there can be no great difficulty, at proper seasons, to procure what may be wanted of the proper soils to make such a Compost as is necessary for the plants.

In making of any Compost, great care should be had, that the several parts are properly mixed together, and not to have too much of any one sort thrown together; therefore, when three or four several sorts are to be mixed together, there should be a man or two placed to each sort, in proportion to the quantity of each; for if two parts of any one sort are requisite to be added, there should be two men put to that, and but one to each of the other: and these men must be careful to spread each sort in such a manner over each other, as that they may be exactly mixed together. Another thing which should be observed is, never to lay these Composts in too large heaps, but rather continue them in length, laying them up in ridges, so that the air and sun may more easily penetrate through it; and, as these composts should, if possible, be made a year before they are used, that they may enjoy a summer's sun and winter's frost, they should be frequently turned over, which will prevent the growth of weeds, and expose every part of the heaps equally to the sun and air, which is of great advantage to all sorts of Composts; for the more they are exposed to the influence of these, the better will the earth be prepared for vegetation; which is evinced by the fallowing of land, which, when rightly managed, is equivalent to a dressing. *Miller's Gard. Dict.*

COMPRESS (*Dict.*)— It is frequently the custom among surgeons, after the plaister and other dressings are applied, to cover all with a Compress, which is made of the softest old linen, four, six, or eight times doubled. These are of service, not only by preserving the parts from the injuries of the external air, but also for the securing and fixing the plaisters and other dressings. Compresses are also frequently applied where no plaister is made use of, and that sometimes dry, sometimes wetted with certain liquors, which are supposed to be strengthening, emollient, resolving, lenient, cooling, &c. They are frequently dipped in the decoctions of certain herbs, into wine, spirits of wine, vinegar, or oxycrate, and sometimes into lime-water, and are administered either cold or hot, as the nature of the case requires. Compresses are of various forms; some are square, others oblong, others triangular, and others in form of a cross, according to the part they are to be applied to, and according to the occasion and situation. Some are called straight, others oblique, others transverse, and others annular, as those that surround the arm or foot. There are some also necessarily made in the form of an asterism; some are divided either on one or both sides, as far as the middle; sometimes they form a hexagon, and sometimes are round or globular, resembling a ball: these are used in luxations of the os humeri, and are placed under the axillæ. Sometimes Compresses of a much smaller size are required, which are either square for the wounds of the blood vessels, to restrain hæmorrhages; or taper, for sectures of wounds, or in ligatures of the arteries.

Compresses of all kinds are intended for these purposes: 1. to preserve and cherish the natural heat of the body. 2. To secure the dressings that are laid under them. 3. To convey liquid remedies to parts wounded or otherwise disordered, and to prolong the use of them. 4. To fill up any cavities or depressions of the parts, that the dressings, especially in fractures, may be applied with greater security: and, lastly, to prevent bandages from bringing a troublesome itching, or other pain or uneasiness on the skin. *Heister's Surg.*

CONCHÆ *anomiæ*, in natural history, the name of a fossile shell-fish, found in great abundance, and in great variety of species, but not known in any of them living, on the shores or in the seas of our own or other countries. In Gloucestershire, and some other of our counties, these are found as common as pebbles on the ploughed lands in other places. They are a sort of bivalve shells, the valves of which are of unequal extent, both of them convex, and the head or beak of the longer valve crooked, and falling over the head of the other. See *Plate* XV. *fig.* 10.

CONCLAVE (*Dict.*)— It depends on the members of the Conclave themselves to pitch upon a place, for the Conclave has no determined one; but, for some time, the palace of St. Peter, otherwise called the Vatican, has been always made use of, both for the greatness of the place, and other conveniencies; so that the cardinals never stand to deliberate now, but only for form's sake. They build then in a great apartment of this palace as many deal cellulæ as there are cardinals, with lodges and places for the conclavists that shut themselves in to wait and serve the cardinals. These little chambers have their numero or number, and are drawn at hazard; so that it happens very often, that cardinals of different factions lodge near one another. These are made up during the nine days of the ceremony of the pope's funeral, all which time, any body may go into the Conclave, and see the cellulæ, which are hung on the outside with green serge or camblet; only those that belong to the deceased's favourites, or to them promoted by him, who have theirs covered with deep violet-coloured cloth, and over each is the cardinal's arms that lives in it. Between the cellulæ and the windows of the palace is a long gallery for the conveniency of the Conclave, and it is from this the cellulæ receive their light. The next day after the pope's burial, that is, the 10th after his death, the cardinals having heard a mass, they call the holy Ghost's, go in procession two by two to the Conclave, where they all meet in the chapel every day, morning and evening for a scrutiny, which is done by writing their suffrages in little billets, and putting them in a chalice that stands upon the altar; when all are put in, two cardinals are chosen by the rest to read openly them that are named, and keep an account of the number for each; and this is done till two thirds join for the same person, but a pope is seldom chosen after this manner; whence it happens, that after the scrutiny they come to what they call an accez, that is, a trial, whether he that has most voices in the scrutiny could come to two thirds; but it is observable, that they cannot give their suffrages, in the accez or access, to those they have appeared for in the scrutiny. If this does not succeed, they have recourse to the way of inspiration, which is an open declaration, or, rather, a conspiracy of many cardinals to cry together, such a cardinal is pope; as, for example, Altieri papa is begun by one or two, chief of a party, when they find suffrages enough to assure them that this method will not fail; and then the rest of the cardinals are forced to join, that they may not incur the pope's displeasure, who would be chosen in spite of them. As for the scrutiny, it is done thus: each cardinal prepares his billet, wherein he writes his own and his name he is for, and another word of device. The cardinal's name is writ under a fold of the paper, and sealed with a seal for that purpose. The name of the chosen is writ by a conclavist under another fold without seal, and the word by which the cardinal knows it is his name that is read, is writ on the outside, as, Deo volente, or some such-like. The fold that covers the cardinal's name is never opened until the pope is chosen, who, to know those that helped towards his promotion unfolds all. The motto serves in the accez, that it may appear, that each cardinal has given another beside that they gave in the scrutiny, seeing two billets with different persons under the same name; and at the end of the scrutiny and accez, if the suffrages be not sufficient for the election, they burn all the billettings, that the chusers names may be kept secret. During the Conclave, each cardinal is allowed but two servants, or three at most; and this only to princes, or for some particular privilege. Several press for this employment, because the new chosen pope gives each conclavist three or four hundred livres, and they have the pleasure of seeing all that passes; yet the place is troublesome enough, because they must take in the meat and drink from a certain place common to all that live in the same part, and must wait at table, and be as streightly confined as their masters. *Histoire du Conclave.*

CONCORD, *Concordia*, in mythology, a goddess much esteemed amongst the ancient Romans. Julius Cæsar, and Tiberius, built her a temple. She was generally represented under the shape of a young girl clad in the old fashion, crowned with a garland of flowers, holding a bason with a heart in her right hand, and in the left a bundle of rods. There is an old medal of the emperor Nerva, wherein union is represented by a woman who bears a lance in her left arm, and a buckler in the other, and by a ship's stern and colours with these words, Concordia exercitum, S. C. Angeloni mentions this last in the History of the Cæsars, p. 102. In other medals they represent union with two horns of plenty in one hand, and a vessel of fire in the other. When Concord is invincible, she is represented by an armed Geryon, a golden crown on his head, with six arms and as many feet; in three of his hands he holds a lance, a scepter, and a sphere, and lays the other three on a shield. *Tit. Liv.*

CONFECTIO *cardiaca*, a name given, in the late London Dispensatory, to the so much esteemed medicine, commonly known by the name of the Confectio Raleighana, or Sir Walter Raleigh's cordial. The composition is also altered, as well as the name, and is ordered now to be made in the following manner: take fresh tops of rosemary and juniper berries, of each a pound; the lesser cardamum seeds, freed from their husks, zedoary, and saffron, of each half a pound. Draw a tincture from these, with a gallon and a half of proof spirit; reduce this tincture, when filtred, to the weight of about two pounds and an half, by a gentle evaporation; then finish the electuary by adding the following species finely powdered; viz. of compound powder of crab's claws, sixteen ounces; cinnamon and nutmeg, of each two ounces; cloves, an ounce; double refined sugar, two pounds. *Pemberton's London Dispensatory.*

CONFECTIO *Paulina*, a name given in the late London Dispensatory, to the composition which used to be called Confectio Archigenis. It is now ordered to be made in the following manner: take costus or zedoary, cinnamon, long-pepper, black-pepper, strained storax, galbanum, opium, and Russia castor, of each two ounces; of simple syrup, boiled to the consistence of honey, an equal weight to thrice the species. *Pemberton's London Dispensatory.*

CONGER, in zoology, the name of the sea eel, a very voracious and extremely large fish of the eel kind.

It grows to an enormous size, four or five cubits being a common length with it, and its thickness that of a man's thigh. It is of a pale grey on the back, and a fine milk-white on the belly, and has on each side a straight white line,

line, somewhat broad, made as is were of a double row of dots, and running from the head to the tail; the top of its back fin is black all the way; and in the end of his upper jaw, just at the nose, he has two short tubular horns, out of which a mucous liquor may be squeesed. Their flesh is very agreeable, but is not easy of digestion. *Willughby's Hist. Pisc.*

CONICHTHYODO'NTES, in natural history, a name given by Dr. Hill to a genus of fossile bodies, called by other authors plectronitæ, from their supposed resemblance to the spur of a fighting cock.

CONSTI'TUENT *Parts*, in chemistry. The Constituent parts of bodies are their dissimilar parts, into which they may be resolved, by the rules of that art. They are thus called in distinction from the integrant parts of bodies, which are parts of the same nature and properties with the bodies themselves. Thus quicksilver, dissolved by aqua-fortis, may be separated from the diluted menstruum, by means of a copper-plate, in its own form; this therefore was only divided into its integrant parts: but cinnabar, resolved by chemistry into sulphur and mercury, is divided into its Constituent parts, neither of these, nor any particle of them, being cinnabar, or having its properties. *Shaw's Lectures.*

CONSTRU'CTION *of equations* (*Dict.*)—The learned Baker, in his Clavis Geometrica, has given us the following elegant method of constructing cubic and biquadratic equations.

Let the parameter, or latus rectum, be called $1 = L$ (*Plate* XV. *fig.* 11.) and its vertex *a*; then, at right angles to the axis, inscribe $RA = \frac{1}{2}p$, for half the second term in the equation; then shall its point A be the vertex of the diameter A D, to be drawn parallel to the axis; so that the distance of this diameter from the axis is always $\frac{1}{2}$ of p, or $\frac{1}{2}$ of pL, for L is equal to 1; and consequently when $p = o$, or when the second term is wanting, A D will be in the axis, and the points R, *a*, A, all coincident. Next, in this diameter he determines the point D by the length of A D, and then erects in D a perpendicular to D A, as D H, whose length he also determines, and by that means finds H, the center of the circle which is to intersect or touch the parabola: and this he performs by what he calls his central rule, viz.

1. $\frac{L}{4} + \frac{pp}{8L} \pm \frac{q}{2L} = b = AD$; And,

2. $\frac{p}{2} \pm \frac{ppp}{6LL} + \frac{pq}{4LL} + \frac{r}{2LL} = d = DH$.

Which two rules, because $L = 1$, may be contracted thus,

1. $\frac{1}{4} + \frac{pp}{8} \pm \frac{q}{2} = B = AD$.

2. $\frac{p}{2} + \frac{ppp}{6} \pm \frac{qp}{4} \pm \frac{1}{2}r = d = DH$.

And you must observe, that in the former of these rules + signifies downwards from the point A, and — upwards from it; and in the latter rule + signifies towards the left-hand, as — doth towards the right; so, according as the affirmative or negative roots prevail, H will be on the left or right-hand of D.

And in both parts, if p, q or r be $= o$, the member where it is found will vanish and become also $= o$.

As to the signs of the quantities in his rule, he makes p always retain the sign it hath in the equation, but q always puts on a contrary one to what it had there; r is always with a positive sign, except when pr have contrary signs in the equation, and then r will always have a negative sign in the rule.

Having thus, by his central rule, found H the center of the circle, the next work is to determine the radius; and, if the equation be no higher than a cubic, H A is always the radius; but, if it be a biquadratic, then supposing — S, or that the fifth term, or absolute number, be a negative quantity, take in the line A H, produced both ways, if there be occasion, $AI = L$ above, and $AK = S$; and, making I K a diameter, describe the semicircle K L I, and erect at the point A the line A L perpendicularly; which therefore will be a mean proportional between A K and A I: I say, the circle must pass through L, and H L will be the radius.

But, if it be + S, you must draw another diameter H A, and therein fit in or apply $AZ =$ to L A before found; for now the square of A L is to be taken from H A, as in the former case it was to be added to it; which will find the point Z through which the circle must pass, and the radius will be H Z, which circle being drawn, it will cut the parabola in 4, 3, 2, or 1, or in no point; and, according to the number of such intersections, will the real roots of the equation be found, which will be always so many perpendiculars from those points to A D, as, *e. gr.* N O on the left-hand, M *o* on the right, &c. Of which, if there be no p or second term, and also it be $-r$, then on the left-hand are the positive roots, and the negatives ones on the right-hand: but if the second term be there, and with a negative sign, as $-p$, then N *o* on the left-hand are affirmative, and the others M *o* on the right negative; but, if it be $+p$, it is, on the contrary, N *o* negative, and M *o* positive.

CONSTRUCTION, *in grammar* (*Dict.*)—The Construction is generally more simple, easy, and direct in the modern tongues than in the ancient: we have very few of those inversions which occasion so much embarrasment and obscurity in the Latin; our thoughts are usually delivered in the same order wherein the imagination conceives them: the nominative case, for instance, always precedes the verb, and the verb goes before the oblique cases it governs.

The Greeks and Latins, M. St. Evremont observes, usually end their periods, where, in good sense and reason, they should have begun; and the elegance of their language consists, in some measure, in this capricious arrangement, or rather in this transposal and disorder of the words.

CONSTRUCTION, is either simple or figurative.—Simple, is that wherein all the terms, or parts of the discourse, are placed in their natural order.

Figurative CONSTRUCTION, is that wherein we recede from this simplicity, and use certain expressions, shorter and more elegant than nature affords.

The syntax, or Construction of words, are distinguished into two parts, concord, and regimen or government.

CONTA'GION (*Dict.*)—In times of pestilential Contagion, the physician, and others who attend upon the sick, are in the most imminent danger of falling into the same condition; nor have any of the so much boasted preservatives against this been found of any consequence; on the contrary, the very remedies, many of them at least, which have been contrived on this occasion, are very dangerous, when lodged in imprudent hands, as well as useless and improper in all. The best methods of safety are, first, never to visit a patient in any infectious disorder, when one is fasting, but some generous wine ought always to be drank first. Some are of opinion that it is proper to eat first a piece of bread and butter, soaked in vinegar, either simple, or with rue first stamped in it. When one is in the patient's apartment, great care is to be taken never to eat or drink there, nor to swallow one's spittle; and it is no idle custom in those who are continually in the infected room to chew zedoary, myrrh, angelica, cinnamon, or the like warm and aromatic drugs; for all these things promote a plentiful discharge of saliva from the mouth, which it is certain, when swallowed, cannot but often carry pestilential particles down with it into the stomach, whence they will easily find their way into the blood. It may be added as a good rule, that we never stay too long in an infected room; for a constitution that could have resisted the Contagion for a small time, may easily be overpowered by too long a continuance in the way of it.

After one is returned home from a visit of this kind, it is always proper to wash one's hands and mouth with vinegar and water; to change cloaths, hanging the former in the air, and then to drink some warm liquor, as tea of scordium, sage, or other herbs of that kind, or, in their place, coffee; for this opens the pores, and, if any small quantity of the pestilential virus should have mixed itself with the blood, expels it by a gentle perspiration. It may be also of great assistance to all about the sick, from preventing them from being infected, to hold frequently sponges dipped in vinegar to their noses, and frequently to sprinkle vinegar on a red-hot iron, in the room, to correct and mend the air. *Heister's Surgery.*

CONTI'NUOUS *Fevers*, a term used by the medical writers to express such fevers as have no intermissions, but have some sort of regular remissions from the violence of their symptoms every day. They are thus called by way of distinction from the continent fevers, which never have the least remissions.

Of the number of Continuous fevers, are the quotidiana continua, and the catarrhal fevers, which are more violent every day towards evening, and are much more mild in the middle of the day. *Junker's Consp. Med.*

CO'NTOR, or CUNTOR, a bird of Peru, said to be the largest in the world. With its wings expanded, it measures fixteen feet from the tip of the one to the other; a single feather of it is four feet two inches long; its beak is strong enough to tear off the hide, and rip up the bowels of an ox. Two of them will attempt a bull, and devour him. *Phil. Trans.* N°. 208.

CONTRA'RY *Propositions*, in logic, universal propositions, one of which affirms, and the other denies, the same predicate of the same subject; as every square is a parallelogram, and no square is a parallelogram. These propositions differ in quality, but not in quantity, and therefore are distinguished from contradictory propositions, which differ in quantity and quality.

Contrary propositions cannot be both true, but may both be false: whereas, in contradictory propositions, one is necessarily true, and the other false.

CONTU'SIONS *of the cranium*. When the cranium is violently contused, it will be discovered by the tumor and softness of the part, by the separation of the integuments from the cranium, and by the collection of stagnating blood which appears to be confined under the skin. In this case you are to endeavour to divide the confined fluids, by attenuating medicines externally applied, or to discharge them by making an opening with a knife, or, lastly, to bring them to suppuration. When the extravasation of fluids is very considerable, it is best to discharge the greatest part of them instantly by incisions, and

and what remains will then easily be dispersed. Fomentations, and medicated bags of the warm herbs, rue, wormwood, savin, scordium, &c. quilted into bags, and boiled in wine, or in water, with a mixture of spirit of wine, or malt, or mellasses spirit. But, where it is found impracticable to divide and attenuate the stagnating fluids, the suppuration of them must be attempted, and, if the contusion have been but small, after the suppuration is formed, and the matter discharged, the wound will easily heal, by the application of a vulnerary balsam.

In violent contusions, where there is no opening, or but a very small one, the wound must be inlarged with the knife, to prevent the neighbouring parts from being corroded, and by this means the wound will be easily cleaned, and the cure performed by the method before laid down. When the pericranium is wounded, but not in so great a degree as to lay the cranium bare, the wound is to be dressed with warm balsamic medicines. But, where the cranium is exposed and laid bare, its external lamella being robbed of its nourishment, by the destruction of the vessels, by which it was constantly supplied, it will lose its natural colour, and become yellow, livid, black, and, by degrees, separate from the neighbouring parts, and exfoliate, which will greatly protract the cure of the wound. To hasten this exfoliation, the surgeon ought to bore several holes through the denudated part, as deep as the diploe, with an awl, or such like instrument. This operation not only forwards the exfoliation of the part, but makes way also for the sprouting up of new vessels. The dressing, which ought to be repeated each time with great expedition, is to be applied in the following manner: when the wound is well cleaned, pledgits thoroughly saturated with the mild balsamics, with the addition of a small quantity of honey of roses, are to be laid upon the injured part of the cranium; over these a sticking plaister is to be applied; and over that the proper bolster and bandage. These applications should be continued till the cranium appears sound, and the wound is in a condition to heal. *Heister's Surg.*

CONVO'LVULUS, *bind-weed*, in botany, the name of a very large genus of plants, which some have also made much larger than it really is, by making every climbing plant belong to it. The characters, however, of the Convolvulus, properly so called, are these: they have flowers consisting only of one leaf each, formed into the shape of a bell, and usually very wide at the mouth. From the cup of the flower arises a pistil fixed to the lower part of the flower, in the manner of a nail; this ripens into a roundish membranaceous fruit, which is usually surrounded by the cup, and in some species is unicapsular, in others tricapsular, and contains seeds usually of an angular figure.

Tournefort has enumerated fifty-six species of Convolvulus.

COO'PERAGE, in mechanic arts, the art of making all kinds of casks, &c.

COO'PERS. This is a necessary and extensive business, in all its branches, which are,

Those which make casks, not tight, chiefly for dry goods, package, and soap.

Others that make all sorts of tight casks, for holding liquids. Both these are smart work, but the latter by much the nicer part; and they take with an apprentice generally the sum of 10 or 20l. whose working hours are from six to eight, in which time some good hands will earn 3s. or 3s. 6 d. but the common wages are 15 s. a week.

And to set up a master in the dry way will require from 200 to 500 l. except they keep to soap casks only, as some do, which is easier work, and does not require so much money. One who keeps to the making of butts, hogsheads, &c. for brewers, vinegar merchants, shipping, &c. requires a good stock of the best staves, and of course more money to carry on their business: But there are those also who work mostly on the lesser sort of tight casks, which is much lighter work, and takes less money.

Lastly, the wine Coopers, whose province is not only to look after the casks, but the liquor itself, in which many of them are also great dealers. These will not take an apprentice with less than 20 l. and, if importers, perhaps, not less than 50 or 60 l. had need have 1000 or 2000 l. stock: and a journeyman in this part has seldom more than the others, unless they are extraordinary cellar-men, who have sometimes 40, 50, or 60 l. a year and their board.

They were incorporated into a company in the year 1501, in the reign of Henry VII, and, by an act in the 20th year of Henry VIII, they were authorized to gauge all beer, ale, and soap vessels for a farthing each: livery fine 15 l.

Their hall is in Basing-hall-street, and their court-day on the first Tuesday in the month.

They have also an handsome barge, in which they attend the lord mayor to Westminster, on the day of his installation.

Arms. Girony of eight sable and gules, on a cheveron between three annulets, or, a croze between two axes sable, on a chief vert three lillies argent. Motto. Love as brethren.

CO'PPEL (*Dict.*) — The matter of which Coppels are to be made, must be such as can resist the strongest fire, such as will not run easily into glass with vitrifiable bodies, as glass of lead, &c. and such as may be reduced into a well coherent,

though porous mass. The best earth for this purpose is found to be that which is made of calcined bones of all animals, a very few excepted, especially swines bones; for a Coppel made of the bones of this creature is found to receive something metallic into it, at the same time that it absorbs the glass. The best bones for this purpose are those of calves, horses, sheep, and oxen; and, of these, the smallest bones are always to be preferred, as they are the more easily calcined, especially such as have been long exposed to the air.

The calcination of these bones is to be made in an open fire, for a few hours or more, according to their size, and such should be chosen as have the least fat about them. The calcination is known to be perfect, when there is not a black spot remaining, either on the outside of the bone, or within it, when broken. When the bones are perfectly calcined, they must be reduced to a very fine powder, either by the grinding on a porphyry, or sifting through a fine sieve, after beating. This powder must be also carefully washed in warm water; for, during the calcination, the bones are almost always impregnated with the salt of the ashes of the fuel.

This powder is called by some clar, and is an excellent substance for Coppels. The bones of fishes, when small, are yet more easily calcined than those of other animals: this may be done with ease in an open earthen vessel, and the powder of these is preferable even to the former.

Parget, or plaister of Paris, made of various kinds of spar, tho' all kinds will not do for this purpose, is also excellent: but, as there are some sorts of spar which will not afford a proper plaister, it is proper to try in a small quantity first. The calcination is to be made in an earthen vessel, covered with a tile, in an open fire. The spar crackles a little with the heat, and, when this noise is over, the calcination is perfect.

As the preparation of bone ashes for this use, however, is tedious, and the proper sorts of spar not always or every-where to be had, the want of them may be supplied with the ashes of vegetables, properly prepared: but, lest the Coppels should vitrify, by reason of the alkaline salt in these ashes, the following method must be observed in their preparation: Wash off the lightest and finest part of the ashes from hot wood embers, with warm water, through a sieve, that the finest part of the ashes may not fly away, nor any of the embers be mixed with them; pour upon this dust pure boiling water; and stir it with a stick; when the ashes have subsided, decant off the water, and pour in fresh boiling water, stirring all together, as before: when this has settled, decant it off again; and repeat this operation with fresh water every time, till the water have not the least taste of the salt, but is perfectly insipid. When this last water is decanted off, add a fresh quantity; stir the ashes thoroughly up, and, after eight, ten, or twelve seconds, pour off the liquor, as yet thick with the ashes, into a clean vessel: part of the ashes will now remain in the former vessel; on these pour more water, stir them, and, after a short rest, pour off as before into the other vessel. Repeat this, till in the first vessel there remains only a little sandy matter, or a few coarser particles. Let the washed ashes now stand, till the water is perfectly clear above them; then decant this carefully off, and you will find these ashes now become a good earth for this use, and free from redundant salt and oil, and immutable in the fire. These, however, if made into a paste, and rolled into small balls, and burnt again in a potter's oven, and then washed anew, become purer and better still.

Finally, put a small quantity of the ashes of beast or fish bones into a very clean earthen vessel, and calcine them a second time, for a few hours, in a most violent fire; afterwards wash them with water, and grind them to a perfectly fine powder on a pophyry, and keep this preparation, as also each of the others, separate, for the more or less nice uses. This last preparation is properly called clar, or caer, by the German metallurgists.

For the hollow of the Coppels, which is to contain the metal, must be a spherical segment, and not very deep: first, that the surface of the melted mass, be it ever so small, be distinctly visible to the artificer's eye; and, secondly, that the metal, left in that cavity, may melt together in one globule. But the outside of the Coppel must be only a small matter convergent towards the basis, like a truncated cone, that it may stand firmly on its base: and, that this figure may be regularly given to these vessels, it is convenient to have copper or brass moulds for the making them.

Now, to make Coppels from these preparations, take bone ashes of beasts or fishes, either alone, or take two parts of wood ashes to one part of these, and mix them perfectly in a marble mortar, or on a porphyry or levigating stone; then add to the mixture, by several quantities, just so much either of pure water, or of the whites of eggs diluted with water, as will be necessary to make the matter stick together, when strongly pressed between the fingers: and great caution must be used, not to exceed or fall short of this proportion of the fluid. If you use the calcined spar, it must be made up with a solution of vitriol.

Put a sufficient quantity of this matter, thus wetted, into a small mortar, supported on a firm prop, and press down the matter closely with your fingers, that the capacity of the mortar may be quite full: lay the rest aside.

Then

Then put the peſtle, made for a mould to make the Coppels, perpendicularly on the ſurface of the matter in the mortar, and with a mallet drive it down with three or four blows, according to the different diameter of the Coppel that is to be made: thus make the maſs conſiderably compact; but take great care that the peſtle do not rub againſt the ſides of the mortar. When this is done, remove the peſtle, and ſtrew the cavity it has made in the maſs with aſhes of dry bones of the preparation called claer, ground extremely fine, and ſifted through a fine ſieve: after this, wipe the peſtle with a clean cloth, and put it into the cavity again, driving it in with one or two more blows. Then having at hand a ſmaller wooden plank, ſtrewed a quarter of an inch thick with dry aſhes, put upon it the mortar containing the Coppel already prepared; the Coppel will eaſily quit its mould, and, its inequalities at the upper edge and bottom being taken evenly off with a knife, let it be inverted, and laid aſide in a dry place.

The dry fine aſhes are applied to the inſide of the Coppel, that the little inequalities commonly remaining there may be filled, and it may make a ſort of fine ſieve, admitting through it vitrified bodies, but retaining gold and ſilver. The cavity, being regularly covered with this perfectly fine ſubſtance, prevents any harm from the common matter of the Coppels being a little defiled with ſand, or other powder, eaſy to be vitrified; which is a fault indeed hardly poſſible to be avoided, eſpecially when wood aſhes are uſed. Hence it is plain, that this powder muſt needs be prepared with very great caution, and even the levigating it muſt be done on a very hard ſtone, leſt, if on a ſoft one, ſome particles might perhaps be abraded from its ſurface, and ſpoil the powder.

Coppels had better be too compact than too looſe in their texture, ſince the latter is always a miſchievous accident, whereas the former, by abſorbing the glaſs more ſlowly, is of no other hurt than the retarding the operation a little.

Coppels made of bone aſhes, or of calcined ſpar, are more valuable than thoſe of wood aſhes, as they require not ſo much caution and regularity in the management of the fire; but, if wood aſhes enter the compoſition, the Coppel muſt be made pretty hot before the metal is put into it, otherwiſe the aqueous vapours, forcing their way out, will cauſe the metal to be thrown out in drops; for Coppels of this kind can never be perfectly dried by the air alone, there being always ſomething of an alkaline ſalt yet remaining in wood aſhes, which makes them attract the water out of the air, as the dark colour of theſe aſhes, and the ſolution of ſal armoniac poured on them, alſo ſhew; for this reaſon, theſe aſhes are alſo more diſpoſed to vitrification than thoſe of bones, the latter approaching much nearer to the nature of the incombuſtible ſtones.

As to the moiſtening the matter of the Coppels, great care muſt be taken not to uſe a fluid too mucilaginous and fat; for this makes the Coppels ſo compact, that they not only either abſolutely reject vitrified bodies, which they are intended to receive, or yield them but a very ſlow or difficult paſſage; but alſo are apt to ſplit, when made very hot, and diveſted of their oily part.

Neither muſt ſuch mucilaginous fluids by any means be uſed, as may produce a great deal of fixed alkaline ſalt in the heating of the Coppel, as the tartareous dregs of fermented bodies do. Nor muſt the aſhes be moiſtened too much; for, if they are, the ſurface of the veſſel will never be perfectly neat.

Some artificers mix about a tenth part of fine waſhed clay to to their aſhes, for the making their Coppels: when this is done, the matter muſt be moiſtened with water only, the clay making the whole ſtick ſufficiently together. Great care, however, muſt be taken, that too much clay is not added, and the different degree of the fatneſs of the clay be attentively conſidered.

The aſhes of bones uſed alone, and ground to a ſufficient fineneſs, require no clay or mucilaginous fluid to increaſe their coheſion, but do very well with pure water alone: and Coppels of this kind, and ſuch as are made of the calcined ſpars, need hardly be made at all hot before the metal is put into them.

The operation, however, when performed in a Coppel made of bone aſhes, or of calcined ſpar alone, takes up a little more time, but it is more ſecurely performed than in Coppels where wood aſhes make a part of the matter of them: for, as the bone or ſpar veſſels receive the vitrified metal more ſlowly, on account of their compact ſtructure, ſo it is leſs to be feared that any of the perfect metals ſhould be abſorbed alſo, even though the management of the fire be not ſo critically minded. *Cramer, Art of Aſſ.*

COPELLING. Silver may be precipitated out of its ore by Copelling alone, in the following manner: roaſt a centner of the ſilver ore in the common way; when roaſted, powder and ſift it very fine, and, if it melts with difficulty, mix with it one centner of litharge: when it is an ore that melts eaſily, this may be omitted. Divide the powder into five or ſix parts, and wrap every one of them ſeparately in ſmall pieces of paper. Put a large Coppel under a muffle in the furnace; ſift it thoroughly; then put into it ſixteen centners of lead. When the lead begins to ſmoak and boil, put upon it one of the ſmall parcels of powdered ore, in its paper; then diminiſh the fire a little. The paper will be immediately conſumed, and the ore caſt to the ſide of the coppel, in form of ſcoriæ. When this is done, increaſe the fire again, and add a ſecond parcel of the ore; and continue this method till all the ore is put in; after which, ſcorify the lead in a ſtronger fire. The ſilver contained in the ore, with that contained in the lead, will now be found in form of a bead in the coppel; and, ſubtracting the known quantity yielded by the lead, the remainder of the weight gives the quantity of ſilver in that centner of ore.

Silver is not the only ore that can be thus worked; many others may be aſſayed in the ſame manner, by Coppelling alone: thoſe are indeed to be excepted from this proceſs, which ſplit, or which corrode the coppels. *Cramer's Art of Aſſ.*

COPPER (*Dict.*)—*The general method of ſeparating* COPPER *from its ore.*—After a proper aſſay, the ore is treated according to the ſubſtances with which it is mixed. If it abounds with ſilver, it is firſt gently warmed or calcined, till a great part of the ſulphur goes off in fume. At Goſlaw in Germany, they firſt break the ore in pretty large lumps, then burn it in an open fire of wood and charcoal; after which they beat it ſmaller, and warm it twice again: and thus make it fit for the firſt furnace, where it is melted into a ſtony red matter, called Copper-ſtone; which, being again roaſted and melted, becomes black Copper; this they roaſt again, in order ſtill more to free it from its ſulphur, and now it is in a fit ſtate to be nealed for its ſilver; which they extract, by adding four parts of lead to one of the black Copper, then melting them together in a ſtrong fire, and caſting the maſs into moulds, where it hardens into blocks. Theſe are carried to another furnace, and buried in charcoal; giving only a gentle heat, till the lead and ſilver melt and run away together into the receiver, leaving the Copper blocks unmelted behind, which are thus honeycombed and drained of their ſilver; but left capable of being brought to tough and malleable Copper, by repeated fuſion. In the Hungarian mines the learned Dr. Brown tells us, that they ſometimes burn the ore, and ſometimes melt it; and this ſometimes by itſelf, and ſometimes mixed with other minerals and its own droſs.

The purification of Copper chiefly depends upon totally freeing it from its ſulphur, which may be done, for the more curious uſes, by melting it ſeveral times with fixed alkali's, nitre, or borax.

After the heterogenous parts have been thrown off, as before directed, from the proper earth of the ore, the pure metal then remains to be ſeparated from this earth by fuſion.

But there are two difficulties, at leaſt one or other of them, always found in this affair. For (1.) This proper mineral earth, how fluxible ſoever it may prove in gold and ſilver, yet ſcarce comes up to the fuſibility of the pure metal, but is apt rather to flow thick and ſluggiſh, unleſs the fire be very intenſe indeed: but it is plain, that, if this ſubſtance remains viſcous, the moleculæ of the metal cannot ſink through it, in order to form a metalline maſs at the bottom. (2.) Sometimes only a very ſmall quantity of pure metal lies concealed in a vaſt body of ſuch adhering earth, or wrapped up with the matter of other metals; whence one of theſe two inconveniences muſt ariſe, viz. either that the ſmall quantity of metal cannot well, under ſo great a load of recrement, come into a little maſs; or elſe, if it could, it muſt of neceſſity be ſo violently agitated and toſſed about by the ſtrong fire required to keep ſo large a bulk of ſlag in fuſion, as in the ebullition to be again involved, as it were, in little drops or bubbles among the pappy maſs of the ſcoria.

Theſe two inconveniences have their remedies. (1.) The firſt is, to add ſuch ſubſtances as promote vitrification, and, at the ſame time, cauſe a thin flux of the vitrified body. Such ſubſtances are, for the large work, ſand, fluxile mud, alkaline ſalts, tartar, nitre, &c. and, for the ſmall, glaſs of lead, a little borax, or any compound flux-ſalt, the baſis whereof are commonly tartar and nitre. (2.) The ſecond is, to add a metal itſelf. This is a common way, and ſeems greatly improveable, if it can be brought to anſwer the expence. In this caſe, as a greater maſs of metal cannot, by the ſame fire, be ſo much agitated and toſſed about as a leſs, or, if it could be agitated as much, yet all its particles would cohere more firmly on a large maſs than in a ſmaller one; hence, by ſuch an addition of metal, the little maſs that would otherwiſe be with difficulty collected from the ſeveral falling particles of the melted matter, is artificially inlarged, ſo as to cover the whole bottom of the melting-pot; in conſequence whereof, all the ſingle metallic particles that fall afterwards, are eaſily catched and detained below, by the large metalline maſs, which there lies ready to receive them.

Copper, being itſelf of difficult fuſion, requires ſuch a fire as is able to melt its glaſſy ſcoria ſufficiently thin, at the ſame time that it is melted itſelf; and this it does, unleſs the flints ſhould prove very obſtinate indeed. Hence bare fuſion, ſometimes, without any other aſſiſtants, will bring out the metal from its ore, and throw it down into a maſs, the ſcoria here flowing ſo thin, as readily to ſuffer the metalline particles to ſink through it; but, when the ore is more ſtubborn, its ſeparation may be promoted by metalline, or other additions, as above-mentioned.

In short, the difficulty of thus separating the metal from its proper earth is principally found in the ores of silver, gold, and Copper; but lead and tin, being very fusible bodies, are much easier melted from their adhering mineral matter.

CO'RAL (*Dict.*)— It had been long the received opinion, that Coral was soft in the sea, and was hardened by the air upon taking it out of the water; and our learned Mr. Boyle was not willing to quit this opinion. But, as experiments are the only way of assuring ourselves of the truth, Boccone, for this purpose, went to sea in one of the Coral-fishers vessels, and, by plunging his arm into the water, had an opportunity of examining the Coral, as they were fishing it up, before it came into the air. He invariably found it hard, except at its extremities; where, upon pressing it between the nails of the fingers, it furnished a small quantity of a milky fluid, resembling in some degree the juice of spurge or sow-thistle. Boccone observes farther, that he saw several furrows under the bark of the Coral, which terminate at the extremities of the branches, about which one might clearly see several small holes of the form of a star, which he imagines are destined for the production of branches. Venette's account of Coral, in his treatise of Stones, is much the same as Boccone's.

The count de Marsigli, in a letter to the Abbé Bignon, in the year 1706, takes notice, that, in order to give the best account of the production of Coral, he wanted to be assured, whether the milky juice before-mentioned was found therein both in winter and summer, which was a matter of dispute even among the Coral-fishers. For this purpose he went in winter a few days to sea with the Coral-fishers, and made several important discoveries into the nature of Coral. He sent the Abbé Bignon an account of some branches of Coral, which he found covered with flowers, and which was a thing unknown even to the Coral-fishers themselves. These flowers were about a line and a half in length, and of the same distance one from another, and formed a star-like appearance. These bodies, which the count de Marsigli imagined were flowers, M. Peyssonnel afterwards discovered to be the insects inhabiting the Coral. As to the fact, whether the Coral furnished a milky juice in winter as well as in summer, count de Marsigli observed, that he did in December find the milky juice between the bark of Coral and its substance, in the same manner as he did in the month of June preceding.

M. de Peyssonnel was unwilling, that the idea, which the ingenious discovery of the count de Marsigli had given, in relation to the flowers of Coral, should be lost; and therefore, being at Marseilles in the year 1723, he went to sea with the Coral-fishers. Being well apprised of what Marsigli had observed, and the manner of his making these observations, as soon as the net, with which they bring up the Coral, was near the level of the water, he plunged a glass vessel therein, into which he conveyed some branches of Coral. Some hours after, he observed, that there appeared a number of white points upon every side of this bark. These points answered to the holes, which pierced the bark, and formed a circumscribed figure with yellow and white rays, the center of which appeared hollow, but afterwards expanded itself, and exhibited several rays resembling the flower of the olive-tree; and these are the flowers of Coral described by Marsigli.

Having taken this Coral out of the water, the flowers entered into the bark, and disappeared; but, being again put into the water, some hours after they were perceptible again. He thought them not so large as the count de Marsigli mentions, scarce exceeding in diameter a large pin's head. They were soft, and their petals disappeared, when they were touched in the water, forming irregular figures. Having put some of these flowers upon white paper, they lost their transparency, and became red, as they dried.

Our author observed, that these flowers grew from the branches in every direction, from broken ones, as well as from those which were whole; but their number lessened towards the root; and, after many observations, he determines, that what Marsigli took for flowers were truly insects.

Coral is equally red in the sea as out of it; and this redness is more shining, when just taken out of the water, than even when it is polished. The bark of Coral, by being dried, becomes somewhat pale. The extremities of its branches are soft, to the length of five or six lines; they are filled with a whitish juice tending to yellow. The Coral-fishers said, that in the month of May this juice sometimes appeared upon the surface of the bark; but this, notwithstanding great attention, our author could not observe.

The body of Coral, although hard, seems to give way a little, when pressed between the fingers; and, being broken at different distances, when just taken from the water, there always came therefrom a small quantity of milky juice through certain tubes, which appeared to be destined towards the bark.

Having enquired of the fishers in what direction the Coral grew in the sea, they acquainted him, where the depth of the sea permitted them to dive, that they had found it growing sometimes perpendicularly downwards, sometimes horizontally, and sometimes upwards.

Having verified these observations during the eight days he staid with the fishermen, he adds, that he had never found any pores perceptible in the substance of the Coral; that there issued less milk from the large branches than from the smaller ones; and that the first were harder, and less compressible.

The bark of Coral covers the whole plant from the root to the extremities of the smallest branches. It will peel off; but this is only, when just taken out of the water. After it has been exposed for a short time to the air, you cannot detach it from the body of the Coral, without rubbing it to powder. This bark appears pierced with little holes, and these answer to small cavities upon the substance of the Coral. When you take off a piece of this bark, you observe an infinite quantity of little tubes, which connect the bark to the plant, and a great number of little glands adhering to these tubes; but both one and the other do not distinctly appear, except when they are full of juice. It is from these tubes and glands that the milky juice of Coral issues forth. Besides these, you see in variety of places the bark push itself outwards, where the substance of the Coral is hollowed, and formed into the little cells, taken notice of by Boccone and Marsigli. In these you see little yellowish bodies, of the length of half a line, which terminate at the holes in the bark; and it is from these that the flowers appear.

Our author has found branches of Coral, which, having been broken, have fallen upon other branches, have fastened themselves thereto, and have thus continued to grow. He has found, when a piece of stone, shells, or other hard bodies, have offered themselves between the ramifications of Coral, that it has expanded itself over them, and inveloped them in its substance. He has seen pieces of Coral growing upon detached pieces of rock, glass bottles, broken pots, and other substances, from which the plant could receive no nourishment. It has been said by great authority, that Coral grows from the rocks perpendicularly downwards; but our author has seen some growing to a round flint, which must necessarily have vegetated upwards, like most other plants.

M. de Peyssonnel proceeds to examine, whether or no Coral is a plant, according to the general opinion, or a petrification or congelation, according to some; and, after having exhibited the various arguments delivered in support of these, he concludes, that Coral, as well as all other stony sea-plants, and even sponges, are the work of different insects, particular to each species of these marine bodies, which act uniformly according to their nature, and as the supreme Being has ordered and determined. The Coral insect, which is here called a little urtica, purpura, or polype, and which M. Marsigli took for its flower, expands itself in water, and contracts itself in air, or when you touch it in water with your hand, or pour acid liquors to it. This is usual to fishes or insects of the vermicular kind.

When our author was upon the coasts of Barbary in 1725, he had the pleasure of seeing the Coral insect move its claws or legs; and, having placed a vessel of sea-water with Coral therein near the fire, these little insects expanded themselves. He increased the fire, and made the water boil, and by these means kept them in their expanded state out of the Coral, as happens in boiling shell-animals, whether of land or sea. Repeating his observations upon other branches, he clearly saw, that the little holes, perceptible upon the bark of the Coral, were the openings through which these insects went forth. These holes correspond with those little cavities or cells, which are partly in the bark, and partly upon the substance of the Coral; and these cavities are the niches, which the insects inhabit. In the tubes, which he had perceived, are contained the organs of the animal; the glandules are the extremities of his feet, and the whole contains the liquor or milk of Coral, which is the blood and juices of the animal. When he pressed this little elevation with his nails, the intestines and whole body of the insect came out mixed together, and resembled the thick juice furnished by the sebaceous glands of the skin. He saw, when the animal wanted to come forth from its nich, he forced the sphincter at its entrance, and gave it an appearance like a star with white, yellow, or red rays. When the insect comes out of its hole without expanding itself, the feet and body of it form the white appearance, observed by Marsigli; but, being come forth, and expanded, it forms what that gentleman and our author took for the petals of the flowers of Coral, the calyx of this supposed flower being the body of the animal protruded from its cell. The milk before-mentioned is the blood and natural juice of the insect, and is more or less abundant, in proportion to its health and vigour. When these insects are dead, they corrupt, and communicate to the water the smell of putrid fish.

The substance of Coral, by a chemical analysis, scarce furnishes either oil, salt, or phlegm: live Coral with its bark furnishes about a fortieth part of its weight in these; but the bark of Coral alone, in which are contained these animals, affords a sixth part. These principles resemble those drawn from a human scull, hartshorn, and other parts of animals.

After the accounts here laid down, we are able to assign the reasons of all the particular facts we observe in Coral. We see, why a branch thereof, broken off and detached from its stem, may flourish. It is because the Coral insects, which are contained

contained in its cells, not having been injured, continue their operations; and, drawing no nourishment from the stem of the Coral, are able to increase, detached and separate. How they live and are nourished, is proposed to be explained in treating of the urtica of the madrepora, in which these animals are vastly larger, and appear very distinctly.

In each hole or star of the madrepora, on which our author lays the evident proof of his new system, the urtica, placed in the center of each pore,' causes it to increase in every direction, by lifting itself further and further from the center of the stone. And in Coral, and in the lithophyton, the urtica, being niched in their crusts or barks, deposits a juice or liquor, which runs along the furrows perceived upon the proper substance or body of Coral, and, stopping by little and little, becomes fixed and hard, and is changed into stone; and this liquor, being stopped by the bark, causes the Coral to increase proportionably, and in every direction. In forming Coral, and other marine productions of this class, the animals labour like those of the testaceous kind, each according to its species, and their productions vary according to their several forms, magnitudes, and colours.

If, after what has been here laid down, some will still consider these marine productions as plants, they are truly zoophytes, formed by the labour of the animals, which inhabit them, and to which they are the stay and support.

By what is exhibited in this work, the author conceives, that he has explained the nature of these several marine productions, which have hitherto been so enigmatical. It is true indeed, that no reasons can be assigned, why the œconomy of these animals is directed in such or such particular forms, We can no more account for the admirable structure and colour of several species of shell-fish: we must in this, as in most of the other operations of nature, cry out, O altitudo divitiarum! *Phil. Transf.* Vol. XLVII. p. 449.

To these observations on this curious subject, we shall add the following of the learned and ingenious Dr. James Parsons, inserted in the same volume of the Philosophical Transactions.

The several ingenious opinions of some of this learned society, upon what M. Peyssonnel has advanced, concerning the formation of some of the submarine bodies by animals, have occasioned the following conjectures; which I lay before you, not at all presuming absolutely to decide a question of so difficult a nature, but only endeavour at throwing a little more light upon the subject, in general, by such further observations, as I thought would be most conducive, at least, to come to a little more certainty about it.

I believe it may be said, that there can be no ocular demonstration of the fabrication of any of these bodies, whether by animals, or by vegetation; because this happens under the water, far enough from any human observation. Therefore, when at any time such of these, as are said to be the work of animals, have been taken up, there is no doubt but that those soft gelatinous weakly animals may have been seen upon them, and thence have been concluded to be the makers of them. Certainly there is nothing impossible to divine providence, in the order and disposition of every thing to the best advantage. Among the animals, from the largest to the most minute, none are destitute of proper habitations; and we see, amongst them, prodigious variety in the modes and designs of such dwelling-places. Some are capable of erecting for themselves commodious apartments to live in, as shell-fish, even out of their own constituent parts, as they grow. Others lodge their young in the very skins of animals; and, where there are any, who have neither sagacity nor strength enough to provide places for themselves, they are at least taught by their Maker to find them ready made.

Such are the bounds set to our intellectual powers here, that we can have no means of judging of objects which do not fall immediately under our inspection, but by comparing them to something else, as near them as may be; or by considering their proportions and effects; what is probable, what is not, in the phænomena that belong to them; and what absurdities may arise from the uses and actions ascribed to them, for certainly they may be easily seen, by considering the objects themselves.

I would neither conclude, with M. Peyssonnel, that, because I found animals upon such bodies as he mentions, they were the makers of such bodies; nor that, if one or more kinds of those bodies were actually the work of such creatures, all others, that had any relation to them, must also be their work; any more than I would, on the other hand, conclude, that, because one or more of these submarine substances were not made by them, none at all were produced by them. I would rather examine the parts of those bodies in as nice and scrutinous a manner as possible, and compare their characteristics with those of other bodies in both the animal and vegetable kingdoms; and, by finding out some of their properties only, be, in a great measure, able to range them in the rank, which they were designed to hold by divine providence.

In order to this, let us see first what are those animals, which we are acquainted with, who certainly fabricate their dwelling-places, as they grow, for themselves; and what the common or usual advantages are, which they are in general observed to be endowed with; which will be best done by taking a nearer view of them. All the testaceous tribe, whether of land or water, and whatever their forms be, may be said to produce their own habitations, but not to fabricate them. For we must observe, there are but two modes, by which these kinds of animals are furnished with them; the one by secretion from themselves, and these necessarily grow with them: the other by a designed apposition of parts of the animals themselves. Now, in the first case, there is a necessity for a just proportion between the animal itself, and the shelly matter secreted from it. It must be large enough, and have stability and strength in proportion to the matter which it secretes, and is to move about with; and it will appear, that this is the general rule through nature: or, if it be an immoveable body, the creature ought certainly to be allowed so much significancy and strength, as would, on the one hand, seem necessary for the secretion of so much matter as was sufficient to constitute that body, or, on the other, to be capable, by its own proper action, of gathering together the matter, and building up the structure. Where this is wanting, I, for my own part, would be far from hastily concluding such work to be the fabrication of such seemingly weakly insignificant animals; more especially if, upon these very bodies, there were appearances of other characteristics, that, at the same time, were likely to lead me into another arrangement of them.

I have produced here before you such of the shell animals, as are unquestionably the makers of their own houses, that are furnished with these requisites mentioned; and others I shall now offer you, being somewhat nearer those said to form the Coral, &c. than other testaceous kinds.

The dentalia are tubular shells, formed from their inhabitant animal, as much as a cockle, or an oyster: and we must observe, that each of these has a sufficient cavity for its habitation, and in itself has the proportional size and strength necessary for the purpose.

The vermiculi marini enjoy the same privileges, and are always attached to their shells at their posterior extremities, as well as the others, of whatsoever kind. They are found in groups, adhering together by a natural cement, blended, and, as it were, confounded together; and yet every one has its own cell, and is sufficient to produce it in those requisites before-mentioned. All the kinds of these have one extremity small, and increase in diameter to the anterior extremity; which is indeed the case of all the turbinated fish of whatsoever kind. To these we may add, that the crusts of crustaceous animals, and those of insects in their chrysalis state, will always shew, how necessarily an animal must have power and sufficiency to form his habitation, either by secretion, or actual operation.

The syringoides, so called from their forms, carry the same testimonies of their strength and power; many species of which we find fossil, of which I have the honour to shew several specimens: and I have no doubt, but it will be hard to find any creatures so deficient, or, in other words, more abandoned to destruction by the Creator, than these, in any part of nature.

Whatever is constructed by an animal, that is, among those that we know with any certainty, it is surely to dwell in themselves, or to deposit eggs or young in. There was really no need to build a fabric to dwell upon; because all those creatures, such as the polypi of every kind, which attach themselves to bodies, have innumerable sorts of matter, to which they can adhere, every-where, near them: and if these of the sea have, in their nature and properties, any analogy with our fresh-water polypi, as to their propagation, and the detachment of their young from themselves; with the several kinds of the same genus, the polypes à panache, polypes à bouquet, the bell-like polypi, and every other kind, by our ingenious observer Mr. Trembley, all which detach their young from them nearly in the same manner; one would almost be persuaded, that they were never intended to dwell in cavities, but upon nidus's convenient for their attachment only, with full liberty, at proper times, to detach their young in like manner; who immediately meet some one or other of these submarine bodies for their security also; for indeed there is hardly room to suppose any other way of propagation for these, than for those of M. Trembley, since they are much of the same substance and consistency every way. And it must be remarked, that few or no animals that have shells of any kind, can ever quit them, but must remain in them till they die.

We are now, secondly, to consider some of the most obvious marks, that distinguish vegetable from other substances.

Whatever body is fixed by its root, no matter, whether it be flat or fibrose, increasing upwards, and ramifying into smaller and smaller branches, till they become more and more pointed to their extremities; having fibres either apparently tubular, or only porous or woody; would incline one, who had at all made the works of nature his study, rather to favour the idea of a vegetable in such a body, than that of any other production. If these characteristics are common to any of the species of Corals, corallines, madrepores, &c. it would be no wonder they owed their increase to a kind of vegetation; nor would their hardness weigh at all against it, because every one knows, that water is the universal vehicle of all matter into bodies of this kind. It is by water, that the testaceous matter is carried into the juices of shell-fish, and from it detached into the order we see it in the shells. It is from water that sparry incrustations upon vegetables are made: it is a deposit from water which lines our common tea-kettles with a sparry crust; and it is also this fluid that conveys the particles of tartar into the grape, which is afterwards deposited on the sides of the wine-vessel; and, no doubt, it is water which carries up into those hard bodies their stony matter; for there can be no doubt of their being organized bodies. Besides, though the organization, in its origin, is probably flexible enough, yet the arrangement of these petrific particles, in so exact a manner, would inevitably render the whole hard enough, in the course of its growth. Is not the shell of a common egg hard enough? And yet its membrane, into the cellules of which the testaceous particles were secreted and ranged, in order to produce that hardness, was soft enough before. If we were to make transverse sections of the generality of these bodies, we should see a regular radiated order of pores from their central medullary pipes, some foliated, others more tubular, others barely porous, all differing from one another only according to their own natures. What more is there in the order of the fibres of trees or plants? Transverse sections of any of these will shew you the most beautiful figures, in such orders, that can be conceived; which, long ago, that accurate and learned naturalist, Dr. Grew has ingeniously observed, in his Anatomy of Plants, where he has given elegant figures of such sections in a variety of examples. And although some of these bodies have their pipes and pores quite stopped up, as they grow, yet their external appearance will shew them fibrose.

In like manner some trees are so very hard, from the strong connection of their parts, that, in a transverse section, neither pores nor fibres can be distinguished: and they are as susceptible of a fine polish as any stone. And indeed it would seem to me much more difficult to conceive, that so fine an arrangement of parts, such masses as these bodies consist of, and such regular ramifications in some, and such well contrived organs to serve for vegetation in others, should be the operations of little, poor, helpless, jelly-like animals, rather than the work of more sure vegetation, which carries on the growth of the tallest and largest trees with the same natural ease and influence, as the minutest plant, in a manner, which I have elsewhere explained.

Is it not also somewhat particular, that, if Corals are the work of these insects, there should be no cavity left behind them, as they raise it into branches; but that they should leave it solid within? And would it not be very surprizing, that such cellular passages, as we see diversified into many kinds, should be made by these creatures from the basis, to be left behind them, as they carry up the building, without any further purpose, in brain-stones, &c. If this was the case, and that these little creatures could be supposed to build them, these would be a deviation from the general uniformity and purpose, that is observed every-where else: for certainly cells are built by every animal to deposit something, eggs, young, or other matter, in them; neither of which can be said of the insects in question.

It has been said, that flies, wasps, and bees, build themselves cells, in order to make a comparison between them and these polypi. They do so; but is there no distinction to be made? I can find several. Bees, wasps, &c. are in themselves compact strong animals, well made for the work allotted them, very able to bring and put together the materials of their nests; and, when they have done their work, that proportion between the fabric, and the creatures which raised it, is apparent, which all nature points out, and the purpose is fulfilled soon, in their filling them with what nature had destined they should hold. But can this be said of our polypi? Where is that proportion between a little configurated-jelly, and the mass of matter said to be their work? What is deposited in the cells they form? What makes others solid? And how do these jellies so wonderfully dispose the fine arrangement of pores, fibres, nodes, branches, &c. And to what purpose, if they could be capable of it? In a word, I humbly propose to sum up this essay in two general sentiments; and these will be the rule, by which I, for my own part, shall always judge of things of this nature; viz.

1. Whatever bodies shall be found to carry the appearances and characteristic marks of vegetables, even though animals are found upon them, they certainly will pass with me for such, till stronger evidence shall evince the contrary.

And 2. I shall ever expect to see, at least, a seeming power, proportion, and stability, in animals to render them capable of performing what they may be thought to have done.

Red Coral. The effect of vegetable distilled oils on Coral, by the help of a long digestion, is such as could not have been imagined, till the experiments of Dr. Langelot shewed that they were a sort of solvent for that refractory substance. This gentleman had put fragments of red Coral into some distilled vegetable oil, and let them stand many months, in hopes of drawing a tincture from them; but without success. At length having a digesting furnace at work, he placed the glass in which the Coral and oil were, in the furnace among the other things; the consequence was, that, after about a month's digestion, the pieces of Coral were found to be swelled, and higher coloured than before, and, with a few days longer continuance with the same heat, the whole quantity of Coral had lost its original figure, and was blended together into a red mucilage, the oil still swimming above it in its pristine form, and not at all altered in colour: the most violent agitation of the vessel could not cause these two substances to mix together, and all the artifice that could be used, proved vain toward the tinging the oil with a red colour. After long trial in the same, and an advanced heat, the oil was poured off as clear as before, and very little altered in smell, or other qualities; and, tartarised spirit of wine being poured on the remainder, with a very short digestion took a very high red tincture. This process is a great proof of the power of digestion.

The common red Coral yields, by distillation in a retort, a volatile vitreous spirit, in no inconsiderable quantity; this turns syrup of violets green, and makes an effervescence with acids, and renders a solution of corrosive sublimate white and milky. And the fixed salt drawn from the residuum produces a white coagulum in the same solution; from which it is evident that it is not a mere alkali, but a sal salsum, in some degree. Red Coral calcined, even in a very gentle fire, becomes white; the same change also happens to it, when infused a long time in some oily substances, as the oils of anise, fennel, or in white wax kept in fusion. The menstrua in this case acquire a red colour, in proportion as the Coral loses it. It appears from these and several other experiments, that Coral is not, as some suppose, a mere terrestrial absorbent, but that it contains a volatile urinous salt, and a bituminous oil, combined with its earthy matter; and on these its virtues in medicine principally depend. The red colour of Coral is evidently owing to its bituminous oil, which it is found not difficult to separate, and wholly divest it of. It is observed, that Coral, newly taken up out of the sea, contains both the salt and oil in greater abundance than that which has been long kept; and it is suspected by many, that its external cortical substance contains more of it than the interior, harder, and more stony matter.

The antients used Coral in many external medicines for distemperatures of the eyes; and internally as an astringent and refrigerating medicine. We use it only internally, and that principally in diarrhœas, and bleedings in too great evacuations of the menses, in the fluor albus. The vulgar attribute to it, besides these virtues, many others, which we have not sufficient warrant for; such as its strengthening the heart, curing malignant fevers, and resisting poison; and they tell us, that it will do all this as well, if worn externally, as if taken inwardly; which may very possibly be true. *Geoffrey, Mat. Med.*

White Coral. There is no part of the world where white Coral is produced in such abundance, as on the shores of the island of Ceylon, and others of the neighbouring Indian coasts. The lime used in that part of the world, for building houses, fortifications, &c. is all made by burning this Coral. It lies in vast banks which are uncovered at low water, and it is spongy and porous. While young, it grows erect, in form of little shrubs, and is then firm and solid, and smooth on the surface, but the branches continually shoot out more, and these other new ones, till the whole is one confused bush. These branches are all covered with a white viscous matter, which, in time, hardens upon them, and becomes Coral; and, this filling up all the interstices between the branches, when they become so numerous, and hardening between and over them, the whole becomes one coarse rock, and the adjoining masses of this kind, uniting to one another, form at last a continued bank, which has the appearance of a great white rock. In the places where the Coral grows in this manner, there are like banks formed of oyster-shells; the oysters here grow often to a foot in diameter, and a foot in thickness; and it is said, that they continue to increase in bulk, after the animal is dead. *Phil. Transf.* Numb. 282.

CO'RALLO-*Achates*, in the natural history of the antients, the name of a very beautiful species of agate, found at this time in the East Indies, but not in any plenty, and called, by Dr. Hill, achates miniaceus flavo variegatus, or the red lead-coloured agate, variegated with yellow. Its basis, or ground colour, is a pale, but very bright red, in which there are discovered, on a close inspection, in most of the pieces, multitudes of veins of a dark red, drawn in very fine and close concentric circles, round one or more points, the whole giving a mixt red, not unlike that of our red lead, or that of the common red Coral in its rough state, when first drawn out of the sea. It is always variegated also with a number of small and beautiful blotches of a fair yellow, which are ranged with great irregularity in the mass, but never interfect, or are interfected, by the veins; they are all small, and either round or oblong. It is very hard, and capable of a fine polish, and, when wrought, is an extremely elegant stone. *Hill's Hist. of Foss.*

CORALLODE'NDRON, *coral-wood*, in botany, the name of a genus of trees, the characters of which are these; the flower is of the papilionaceous kind, but of a very singular make; its vexillum is remarkably long, and of the shape of a sword; its alæ and carina short; from the cup of the flower there is a cylindric pistil, surrounded by a fimbriated membrane, which finally becomes a sort of knotty pod, composed of two valves, and containing a number of kidney-shaped seeds.

CORALLOI'DES, in botany, a term used by M. Tournefort to express a genus of mushrooms; the distinguishing characters of which are, that they are of a fleshy fungose texture, and are branched in the manner of coral.

CO'RDIA, the sebesten, in botany, a genus of plants, whose characters are:

The flower is of one leaf, which is funnel-shaped, and is expanded at the brim, where it is slightly cut into five or six parts: the pointal, which is situated in the middle of the empalement, afterwards becomes a globular fruit, pointed at one end; which is divided into two cells, in each of which is included one oblong seed.

These plants, being natives of warm countries, are too tender to live through the winter in this country, unless they are preserved in a stove. They are propagated by seeds, which must be procured from the countries of their natural growth; for they never produce any in England. These seeds must be sown in small pots, which must be plunged into a good hot bed of tanners bark in the spring; and, if the seeds are fresh and good, the plants will begin to appear in five or six weeks after. These must be brought forward in the hot bed, by being treated as other tender exotic plants; observing frequently to water them, as they are aquatic plants; and in July, if the plants have made much advance, they should be gradually hardened; otherwise they will grow so weak, as not to be easily preserved through the winter. As these plants obtain strength, they will become more hardy; but, during the two first winters, it will be proper to plunge them into the tan-bed in the stove; but, when they begin to have woody stems, they may be placed on shelves in a dry stove, where if they are kept in a moderate degree of heat, they may be preserved very well. They may also be placed abroad in a warm situation, in the beginning of July; where the plants may remain till the middle of September, provided the season continues warm; otherwise they must be removed into the stove sooner. *Miller's Gard. Dict.*

CO'RDIAL or *compound waters*, in chemistry.—*The best method of making* CORDIAL *or compound waters.*

Infuse a pound of fresh citron-peel in two gallons of good melasses spirits, commit the whole to the still, draw off the spirit gently, with care to avoid the faints: then make up, as they call it, with soft water, so as to leave the liquor proof, and add half a pound of fine sugar; and thus you will procure a genuine citron water.

This experiment is general, and shews the usual methods of making all the compound or cordial waters, by those distillers who are called compounders, and also by the apothecaries; though apothecaries seldom make distilled waters so good as the compounders.

The perfection of this branch of Distillation depends upon the observance of a few rules, which might be easily complied with: and these rules we shall here lay down, as judging them of consequence to the improvement not only of the art of the compounder, but also of a branch of pharmacy and medicine.

The first rule is, to use a well-cleansed spirit, that is freed from its own essential oil. For, as the design of compound distillation is to impregnate the spirit employed with the essential oil of the ingredients, it ought first to have deposited its own.

The second rule is, to suit the time of previous digestion to the tenacity of the ingredients, or the ponderosity of their oil. Thus rhodium-wood and cinnamon require to be longer digested before they are distilled, than calamus aromaticus, or lemon-peel. Sometimes also cohobation (that is, the pouring of the spirit, once drawn off, upon the same ingredients) proves necessary; as particularly in making strong cinnamon water; where the essential oil is extremely ponderous, and difficultly rises along with the spirit, without one cohobation more.

The third rule, is, to suit the fire or strength of the distillation to the ponderosity of the oil intended to be raised with the spirit. Thus strong cinnamon water should be distilled off brisker than the spirit of mint or baulm.

The fourth rule is, that a due proportion of only the finer essential oil of the ingredients be thoroughly united or incorporated with the spirit, so as to keep the grosser and less fragrant oil. And this may be chiefly effected by leaving out the faints, and making up to strong proof with fine soft water in their stead. And upon the observance of these four easy rules the perfection of the art of compound distillation seems to depend.

The addition of fine sugar to Cordial waters is a thing of less moment, and may be used or omitted occasionally. And, if these directions be observed, there will be no need of fining down Cordial-waters with allum, white of eggs, ising-glass, or the like; for they will be presently bright, sweet, and pleasant-tasted, without any further trouble.

CORIA'RIA, myrtle-leaved sumach in botany, a genus of plants whose characters are:

It is male and female in different plants; the male flower has five leaves, which are joined to the empalement; these have ten slender stamina: the female flowers have the like empalement, and the same number of petals; and in the center are placed five pointals, which turn to a berry, inclosing five kidney-shaped seeds.

The sort with male flowers is most common in England, the other being very rarely seen in any of the gardens. These grow wild in great plenty about Montpelier in France, where it is used for tanning of leather; and, from this use, has been titled by the botanists, rhus coriariorum; i. e. tanners sumach.

These shrubs seldom grow more than three or four feet high, and, as they creep at the root, they send forth many stems, whereby they form a thicket; so may be planted to fill up vacancies in wilderness quarters; but they are improper for small gardens, where they will take up too much room: and, as there is no great beauty in the flowers, they are only admitted for variety.

It may be propagated plentifully from the suckers, which are produced from the creeping roots in great abundance: these should be taken off in March, and planted into a nursery, to form good roots; where they may continue one or two years, and then must be removed to the places where they are to remain.

This plant delights in a loamy soil, which is not too stiff; and should be placed where it may have shelter from the north and east winds; where it will endure the cold of our ordinary winters very well, and will flower better than if it is preserved in pots, and sheltered in the winter, as hath been by some practised.

CORI'NDUM, *heart-peas*, in botany, a genus of plants whose characters are these:

It hath a trailing stalk, emitting claspers, whereby it fastens itself to whatever plant it stands near: the calyx (or flower cup) consists of three leaves: the flowers consist of eight leaves, and are of an anomalous figure: the ovary becomes a fruit which is like a bladder, and divided into three cells; in which are contained round seeds, in form of peas, of a black colour; having the figure of an heart of a white colour upon each.

These plants are very common in Jamaica, Barbadoes, and most of the other warm islands in the West-Indies; where their seeds are scattered, and become weeds all over the country.

They may be cultivated in England, by sowing their seeds on an hot bed in March; and, when the plants come up, they must be transplanted into a fresh hot bed, where they may remain until the middle of May; at which time they may be transplanted into pots or borders, and exposed to the open air. These plants will require sticks to support them, otherwise their branches will trail upon the ground, and be apt to rot, especially in a wet season. There is no great beauty in this plant; it is chiefly preserved as a rarity in the gardens of the curious. It produces its flowers in June, and the seeds are perfected in August.

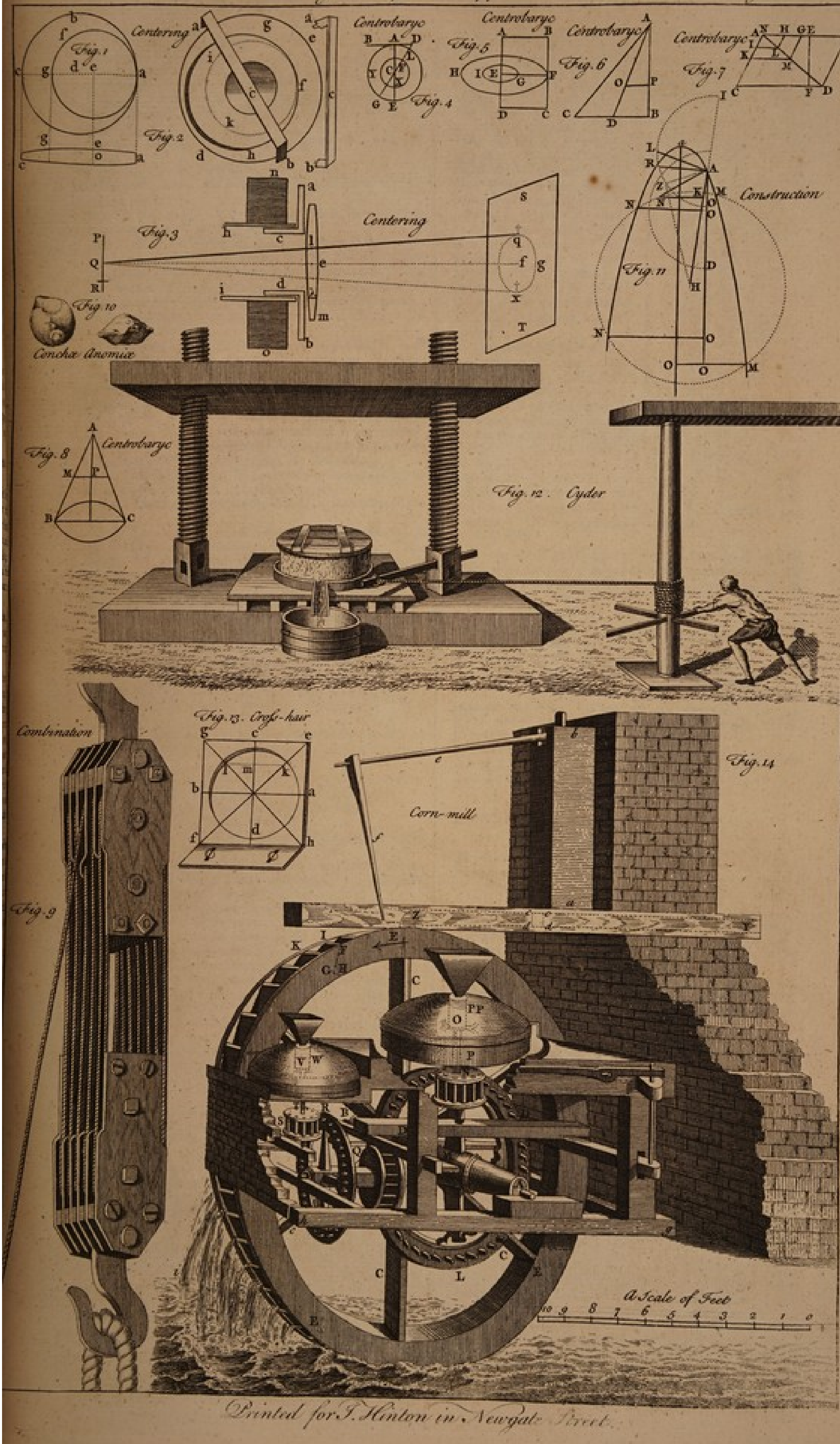
CO'RN-MILL—AB (*Plate* XIV. *fig.* 14.) is an under shot wheel, upon whose shaft D is fixed a spur or cog-wheel (here called a face-wheel) E, whose cogs take the rounds of the trundle or lantern G, which carries round the mill-stone in the hurst, or round from I, containing the nether mill-stone at V V, and the upper at N N; the axis fixed to the upper mill-stone being the iron bar F.

They commonly make these sort of wheels from 12 to 18 feet in diameter, the float boards about 2½, or three feet broad in their length, with an height of 10 or 12 inches. The shaft is 15 or 18 inches diameter.

The cog-wheel is generally eight feet diameter, measuring from the middle of the sole (that is, where the cogs are put in to take the rounds of the trundle) on one side, to the same on the other. The sole or rim of this wheel must be made of two pieces eight inches thick, crossed one over the other, so as to have a breadth of eight inches. This wheel has 48 cogs four inches high, and 3⅓ inches wide, 2 inches thick at the end, and 2⅓ inches at bottom, because of the heel. Their root is twelve inches long, and 2½ thick, square at top, and reduced to an inch and ½ at bottom.

The lantern or trundle is made of two round pieces or flat heads of 22 inches diameter, and four inches thick, in which are set nine rounds of two inches and an half diameter, and 18 inches high; the center of these rounds is placed upon the circumference of a circle of nine inches radius, which must be taken for the diameter of the trundle. The rounds must be made of hard wood, as wild pear-tree, or crab-tree. Through the trundle goes an iron axis 2½ inches square, and of an height proportionable to the situation of the mill-stones, in respect to the position of the cog-wheel; it must be well fastened to the upper mill-stone, and its bottom must be reduced to a pivot of about half an inch diameter, which turns in a socket let into the thickness of the horizontal supporting piece H. The same dimensions are given to the parts of a wind-mill.

Here follow the names and the measures of all the parts of such a mill, necessary when we would calculate its effect, which may be easily done by those who understand algebra.



Printed for T. Hinton in Newgate Street.

a = 8 feet, radius of the water-wheel.
b = 4 feet, radius of the cog-wheel.
c = 9 inches, radius of the trundle.
d = 2 feet, mean radius of the mill-ſtone.
f = $\frac{3}{4}$ of an inch, radius of the gudgeons of the wheel.
h = $\frac{1}{2}$ of an inch, mean radius of the end of the pivot of the mill-ſtone, or of the trundle.
p = 200 pounds, the force of the power that turns the wheel.
q = 1305 pounds, the friction of the centers.
r = 4348 pounds, the weight of the mill-ſtone, and the trundle and its axis.
x = the weight equivalent to the reſiſtance that the mill-ſtone meets with in grinding the corn.

Such a mill as this having its upper mill-ſtone of 6 feet diameter, and of about 4348 pounds weight, and which goes round about 53 times in an hour, may grind in 24 hours about 120 ſeptiers of corn, each weighing 75 pounds, when the ſtone is newly chipped or pecked, and is of a good quality; the hard and ſpongy ones being the beſt, &c. *Belidor's Hydraul.*

The following is a curious over-ſhot mill for grinding corn, at the Bar Pool, by the abbey in Nuneaton, in Warwickſhire.

In the perſpective drawing all care has been taken, to ſee as much as is neceſſary to ſhew the whole ſtructure of all the uſeful or moving parts of the mill; for which it is laid open or cut in ſuch ſections, as I judged beſt ſuited the purpoſe. The ſcale fits the orthography or fore right ſide of the frame or building; the other parts perpetually diminiſhing.

A B, (*Plate* XV. *fig.* 14.) The axle-tree or ſhaft of the water-wheel 13 feet long, and 17 inches diameter.

C C C. Having ſix arms fixed in it at D, 9 inches broad and 3 thick.

E E E. The ſole of the wheel is fixed, being 18 inches broad, and the ſhrouds 14 inches deep; having 30 buckets. Their breadth F I 17½ inches. F G, depth 19. G H, the elbow to the ſide 4 inches.

I K. Their diſtance from one to another 17 inches and an half. The whole height or diameter of the wheel 16 feet.

L L. A cog-wheel placed on the ſame ſhaft by 4 arms at M, 7 feet diameter, having 48 cogs or teeth, which turns,

N. A wallower, pinion, or trundle 19 inches diameter, of 9 rounds or leaves, in which is fixed an iron ſpindle

N O. Going through the middle of the lower mill-ſtone P, moving in a collar, to which is fixed the rind O laid into the upper ſtone P P, which it bears up and turns about. That upper ſtone

P P. Whoſe diam. is 5. 8. } And between the edge and the
Thickneſs at the edge 0. 5. } middle the convexity is about
Middle 1. 4. } 1 inch ½.

Q. A wallower 2. 4 diam. of 15 rounds, which is at pleaſure applied to the cog-wheel L L. On the ſame axis is

R. A cog wheel 5. 4 diam. of 40 cogs, turning

S. A wallower of 9 rounds, whoſe axis

T. Has a rind V at its top bearing and turning the upper mill-ſtone,

W. Which ſtones are uſed for grinding wheat for fine flower. They are 4 feet diam. 5½ thick at the edge, 15 in the middle, with the convexity between 1½.

X. The ſurface of the water in the pool lying 7½ feet above the level or the top of the wheel.

Y Z. A trough or lander conveying the water from the pool at Y, and delivering it into the buckets of the wheel at Z. This trough is 12 inches ſquare within, having

a b. A penſtock upon it, whoſe cavity is the ſame, and

c d. An orifice 10½ broad and 12 high, with a ſhuttle or ſluice to open and ſhut it, which lets the water upon the wheel, and is (generally) raiſed about two inches, by means of

e. A lever or balance fixed to its ſhank, by the handle *f.*

This mill will grind 30 buſhels in 12 hours.

The velocity of the { wheel 8 / large ſtone 40 } per minute.

But as its force, power, action, &c. that are moſt wanting to be known, have, as yet, been but little conſidered: I ſhall here ſubjoin the calculus in ſuch a plain manner, as may be underſtood by any who are a little verſed in numbers; though to have done the ſame in an algebraic, or (ſome parts) in a fluxionary proceſs, would have been more elegant, but not ſo generally underſtood and examined.

For the velocity of the water and the wheel.

The water falls 7, 5 feet = 90 inches, which ſpace a heavy body falls in 41‴, and a double column of water iſſues forth, viz. 15 feet. Then in one minute there will be expended at the orifice 1350 feet = 16200 inches; and, the opening of that ſluice being 10. 5 × 2 = 21 inches area, there will be 1206 ale gallons fall on the wheel in a minute = 19 hogſheads 9 gallons, or 1148 hogſheads per hour.

2. The diameter of the wheel being 16 feet, the circumference is . 50,3 feet;
Which multiplied by the revolution it makes in a minute — — — — — — — } = 8
The wheel goes in a minute, or its velocity 402,4 feet.

Then as 402 : 1350 :: 1 : 3,35; ſo the velocity of the water to the velocity of the wheel is as 3,35 is to 1.

3. The adjutage, as above, gives 1206 gallons, which, divided by 8, gives 150,7 ale gallons, which ÷ by 30, the number of buckets, gives 5,02 gallons to each bucket, that is, nearly 50lb. wt. of water in each bucket.

4. But, as only one bucket, viz. that horizontal with the axis, can act by a force of 50lb. on the longer end of the lever, the radius of the wheel E E (the ſhorter end being the radius of the cog-wheel L L) their forces in proportion to their centers of gravity will be different; which calculated, and from thence their ſtatical weights (as I call them) their forces will be (in a leſs number than half the buckets) as in the margin. The ſum of the weights in the laſt column will be 3 hundred and 66 pounds.

Buck	lb.	hun. lb.	Stat. Wt. lb.
1	50	1.0	6.8
2	50	2.6	17.6
3	40	4.3	29.2
4	50	5.6	38.
5	50	6.3	42.8
6	50	6.8	46.2
7	50	7.3	50.
8	50	7.2	49.5
9	42	6.8	38.
10	40	6.3	33
11	36	4.4	27
12	31	4.0	17
13	22	2.5	7

402,1 = 3 hund. 66lb.

5. But as a cubic inch of water weighs 58 ounces, and there are always falling 3780 cubic inches, the force impreſſed, were it on the tangent of the wheel, will amount to 137 lb. but the diſtance of the penſtock from the pool 6 feet. The force is in it and by the ſhuttle, as alſo its ſtriking obliquely on the paddles or buckets nearly to an angle of 45 degrees; from which conſiderations (and experiments I have made) its velocity, and conſequently force, is leſſened about one half: therefore I add only 60lb. to the ſum of ſtatical weights, and it makes 4 hund. 0q. 14lb. = 462 pounds.

6. Rad. wheel 8
Rad. cog-wheel 35)3696(1056 force at the cogs or trundle of the ſtone equal to 9 hund. 48lb. for the reſiſtance of the ſtones, the grinding, and the great friction of the ſtones and corn.
Or 1056
× by rad. wall ,75
Rad. of the ſtone 2.8) 729(282,8lb. force at the periphery of the ſtone = 2 hund. 2q. 2lb.

7. The force on the wallower rounds (Q) 1056
The rad. of that wallower × 1.2
The rad. of the next cog-wheel 2.4)1261,2(526lb. force on the trundle (S) that carries the wheat mill, and 526 × rad. wall. 7 is = 3682 ÷ 24 rad. of the ſtone gives 153lb. force at the periphery thereof.

8. The great ſtone makes 5, 33 revolutions for the wheels 1, and 42, 4 times per minute.
Rounds, cogs (3.2
15 48(× 8 times the wheel.
25,6
9)40(4,4 × 4,4
112,6 per min.

The velocity of the periphery of the great ſtone.
Its circumference 3136
× 42.4
754,72 feet in a minute.

Alſo the velocity of the ſmaller is 1407,5 feet per minute.

9. The weight of the mill-ſtones.
The great one contains 22,5 cubic feet = 1912 lb. = 17 hund. 0 q. 4 lb.

This water-mill is by moſt people accounted as good a one, as any the country affords, for diſpatching as much buſineſs in the time, and doing it well, though perhaps among the curious there may be ſome objections againſt its train (as the movement-makers call it) for they generally ſay that the pinion ſhould divide the wheel exactly, or be ſome aliquot part of it, which here it is not; for 9)4.8(5.33. but, had it been
4.5
40
9)54(6, it then had been ſuch. 27
0

However, this goes well, it is a very agreeable height 16 feet, the fall conſiderable 7½ feet; for, the wheel being made 20 feet higher in the place it ſtands, it could not have been capable of doing ſo much buſineſs: of ſo much more ſervice is the impulſe, ſtroke, or momentum of the water, than is its bare ſtatical weight.

N. B. Our buſhel here generally holds $\frac{1}{12}$ parts more than the Wincheſter. *Beighton.*

M. Belidor, by the particular account he ſeems to give of under-ſhot mills, and their ſeveral parts; and the calculations concerning the operations of the parts ſingly, and the whole together; ſhewed that he had well examined thoſe mills: but he knew very little of over-ſhot mills, which he ſpeaks very ſlightly of, ſaying, that the millers value them very little; but it muſt be ſuch millers as live in a flat country, and are only uſed to mills upon rivers and large brooks; for, in hilly countries, the over-ſhot mills are of vaſt ſervice, and uſe of little water, as often to do good work by the water of ponds ſupplied

ſupplied by ſprings. As in this Nuneaton mill, with the expence of only 1148 hogſheads, or 287 tons per hour, thirty buſhels or 1800 pounds of corn are ground in twelve hours. The under-ſhot mill deſcribed by M. Belidor does indeed grind about twice and an half more corn, viz. 4500 pounds, in twelve hours; but it is with the expence of twenty-four times more water. For, if the ladle-boards of this under-ſhot mill be three feet long, and go twelve inches in water, and the adjutage, or paſſage of the water againſt them, be in the ſame proportion with an height of water ſeven feet and an half above the center of the adjutage, as in the over-ſhot mill; the expence of water will be 6820 tons per hour in the under-ſhot mill: whereas the expence of water in the over-ſhot, through an adjutage ten inches and an half wide, and two inches deep, is only 287 tons per hour.

I have had occaſion to examine many under-ſhot and over-ſhot mills, and generally found, that a well made over-ſhot mill ground as much corn in the ſame time as an under-ſhot mill, with ten times leſs water: ſuppoſing the fall of water at the over-ſhot to be twenty feet, and at the under-ſhot to be about ſix or ſeven feet. I generally obſerved, that the wheel of the over-ſhot mill was of fifteen or ſixteen feet diameter, with an head of water of four or five feet, to drive the water into the buckets with ſome momentum.

It is a difficult thing, and requires ſome experiments to determine, whether there ſhould be any impulſe given in an over-ſhot mill; or rather a wheel made of ſuch a large diameter as to receive the water without any percuſſion, by which means it may go with leſs water; and thoſe who are for this method alledge, that, beſides the obliquity of the impulſe when a fall is made uſe of, there is only the firſt beginning of the jet that can do any thing, the ſpouting water daſhing in the water that is already in the bucket, and making a froth. For my part, I can determine nothing certain in this for want of ſufficient experiments; but I think, that there might be ſome fall allowed, that the momentum might be uſeful at firſt, while the water ſtrikes againſt the wood of the bucket, before the bucket is ſo full that the water daſhes againſt water. The determining this, to know what part of the height of the fall muſt be taken for the diameter of an over-ſhot wheel, would be a uſeful maximum. Too great an impulſe might make the wheel go ſo faſt, that it might, as it were, withdraw itſelf from the action of the ſtatical weight.

The velocity that M. Parent determines, in his maximum, for the under-ſhot wheel, may perhaps be the beſt here; though it has not been demonſtrated to be ſo. But here it is ſo, the velocity of the wheel is the third of that of the water; and the goodneſs of this mill ſhews it to be right.

The objection which Mr. Brighton thinks may be made, as to the train, is of no force here; for though, in clock work, the number of the pinion ſhould equally divide the wheel, leſt a leaf of the pinion ſhould fall foul upon the edge of a tooth; it is an excellency in mill work, not to have the number of the trundle to be an aliquot part of the number of the ſpur wheel, becauſe, that way, the rounds are worn out too faſt, when the ſame cogs too often take the ſame rounds: and very likely this was done on purpoſe.

CORNUS, *the cornelian cherry*, in botany, a genus of plants, whoſe characters are:

The calyx, or flower cup, conſiſts of four ſmall rigid leaves, which are expanded in form of a croſs: from the center of which are produced many ſmall flowers, each conſiſting of four leaves, which are diſpoſed almoſt in form of an umbrella: theſe flowers are ſucceeded by fruit, which are oblong, or of a cylindrical form, ſomewhat like an olive, containing an hard ſtone, which is divided into two cells, each containing a ſingle ſeed. See *Plate* XVI. *fig.* 1. where *a* is the flower, *b* the flower ſeparate, *c* the fruit.

All the ſorts of Cornus may be propagated by their ſeeds, which, if ſown in the autumn ſoon after they are ripe, will moſt of them come up the following ſpring; but, if the ſeeds are not ſown in autumn, they will lie a year in the ground before the plants will appear; and, when the year proves dry, they will ſometimes remain two years in the ground; therefore, the place ſhould not be diſturbed, where theſe ſeeds are ſown, under two years, if the plants ſhould not come up ſooner: when the plants are come up, they ſhould be duly watered in dry weather, and kept clean from weeds; and, the autumn following, they may be removed, and planted in beds in the nurſery, where they may remain two years; by which time they will be fit to tranſplant, where they are to remain for good.

They are alſo propagated by ſuckers, and laying down of the branches; moſt of the ſorts produce plenty of ſuckers, eſpecially when they are planted on a moiſt light ſoil, which may be taken off from the old plants in autumn, and planted into a nurſery for a year or two, and then may be tranſplanted into the places where they are to remain; but thoſe plants which are propagated by ſuckers, rarely have ſo good roots as thoſe which are propagated by layers, and, being much more inclinable to ſhoot out ſuckers, whereby they will fill the ground round them with their ſpawn, they are not near ſo valuable as thoſe plants which are raiſed from layers.

COROLLA, among botaniſts, is the moſt conſpicuous part of a flower. It expreſſes the coloured tender part which ſurrounds the organs of generation. The parts it is compoſed of are called petals; if it conſiſt only of one piece, it is called monopetalous; if of more, it is ſaid to be dipetalous, tripetalous, and ſo on, as it conſiſts of two, three, four, or more parts.

COROLLARY, or CONSECTARY, in mathematics, is uſed for a conſequence drawn from one propoſition already advanced or demonſtrated: as if from this theorem, That a triangle, which has two equal ſides, has alſo two equal angles, this conſequence ſhould be drawn, that a triangle, which hath the three ſides equal, has alſo its three angles equal. *Ozanam, Dict. Math.*

CORONA, in anatomy, is that edge of the glans of the penis where the preputium begins.

CORONA, among botaniſts, expreſſes any thing growing on the head of the ſeed. The Coronæ of ſeeds are of various kinds; ſometimes ſimple, conſiſting only of a dentated membrane; ſometimes pappoſe, conſiſting of downy matter, which in ſome caſes is immediately fixed to the ſeeds; in others, its has a pedicle growing from it. Sometimes the Coronæ are compoſed of ſimple filaments, and ſometimes they are ramoſe.

CORONA *imperialis*, crown imperial, in botany, the name of a genus of plants, the characters of which are theſe: the flowers are collected into a ſort of crown near the top of the ſtalk, and have over them a large tuft of leaves. The flowers are of the liliaceous kind, being each compoſed of ſix petals. This piſtil ſtands in the center of the flower, and finally becomes an oblong fruit, edged with a ſort of membranaceous wings. This is divided into three cells, which contain a large number of ſeeds, of a flatted ſhape, lying cloſely upon one another. To this it is to be added, that the root is tunicated, and has a number of fibres iſſuing from its baſe.

There are ſeveral diſtinct ſpecies of this plant preſerved in the gardens of the curious, all which make a very elegant appearance; there are alſo a great number of varieties which are propagated from the ſeeds of one or other of the ſpecies, in the ſame manner with thoſe of the tulip.

When they are thus raiſed, the beſt time for tranſplanting them is in July or Auguſt, before they puſh forth new fibres; or they may be taken up out of the ground in June, after their green leaves are decayed, and kept till Auguſt, and then planted out into beds of rich earth, with ſome rotten dung buried deep in them. The moſt pleaſing method of planting them is at eight or ten feet diſtance, in the middle of long flower beds; a hole of ſix inches deep ſhould be opened with a ſpade, and the root put into it, and the earth put in with the hand upon it, and all the ſtones picked out, and the lumps broke. They now require no farther care, but in February will ſhoot up, and grow ſo quick, if the weather be mild, as to flower in March. As this is uſually a windy ſeaſon, it is proper to plant ſtakes in the earth, to tie theſe plants to, to prevent their being blown down; and it is a good caution never to gather the flowers, which much weakens the roots; they ſhould, therefore, always be ſuffered to die upon the ſtalks. The roots ſhould be removed once in three years, and their off-ſets ſeparated, and planted in beds. *Miller's Gard. Dict.*

CORONA *imperialis*, in conchyliology, a name given by authors to a kind of voluta, differing from the other ſhells of that family, by having its head ornamented with a number of points, forming a ſort of crown.

CORONILLA, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind, and the piſtil which ariſes from the cup, finally becomes a pod compoſed of many parts joined together by a ſort of articulation, each containing an oblong ſeed.

There have been pieces of amber found, with the pennated leaves of Coronilla included in them, and as elegantly expanded as the moſt curious botaniſt could have expected it, for preſerving them in his Hortus ſiccus. Breynius gives us an account of one of theſe pieces of amber, in which the middle part of one of theſe leaves was thus elegantly preſerved; he examined the ſpecimen with the greateſt accuracy, but could not find the leaſt fraud or deceit in it, and is very particular in the deſcription of the piece, and in the diſpoſition of the leaf in it.

CORPUS *Chriſti-day*, a feaſt held always on the next Thurſday after Trinity Sunday. It was inſtituted in the year 1264, in honour of the bleſſed ſacrament, to which alſo a college in Oxford is dedicated. We find it mentioned in 32 Hen. VIII, c. 21. By which ſtatute Trinity term is appointed for ever to begin the morrow after this feaſt.

CORTEX, the rind or bark of trees. The wounds of the bark, and its ſeparation from this wood, whether natural, or experimentally made, are eaſily cured, and made to unite again, by proper care. If ſections be made in the rinds of the aſh and ſycamore, of a ſquare figure, three ſides cut, and the fourth uncut, and the whole be afterwards bound round with a packthread, it will all unite again, only leaving a ſcar in each of the ſides where it was cut. If ſeveral parts of the bark of either of theſe trees be cut off, and intirely ſeparated from the tree, ſome ſhallower, leaving a part of the bark on, and others deeper, to the wood itſelf; theſe pieces being again put

put into their places, and bound on with packthread, will not indeed unite, but a fresh bark will grow in their places, and thrust them away; but, if they be first carefully laid on in the exact direction, in which they originally grew, and then the whole part beyond the wound on every side covered with a large plaister of diachylon, or the like, and this bound over with packthread to keep all firmly in their places, the pieces of bark, whether cut off shallower, or deep down to the very wood of the tree, will firmly unite themselves to the places where they originally grew. This cure will be performed in the space of about three weeks; but the outer rind of the separated pieces will not be plump, but somewhat shrivelled; the edges also will recede somewhat from their original place, so that there remains a sort of scar all round. These experiments are best made in the spring season, for, in the autumn and winter, the sap arising but weakly, the parts that should unite wither before that is brought about. The success of these experiments has made some think, that the whole branch of a tree, separated and bound on again, might grow on again; but the experiments that have been made in the most favourable manner for such a trial, have all proved vain, the branch cut off withering always in a few days, however well united, and carefully kept on. *Phil. Transf.* N°. 25.

CO'TINUS, *Venice sumach*, in botany, a genus of plants, whose characters are:

It hath round leaves, with long foot-stalks: the flowers are small, consisting of five leaves, which expand in form of a rose; are disposed in capillary branches of very slender and stiff filaments or hairs, which are widely diffused after the manner of plumes, and spring out of the top branches: in the center of the flower is situated the pointal, attended by five minute stamina: the pointal afterwards turns to an oval berry, inclosing one triangular seed.

The wood of this shrub is greatly used in the southern parts of France, where it grows in great plenty, to dye their woollen cloths of a yellow colour, or feuillemorte; and the tanners use the leaves to prepare their skins; from whence it was called Coti coriaria.

CO'RVUS, *the raven*, is particularly used for a large bird of the crow kind, well known throughout the world, as being found in all climates, and all regions. The ravens build in high trees, or upon the ruins of old lofty buildings; they lay four, five, or six eggs, of a bluish green, variegated with spots and streaks of black. There are many fabulous stories of the longævity of the raven, but birds are in general long-lived, and the crow kind not less so than the rest. *Ray's Ornithol.*

CORVUS, in antiquity, a machine, invented by the Romans, at the time of their wars in Sicily, when they first engaged the Carthaginian fleet. According to Polybius, the Corvus was framed after this manner: On the prow of their ships they erected a round piece of timber about one foot and a half diameter, and twelve feet in length, on the top of which was a block, or pulley; round this piece of timber was a platform of boards four feet in breadth, which was about eighteen feet long, and well framed and fastened with iron; the entrance was longways, and it was moveable round the aforesaid upright piece of timber, and could also be hoisted up and down within six feet of the top: about this frame was a sort of parapet knee high, which was defended with upright bars of iron, sharp at the ends, and towards the top there was a rising, by the help of which, and a pulley, or tackle, it was hoisted and lowered at pleasure; with this moveable gallery, they boarded the enemy's ships, when they did not lie side by side, sometimes on their bow, and sometimes in the after part of the ship; the soldiers, keeping the boss of their bucklers level with the top of the parapet, &c. and by means of this new engine, got a victory over the Carthaginians in their first sea fight with them, though the enemy were long before well skilled in naval affairs, and the Romans raw and ignorant.

CORVUS *aquaticus*, in zoology, the name given by authors to the bird commonly known by the name of the cormorant. It is of the size of a goose, and is of a very deep dusky brown on the back, with some admixture of a greyish gloss, and white on the belly and breast; its long wing feathers are greyish; its tail is a hand's-breadth and a half long, and when expanded, looks roundish at the end; its beak is between three and four fingers-breadths long, and is a little hooked at the end; its legs are very short, but very thick and strong, and, which is a very peculiar thing, are flat, or compressed, especially while the creature is young; and another singularity is, that the base of the lower chap is covered by a naked yellow membrane, in the manner of the wild swan's beak; its legs are black, and covered with a series of cancellated scales; the toes are all joined by one membrane. It builds not only among the rocks, but often also on trees. *Ray's Ornithol.*

CORY'ZA (*Dict.*)— This is a disease which few people trouble a physician about, being usually left to nature; but it is, however, in the power of medicine to do great service, and, usually, wholly to remove the complaint; which, even where it is not attended with danger, is so far troublesome, as that any one would wish to be rid of it. In cases of a gravedo, a just and necessary excretion of the congested matter must be provided for; and this may easily be contrived to be made, by less troublesome evacuations than those to which nature seems to point, and by more convenient outlets; and, by continuing this method, the future distempers of this kind may be anticipated and prevented. For the ready discharge of the matter, according to the intent of nature, errhines are to be used; the powders of the cephalic herbs, as thyme, betony, lavender, and the like, may be snuffed up the nose, and, by the volatile pungent salts, may be smelled to: by these means the mucid humour, which caused the infarction, will be rendered thin, and fitted to discharge itself. After this, it will be proper to give a gentle purge. And, when the cure is perfected, the return may be prevented by bleeding and purging in spring and autumn. When the defluxion is very violent, Stahl recommends the use of gentle diaphoretics, and of a powder composed of cinnabar, and a gentle opiate. In cases where the matter of a Coryza is very acrid, and there is a violent pain in the head, the external use of camphor is of great service; it is in this case to be applied to the temples; and the patient should at the same time take, internally, powders composed of nitre and the common absorbents, and diaphoretic antimony, and afterwards should take some gentle purges, and frequently bathe the feet in warm water. *Junker's Consp. Med.*

COSMO'LOGY, the science of the world in general. This Wolfius calls general, or transcendental Cosmology, and has written a treatise on the subject, wherein he endeavours to explain how the world arises from simple substances; and treats of the general principles of the modifications of material things, of the elements of bodies, of the laws of motion, of the perfection of the world, and of the order and course of nature.

CO'STAR's *Engine*, an invention for raising water from mines. Devonshire and Cornwall, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits, as they call them, or subterraneous channels, or sought from the bottom of the mine where the miners are at work, to some valley at a distance, a little lower at the bottom of the mountain, to carry off the water from the mine, which otherwise would drown them out from getting the ore. These adits are sometimes carried a mile or two, and dug at a vast expence, as of two, three, or four thousand pounds, especially where the ground is rocky. And yet they find this much cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty, and the mine is deep. Sometimes they cannot find a level near enough proper to carry to it an adit from the bottom: suppose the mine be 50 yards deep, and they can only find a level 25 yards above the bottom; yet they find it worth while to make an adit to save half the height to which the water is to be raised, thereby saving half the expence, and delivering the water into the trough L Z (*Plate* XIV. *fig.* 13.) where it runs off under ground without bringing it up to the grass.

The late Mr. Costar, considering that sometimes from a small stream, and sometimes from little streams or collections of rain water, one might have a pretty deal of water above ground, though not a sufficient quantity to turn an over-shot wheel; thought that, if a sufficient fall might be had, that water might be made useful in raising the water from the bottom of the mine to the adit, and thereby save the expence of men and horses used for that purpose: the fall to be had appeared to him to be C L; that is, from the grass or mouth of the pit down to the adit, which here we will suppose 25 yards. Then he contrived to place a rag-wheel R R, with its chain or bucket pump at the mouth of the pit at C *c*, much after the manner of Francini, receiving the superior waters brought into a collective cistern W, through a pipe A, leading it into the buckets B, making them go the reverse way, because in the common chain-pump the rag-wheel carries the buckets, but here the buckets carry the rag-wheel, down as far as the adit, into which they discharge themselves at *b b*; and there turning another rag-wheel *r r*, whose axis works an engine bringing the water from the bottom, which is also delivered into the adit which carries away both the waters to the delivery at the bottom of the mountain at Z, which we suppose at a great distance from the mine. Any kind of engine may be worked by this lower rag-wheel, whose axis is H I; as, for example, a common chain pump, by making the rag-wheel sufficiently deep; or cranks, as I have represented it at G *g* in the figure, working two pump-rods K K moving in the barrels M M, and delivering their water into the trough leading to the adit.

N. B. There must be a wheel fixed to the axis of the upper rag-wheel at C, to carry a pinion or smaller wheel D, having a fly E F, in order to regulate the motion of the whole machine, and prevent jerks.

CO'STUS *dulcis*, in the materia medica, the name of a root, which, being apt to contract a bitterness in growing old, is called in that state, by many authors, bitter Costus, and supposed a different drug.

It is the root of the Costus Indicus violæ martis odore, called by the Indians tsianocua. It grows to six or seven feet high; the leaves are of a lively green, but something paler on the upper side than the lower; the flowers are four-leaved, white, and

and ſhaped like a bell; the fruit is three-cornered, and divided into three cells, containing a number of triangular ſeeds. The root always contracts a bitterneſs, and grows darker-coloured in keeping, though, when freſh, it was pale and ſweet; and hence the ſuppoſed difference, the deſcriptions of authors agreeing alike to each, in all but theſe accidents.

The leaves of the common garden coſtmary are ſtomachic and detergent. They are given with ſucceſs againſt crudities of the ſtomach, belchings and vomitings after meals. They have alſo great reputation in curing an offenſive breath, heart-burns, and many of the moſt obſtinate and inveterate head-aches, the cauſes of which lie in the ſtomach.

COTESIAN *Theorem*, in geometry, an appellation uſed for an elegant property of the circle diſcovered by Mr. Cotes. The theorem is:

If the factors of the binomial $a^{\lambda} \pm x^{\lambda}$ be required, the index λ being an integer: let the circumference A B C D (*Plate* XVII. *fig.* 1.) the center of which is O, be divided into as many equal parts as there are units in 2λ; and from all the diviſions let there be drawn to any point P in the radius O A, produced if neceſſary, the right-lines A P, B P, C P, D P, E P, F P, &c. then ſuppoſing $OA = a$, $OP = x$, the product of all the lines A P, C P, E P, &c. taken from the alternate diviſions throughout the whole circumference, will be equal to $a^{\lambda} - x^{\lambda}$, or $x^{\lambda} - a^{\lambda}$, according as the point P is within or without the circle; and the product of the reſt of the lines B P, D P, F P, in the remaining alternate places, will be equal to $a^{\lambda} + x^{\lambda}$.

For inſtance, if $\lambda = 5$, let the circumference be divided into ten equal parts, and the point P be within the circle; then will $AP \times CP \times EP \times GP \times IP$ be equal to $\overline{OA}^5 - \overline{OP}^5$, and $BP \times DP \times FP \times HP \times KP = \overline{OA}^5 + \overline{OP}^5$. In like manner if λ be $= 6$, having divided the circumference into twelve equal parts, $AP \times CP \times EP \times GP \times IP \times LP$ will be equal to $\overline{OA}^6 - \overline{OP}^6$, and $BP \times DP \times FP \times HP \times KP \times MP = \overline{OA}^6 + \overline{OP}^6$.

The demonſtration of this theorem may be ſeen in Dr. Pemberton's Epiſt. de Coteſii Inventis.

By means of this theorem, the acute and elegant author was enabled to make a farther progreſs in the inverſe method of fluxions, than had been done before. But in the application of his diſcovery there ſtill remained a limitation, which was removed by Mr. de Moivre. See *Dr. Smith's Theoremata logometrica & trigonometrica, added to Cotes's Harmonia Menſurarum, p.* 114, 115. *De Moivre, Miſcel. Analyt. p.* 17, *& ſeq.*

COTESIAN *Theorem*, in dioptrics, a beautiful theorem invented by Mr. Cotes.

Prop. To find the apparent magnitude, ſituation, apparent place and degree of diſtinctneſs with which an object is ſeen through any number of glaſſes of any ſort, at any diſtances from each other, and from the eye and object.

Let P M (*Plate* XVII. *fig.* 2.) be an object viewed by the eye at O through any number of glaſſes at A, B, C, whoſe focal diſtances are the lines a, b, c. The diſtance O P may be conſidered as divided by the glaſſes A, B, C, into two parts, ſuch as P A, A O; P B, B O; P C, C O; or into three parts, ſuch as P A, A B, B O; P A, A C, C O; P B, B C, C O; or into four parts, ſuch as P A, A B, B C, C O; and ſo on as far as the number of glaſſes permits. All the ſeveral products of ſuch correſponding parts, applied reſpectively to the focal diſtance, or to the product of the focal diſtances of the glaſſes which are placed at the point or points of diviſion, will give ſo many ſeveral lines, which muſt be looked upon as negative, if there be an odd number of convex glaſſes at the points of diviſion, otherwiſe as affirmative. Let P Ω be the ſum of P O and thoſe ſeveral lines according to their ſigns, and let P Ω and P O lie the ſame way, if the ſum be affirmative, but contrary ways, if the ſum be negative; and Ω will be the point, at which the naked eye being placed, ſhall ſee the object under the ſame magnitude with which it appears through all the glaſſes, the eye being at O; and, therefore, the apparent magnitude of the object will bear the ſame proportion to the true magnitude, as the diſtance P O bears to the diſtance P Ω.

The apparent ſituation of the object is alſo determined by the point Ω. For, if Ω and O be placed on the ſame ſide of the object, it will appear erect, otherwiſe inverted.

Imagine, now, the eye to be removed from O to C, ſo that its diſtance from the laſt glaſs may vaniſh; at the ſame time the point Ω will move to another place ω, which may be found as above. Let O γ bear the ſame proportion to O C, which Ω P bears to Ω ω, and let the order of the points O, C, γ, be the ſame as the order of the points Ω, ω, P; then will γ be the apparent place of the object viewed at O, through all the glaſſes.

And, from the ſituation of this point γ, a judgment may be formed of the degree of diſtinctneſs with which the object appears. For the rays flowing from the point P, by paſſing through the glaſſes, are diſpoſed to fall upon the eye in the ſame manner, as if, the glaſſes being removed, they tended from the point γ when it is before the eye, or towards the point γ when it is behind the eye.

For let α r (*Plate* XVII. *fig.* 3.) be the firſt image of the object made by the glaſs A; β s its ſecond image made by the glaſs B; γ t its third image made by the glaſs C. It is evident that the object P M and its image α r will be terminated by the ſame lines P A α, M A r; that the image α r and its image β s will be terminated by the ſame lines α B β, r B s; that the image β s and its image γ t will be terminated by the ſame lines β C γ, s C t. Now, if the eye be placed at O, and γ t be the laſt image, it is manifeſt, that the object ſeen through all the glaſſes will appear under the ſame angle which is really ſubtended by the image γ t. Draw therefore M Ω parallel to t O, making the angle P Ω M equal to γ O t, and the naked eye, being placed at Ω, ſhall ſee the object P M under the ſame magnitude with which it appears through all the glaſſes, the eye being at O. And, conſequently, the apparent magnitude ſhall be to the true magnitude, as the angle P Ω M to the angle P O M, or as the diſtance P O to the diſtance P Ω. Let us at firſt ſuppoſe all the glaſſes to be concaves. The diſtance P Ω will be to P A, as the angle P A M to the angle P Ω M, or, as α A r to γ O t; or in the compound ratio of α A r to α B r, β B s to β C s, γ C t to γ O t, that is, in the compounded ratio of α A + A B to α A, β B + B C to β B, γ C + C O to γ C. Therefore $P\Omega = PA \times \frac{\alpha A + AB}{\alpha A} \times \frac{\beta B + BC}{\beta B} \times \frac{\gamma C + CO}{\gamma C}$ &c. by which theorem the diſtance P Ω is given ſo ſoon as α A, β B, γ C, can be found. Theſe are found as follows, $\alpha A = \frac{PA \times a}{PA + a}$, $\beta B = \frac{\overline{\alpha A + AB} \times b}{\alpha A + AB + b}$, $\gamma C = \frac{\overline{\beta B + BC} \times c}{\beta B + BC + c}$.

Whence it is eaſy to conclude, that, if the eye at B views the object P M through one glaſs at A, P Ω will be equal to $PB + \frac{PAB}{a}$; that, if the eye at C views the object P M through two glaſſes A and B, P Ω will be equal to $PC + \frac{PAC}{a} + \frac{PBC}{b} + \frac{PABC}{ab}$; that, if the eye at O views the object P M through three glaſſes A, B, and C, P Ω will be equal to $PO + \frac{PAO}{a} + \frac{PBO}{b} + \frac{PCO}{c} + \frac{PABO}{ab} + \frac{PACO}{ac} + \frac{PBCO}{bc} + \frac{PABCO}{abc}$; and ſo forwards continually as the ſolution of the problem directs. Now, if any of the glaſſes be convex, the focal diſtances of ſuch glaſſes muſt be looked upon as negative, ſince they are contrary to thoſe of concave glaſſes; and, therefore, the terms which involve an odd number of convex glaſſes at the points of diviſion, muſt be taken as negative. Q. E. D. 1°.

The point M is ſeen immediately through the glaſſes by the ray t O, which enters the eye at O in a direction parallel to M Ω by conſtruction. If therefore Ω fall on the ſame ſide of the object as O, the ray t O muſt advance towards the eye, from the ſame ſide of the common axis O P as the point M; and, conſequently, the object will appear through the glaſſes erect. But, if Ω falls on the contrary ſide of the object to the point O, the ray t O which advances towards the eye in a direction parallel to Ω M, muſt appear to come from the contrary ſide of the axis to the point M; and, conſequently, the object will appear through the glaſſes inverted. Q. E. D. 2°.

By conſtruction the lines M Ω, M ω, M P, P Ω, are reſpectively parallel to the lines t O, t C, t γ, γ O; and, therefore, the figure M Ω ω P is ſimilar to the figure t O C γ. Hence it follows, that O γ the diſtance of the laſt image from the eye, or the diſtance of the apparent place of the object from the eye, is to O C as Ω P is to Ω ω; and that the order of the point O, C, γ, will be the ſame as the order of the points Ω, ω, P. Q. E D. 3°.

The point γ being the laſt image of the point P, the rays which flow from P, after they have paſſed through all the glaſſes, will flow from or towards the point γ. Q. E. D.

COUCH, in heraldry, a term uſed to expreſs the ſhield of a coat of arms, when it does not ſtand erect, but hangs downward. The origin of this poſition of ſhield ſeems to have been, that the perſons who were to fight in tournaments were compelled, from the time that proclamation was made till the day of fighting, to hang up their ſhields, by one corner, from the windows or balconies of the neighbouring houſes, or on the trees or barriers of the ground, if the exerciſe was performed in the field. The horſe combatants hung up their ſhields by the left corner, and the foot combatants by the right. Hence the left corner, hanging, became the moſt honourable, and we ſee, in all the ſons of the royal blood of England and Scotland, that the ſhields with their arms all hang that way. Some writers on heraldry expreſs this diſpoſition by the word pendant. *Niſbet's Heraldry.*

COULTER, in heraldry, that part of the plough which forms the edge, ſtanding before the ſhare of the plough, and cutting the clods, as the ſhare tears them up. The Coulter is an inſtrument of two feet eight inches in length, of near two inches breadth, and near one inch thick. It is driven through the beam

beam of the plough, and fixed in its proper direction by a wedge. See PLOUGH.

The modern improvement of the plough by Mr. Tull gives it four Coulters; the consequence of which is, that the earth, ploughed up, is cut four times as small as by the common plough, which has only one.

In all Coulters, the length and direction are to be nicely regulated. The cutting the hole and driving the wedge, regulate the direction, and its length is altered from the beam by the driving it farther down, as its point wears away. The first Coulter in all ploughs ought to be laid in the beam, in the following manner: its back is to bear against the back of the Coulter-hole, its right side above, to bear against the upper edge of the Coulter hole, and its left side to bear against its lower edge; so that there should always be at least three wedges to hold the Coulter; the pole wedge before it, another on the left side of it above, and a third on the right side underneath; and the hole must be so made, that, the Coulter standing thus across the hole, its point may incline so much towards the left, as to be about two inches and a half farther to the left than the point of the share, if it were driven down so low as it. But it never ought to be so low in any plough. As to its bearing forward, the point of the Coulter should never be before the middle of the point of the share; but, if it be set too obliquely, it will, in the working, have greater power to move up the pole wedge and get loose.

In the four-coultered plough, the three additional Coulters must all stand in the same position with this, in regard to the inclination of their points one to another. This is a vast advantage to them; for by this means, when the fin of the plough is raised up, by turning the handles towards the left, their points do not rise out of the ground, as they would do, were it not for this inclination. In regard to their pointing forward, experience shews, that it is best that every one of the three should be a little more perpendicular than that next behind it; by this means there is a greater space left between them above than below, and the roots of weeds can never clog them up as they otherwise would do, and by that means raise the plough out of the ground, if not picked clean by a man at times.

None of these Coulters ought to descend so low as the share, except when the land is to be ploughed very shallow; it is always sufficient for them to cut through the turf, let the plough go as deep as it will; in ploughing shallow, the fin of the share must also be broad enough to cut off the fourth piece or furrow; else that, lying very fast, will be apt to raise up the groundwrist, and throw out the plough; but, when the land is plowed deeper, the groundwrist will break off this fourth furrow, though the fin be not broad enough to reach it. *Tull's Husbandry.*

COUNCIL *(Dict.)*—The first general Council ever since the time of our Saviour was the Nicene, so called from the place where it was held, viz. Nice, a city of Bithynia, a province in Asia Minor, formerly called Bebrycia and Mygdonia, and now, by some, Bursia, by others, Bescangial, and, by the Turks, Osmanili.

But, though the place in which this most renowned Council was convened is universally agreed upon, the precise time of its celebration is not so certainly determined. That it was held in the reign of Constantine the Great, the first Christian emperor, as it had been summoned by his honourable letters, is very evident from Eusebius, an eye-witness, and a very significant party in it; from Socrates, and other historians; besides the concurring testimony of the whole Council itself to attest it. But then, about the time, authors are not so unanimous. For, whereas some place it under the year of our Lord 324, others make it in 325; some again in 328, and others in 330. But our modern writers, in general, place it in the year 325: which seems to be the truer account, especially if we follow the authority of the forenamed Eusebius; who says that Constantine made a royal entertainment at the conclusion of that Council, for the fathers of it, in the 20th year of his reign; which began immediately upon the demise of his father Constantius, in the year 306.

However, what gave occasion for calling this holy and oecumenical or general Council, we have more certain knowledge of, viz. The heresy of Arius, a presbyter of the church of Alexandria; who began to vent his pernicious doctrines against the divinity of our blessed Saviour, about the year of our Lord 317.

The place appointed for the meeting of this Council being the city of Nice, all necessary preparations were made for the reception of so venerable a body; and indeed, not only venerable, but numerous; for there came to this assembly, besides a very great appearance of bishops from all parts, of presbyters, deacons, acolyths, &c. an innumerable company: all whose expences were liberally supplied out of the emperor's treasure. But, besides those of the clergy, there were many others, disputants and orators, who likewise attended.

After having determined the differences which troubled the church, they proceeded to make some rules for the discipline of it, which were called canons. Of these there were only twenty, according to Theodoret, though Ruffinus makes twenty-two; but that is by dividing two of them to make up that number; so that, in truth, he owned no more than twenty; of which the reader may see an account in *Du Pin's Ecclesiastical History.*

The second general Council, since the times of Christianity, was held at Constantinople, under the reign, and by the command of Theodosius the Great, though, the year is not certainly agreed among historians; some asserting that it was in the year 313, while others place it in 385: but Mr. Du Pin differs from them all; for he seems to make it a year earlier than the earliest of them, viz. 312: but this admits of some doubt.

The occasion of calling this Council was much the same with that for calling the Nicene, viz. to curb the insolence of the Arians, by a ratification of the Nicene confession, and to ordain a bishop into the see of Constantinople from whence Gregory of Nazianzen was resolved to depart.

In this Council Prosper says there were 180 bishops present, though Socrates and some others mention but 150. But, when Prosper reckons 180, it is not improbable that he includes the Macedonian bishops in that number, because they were summoned as well as the Catholics, and thirty-six of them appeared. And what very much favours this conjecture is this, that we find afterwards, that 150 bishops were present at the election of Nectarius, when the Macedonian bishops were departed from Constantinople.

The canons which Mr. Du Pin ascribes to this general Council, are seven.

The third general Council was that of Ephesus, convened by Theodosius junior, at the suit of Nestorius himself; and promoted by pope Celestine, the first of that name, about the year of our Lord 434, according to Prosper's computation; though some others make it a year later: but the difference is not very material.

That this Council also was assembled by the imperial mandate, besides the authority of Evagrius, we have the words of the Council itself, in an epistle to the emperors: 'The holy Council, which was gathered together by the grace of God, and by the authority of your dominion, in the chief city of the Ephesians, &c.'

There are, as bishop Prideaux observes, two copies of this Council; the first containing eight, the second thirteen canons; all which are comprehended in the anathema's of St. Cyril, to which we refer the reader.

The fourth general Council was the general Council of Chalcedon, a city in Bithynia, lying directly over-against Constantinople. This Council also, as the former, was convened by the authority of the emperor.

The precise year in which this Council was celebrated, is no more certain than any of the former: some placing it in 454, others in 455, and Mr. Du Pin, according to custom, three or four years before the rest, viz. in 451: though, if it be true, that this Council was convened in the third year of Martianus, which Mr. Sympson asserts, and Martianus came to the throne in the year 450, as bishop Prideaux says he did, it is evident that neither of the former computations are to be depended upon. However that be, this Council was held in the great church of St. Euphemia in the city of Chalcedon, in the presence of the commissioners, officers of the emperor, and counsellors of State, who regulated every motion of it, and were seated in the middle of the assembly. Some writers say, that the emperor himself was there in person, and that he intreated all the fathers not to attribute it to ostentation of his power that he sat there, but to his earnest desire that the true faith should be confirmed and established.

Concerning the president of this Council there is no certainty, unless perhaps the emperor himself presided: neither is the number of bishops, &c. any better determined; for some say there were about 600, others 630; but Mr. Du Pin says, there are but 350 in the subscriptions: however, it is most generally received, that the number was 600 or upwards, and that this was the most numerous Council that had ever been.

Several very great men were present at this Council, and even some who had been instrumental in the condemnation of Nestorius. Notwithstanding, by some strange infatuation, the wicked opinion of Eutyches was approved by this Council; Eutyches himself, with 300 monks, all involved in this heresy, and excommunicated by Flavianus, were absolved, and the tables were turned upon Flavianus, for they excommunicated him; and not only so, but the faction of Eutyches most barbarously treated him, trod him under foot, and so wounded him, that he died in three days time. In this synod also were condemned several pious and learned men, Ibas of Edessa, and Theodoret of Cyrus in particular, besides Eusebius of Doryleum, &c.

During the whole time of the sitting of this Council, the place was environed with very strong guards, which Chrysaphius brought with him, to compel those bishops who would not comply to favour the Eutychian heresy: from hence this second Council of Ephesus was by the antients called [illegible], as if it had been nothing else but a convention of robbers.

The transactions of this Council are set down at large in Mr. Du Pin's Ecclesiastical History, Cent. 5. to which we refer the curious reader.

Besides

Besides this, there are thirty canons ascribed to the Council of Chalcedon; though Mr. Du Pin is of opinion, that the collection of them was not made in any session of the Council; but that they were composed since, and taken out of the several actions: however, he set them down in order. The first of them commands, that the canons made by preceding Councils be observed. The sixth forbids the ordination of any clergyman, absolutely, and without a church title. The eighth enjoins the clergy that belong to monasteries and chapels of martyrs, to be subject to their bishop. And the twenty-eighth grants to the church of the city of Constantinople, which is called new Rome, the same privileges with old Rome, because this city is the second city in the world. It also adjudges to it, besides this, the jurisdiction over the dioceses of Pontus, Asia, and Thrace, and over the churches which are out of the bounds of the emperor, and a right to ordain metropolitans in the provinces of their dioceses. These are the most material canons of this Council: the rest, which principally concern only clerks and monks, are of lesser moment, and for that reason we shall not trouble the reader with them.

The fifth general Council was held again at Constantinople, and is therefore called the second of that place. It was gathered by the emperor Justinian: for Evagrius says thus: Eustachius being bishop of Jerusalem, Justinian gathered together the fifth Council. And so Nicephorus: The emperor Justinian gathered together the fifth holy general Council, the bishops of all churches being called together.

The time in which this Council was held is as uncertain as the rest, some placing it in the year 551, others in 552, and Mr. Du Pin in 553.

The number of bishops assembled at this Council was 165, according to some; though Mr. Du Pin says, there were but 147, besides the eastern patriarchs; and that all the bishops present at it belonged to their patriarchates.

In the meetings of this Council, what they did, principally was, they condemned the three chapters; having first discussed that great question, whether it was lawful to anathematize the dead? and passed it in the affirmative. Mr. Du Pin says, When the extracts taken out of the books of Theodorus of Mopsuestia, and the creed attributed to him, were read, the bishops, without any further examination, cried out anathema against the writings, against the creed, and against the person of Theodosius; an anathema to those who did not anathemize him.

Mr. Du Pin seems to think, that this business of the three chapters was the whole employment, and took up all the time of this Council. But some other authors tell us, that the several errors of Origen about the trinity, the plurality of worlds, and the pre-existence of souls, were condemned by it: and that his whimsical opinions, that the heavens and the stars are animated; that the glorified bodies shall be of a round figure; and that the torments of the damned shall have an end, were utterly exploded.

There are extant eight collations of this Council, and fourteen canons, which are all contained in their anathema's, according to bishop Prideaux; though Mr. Collier says, that neither this nor the following Councils made any canons, and that the Quinisex Council, or the Council in Trullo, was called afterwards to supply the defect.

The sixth general Council, being the third of Constantinople, was held in that city, by the command of Constantinus Pogonatus the emperor, so called from his bringing home with him a long beard from the wars, whereas he went forth without one. This Council was assembled in the twelfth year of that emperor, and of our Lord 781, according to some; though Mr. Du Pin says it was a year sooner, and yet makes it the thirteenth of that emperor, notwithstanding he began his reign in 769.

The most remarkable transactions of this Council were these: the patriarchs of Constantinople and Antioch were accused of teaching that there was but one will in Jesus Christ; which Macarius of Antioch publicly and strenuously maintained in the Council; but the patriarch of Constantinople retracted, with all the bishops of his patriarchate, except Theodoret of Meletinum.

In the seventeenth session they also received the definitions of the five first general Councils, and particularly that of the fifth general Council against Origen, against Theodorus of Mopsuestia, &c. They recited the creeds of Nice and Constantinople, and approved the definition of the Council held at Rome by Agatho, against the Monothelites.

As for the canons of this Council, the reader is to expect no more from it, than were made by the former, according to Mr. Collier, i. e. just none: though there are who make the subsequent Council in Trullo, as it were, an appendix to it; and, if so, there are more canons of this Council, than of all the general Councils before it.

But, before we dismiss this sixth general Council, it will be necessary to observe, that, though this Council under Constantinus Pogonatus is commonly reckoned one of the Councils acknowledged by the ancients to be general, there are some writers of great authority, who rather give that title to the next succeeding Council, held at Constantinople, under the reign of Justinian the Second: and this, they say, was the sixth general Council, not that in the reign of Pogonatus. Among the writers who are of this opinion, is the right reverend and judicious bishop Beveridge; for he says thus: 'The sixth general Council is that which is commonly called the Tertullian Council, gathered together by Justinian, the son of Constantinus Pogonatus.'

In this Council 102 canons of discipline were ratified according to Mr. Du Pin and others; several of which are in direct opposition to the practice of the modern Latin church, tho' they were so agreeable to the sentiments of the ancients, that Gratian says this synod was received by the fathers of the second Nicene Council.

The second Nicene Council is generally allowed to be the seventh general Council; though Mr. Sympson reckons another before it, viz. a fourth Council held at Constantinople, under Constantinus Copronymus, or Constantine the fourth of that name: and this Council, consisting of 338 bishops, he says, was assembled by the command of that prince, in the year 755 (Mr. Du Pin says in 750) in order to abolish the worship of images, which for some time before had prevailed mightily in the East. What Copronymus designed he also effected by the means of this Council; for in it several defenders and champions of image-worship were condemned, and a decree made against the use and worship of them. However, as Mr. Sympson observes, though they abolished one, they introduced another superstition, not less dangerous in the consequence than the former; for in the fifteenth and seventeenth canons of this Council, which are nineteen in number, they allow of the invocation of saints. But this Council was not received in the church of Rome, though a great part of the Eastern churches received it, by the emperor's authority, and put the decree against images in execution; till at last the reins of the government came into the hands of Irene the empress, widow to Leo III; she assembled another Council, to disannul the decree against images, in the reign of Copronymus. To this Council she invited pope Adrian, who sent two priests, as his deputies, to Constantinople, where this Council was designed to meet; and did meet in the year 786, according to Mr. Du Pin, others say in 788, till the soldiers besieged the bishops, and required with threatenings, that no Council should be held. Hereupon they were forced to separate for that time: but in the latter part of the next year they were assembled again at Nice, by the same authority, when the pope's legates held the first place, the patriarch of Constantinople held the second, the deputies of the eastern bishops the third, and after them the bishops of Cæsarea, Ephesus, and Cyprus, with 250 archbishops or bishops, and above 100 priests or monks.

There are twenty-two canons of this Council yet extant.

We come now to speak something of the eighth general Council, which, properly speaking, was the fourth of Constantinople: bishop Beveridge says, the eighth general Council was gathered together at Constantinople by the emperor Basil; and he cites the authority of the acts of that Council to prove it. And, if this be sufficient to prove this one of the famous general Councils of the Greeks (and we are giving an account of those Councils only) this was one of those famous Councils. But bishop Prideaux, though he says this fourth Council at Constantinople was assembled under Basil; he also says it was assembled under Basil, the murderer of the Greek emperors, and Adrian the Second, usurping the Roman see, notwithstanding the opposition of the Roman emperor. And for this reason it is, as may be conceived, that he places this Council in the number of the controverted general Councils.

However, as the learned bishop Beveridge, and some others, give this Council a place among the œcumenical or general Councils, and hold none to have been general after this; it cannot be a fault to enlist this Council, upon that great authority, in the number of the more famous general Councils.

This eighth general Council assembled at Constantinople in the year 869, as Mr. Du Pin says, though others say in 871, when Lewis II. (the Western empire being now entirely divided from the Eastern) was emperor of the West.

The regulations made by this Council are contained in 27 canons, the heads of which are set down by Mr. Du Pin in his account of this Council; to which the reader is referred.

These, as bishop Beveridge observes, are all the Councils allowed by the Greek church, or any other, except the papists. The famous Bullinger, in his treatise De Conciliis, it must be owned, allows but the six first of these Councils to be properly called œcumenical, or general: but Dr. Prideaux reckons the seventh among them; and bishop Beveridge has increased their number to eight, which he says are all the general Councils which have ever been held since the time of the first Christian emperor.

COUNTER-GUARD *(Dict.)* — *To construct a* COUNTER-GUARD. — Having described the ravelins and drawn their fosses, then in the counter-scarp of the ravelin take *a b (plate* VI. *fig.* 21.) equal to about twenty-four yards, and draw the face *b c* parallel to the counter-scarp of the foss before the bastion; and the out-line of the Counter-guard will be determined, the inner boundary being the counter-scarp of the grand foss.

In this work put a rampart of about sixteen or eighteen yards broad, with a parapet of six yards, and annex the ramps and a barbet, a barbet, if necessary: also make a foss of twenty-four yards broad, the counter-scarp being parallel to the faces.

The Counter-guard seems to be, next to the ravelin, one of the most useful outworks; for it occupies but little ground, is of no great expence, covers the faces of the bastion so effectually, that they cannot be battered in breach until the enemy has made himself master of this work; and, when he has it, he will meet with difficulties enough in finding earth to cover himself and erect batterries; and must, therefore, be at a considerable trouble in bringing it from beyond the foss, while he is exposed to the fire of the faces of the neighbouring ravelins; which, with the flanks of the bastions, are the defences of the Counter-guard.

COUNTER-*drawing*, in painting, &c. the copying a design or painting, by means of a fine linen cloth, an oiled paper, or other transparent matter; whereon the strokes, appearing thro', are followed and traced with a pencil, with or without colour.

COUNTER-*mark*, a second or third mark, put on any thing marked before.

The word is applied, in commerce, to the several marks put on a bale of goods belonging to merchants, that it may not be opened but in the presence of them all, or their agents.

In goldsmiths works, &c. the Counter-mark is the mark or punchion of the hall, or company, to shew the metal is standard, added to that of the artificer who made it.

COUNTER-mark of a horse, is an artificial cavity, which the jockies make in the teeth of horses that have outgrown the natural mark, to disguise their age, and make them appear as if they were not above eight years old.

COUNTER-mark of a medal, is a mark added to a medal, a long time after its being struck.

Counter-marks appear to be faults or flaws in medals, disfiguring the ground, sometimes on the side of the head, and sometimes on the reverse; particularly in the large and middle-sized brass: yet are they esteemed as beauties among the curious, who set a particular value upon such medals, in regard they know the several changes in value they have undergone; which are expressed by those Counter-marks.

Antiquaries, however, are not well agreed about the signification of the characters they find on them. On some, N. P R O B. on others, N. C A P R. on others, C A S R. R M. N T. A V G. S C. Some have, for their Counter-mark, an emperor's head; some several; some a cornucopia.

Care must be taken not to confound the monograms with the Counter-marks; the method of distinguishing them is easy. The Counter-marks, being struck after the medal, are dented or sunk in; whereas the monograms, being struck at the same time, with the medals, have rather a little relievo.

COURIER (*Dict.*)—The ancients also had their Couriers: we meet with two kinds, viz. those who ran on foot, called by the Greeks hemerodromi, q. d. Couriers of a day. Pliny, Corn. Nepos, and Cæsar, mention some of these, who would run 20, 30, 36, and, in the circus, even forty leagues per day.—And riding Couriers, cursores equitantes, who changed horses, as the modern Couriers do.

Xenophon attributes the first Couriers to Cyrus. Herodotus says, they were very common among the Persians, and that there was nothing in the world more swift than these kind of messengers. 'That prince, says Xenophon, examined how far a horse would go in a day; and built stables, at such distances from each other, where he lodged horses, and persons to take care of them; and at each place kept a person always ready to take the packet, mount a fresh horse, and forward it to the next stage: and this quite through his empire.'

But it does not appear, that either the Greeks or Romans had any regular fixed Couriers, till the time of Augustus: under that prince they travelled in cars; though it appears from Socrates, they afterwards went on horseback.

Under the Western empire, they were called viatores; and, under that of Constantinople, cursores: whence the modern name.

COURSING.—There are three several courses with greyhounds. 1. At the hare, 2. At the fox, and 3. At the deer. For the deer there are two sorts of Courses, the one in the paddock, the other either in the forest or purlieu. For the paddock Course, there must be the greyhound and the terrier, and the mungril greyhound, whose business it is to drive away the deer before the greyhounds are slipped; a brace, or a leash, are the usual number slipped at a time, seldom at the utmost more than two brace.

In the Coursing the deer in the forest or purlieu, there are two ways in use; the one is Coursing from wood to wood, and the other upon the lawns by the keeper's lodge. In the Coursing from wood to wood, the way is to throw in some young hounds into the wood, to bring out the deer; and, if any deer come out that is not weighty, or a deer or antler, which is buck, sore, or sorrel, then you are not to slip your greyhounds, which are held at the end of the wood, where the keepers, who can guess very well on these occasions, expect that the deer will come out. If a proper deer come out, and it is suspected that the brace or leash of greyhounds, slipped after him, will not be able to kill him, it is proper to way-lay him with a couple of fresh greyhounds.

The Coursing upon the lawn is the most agreeable of all other ways. When the keeper has notice of this, he will lodge a deer for the course, and then, by coming under the wind, the greyhounds may be brought near enough to be slipped for a fair course.

The best method of Coursing a hair, is to go out and find a hair sitting, which is easily done in the summer, by walking a-cross the lands, either stubble, fallow, or corn grounds, and casting the eye up and down; for in summer they frequent these places for fear of the ticks, which are common in the woods at that season; and, in the autumn, the rain falling from the trees offends them. The rest of the year there requires more trouble, as the bushes and thickets must be beat to rouse them, and often they will lie so close, that they will not stir till the pole almost touches them: the sportsmen are always pleased with this, as it promises a good Course.

If a hare lies near any close or covert, and with her head that way, it is always to be expected that she will make to that immediately on being put up: all the company are therefore to ride up, and place themselves between her and the covert before she is put up, that she may take the other way, and run on an open ground. When a hare is put up, it is always proper to give her ground or law, as it is called, that is, to let her run twelve-score yards or thereabouts, before the greyhounds are slipped at her; otherwise she is killed too soon, and the greater part of the sport thrown away, and the pleasure of the several windings and turnings that the creature will make to get away, is all lost. A good sportsman had rather see a hare save herself, after a fair Course, than see her murdered by the greyhounds, as soon as she is up.

In Coursing the fox, no other art is required than standing close, and on a clear wind, on the outside of some grove, where it is expected he will come out; and, when he is come out, he must have head enough allowed him, or else he will turn back to the covert. The slowest greyhound will be able to overtake him after all the odds of distance necessary; and the only danger is, the spoiling the dog by the fox, which too often happens; for this reason, no greyhound of any value should be run at this Course, but the strong, hard-bitten dogs, that will seize any thing.

COW, *bos*, in zoology, a quadruped too well known to need a description.

The use of the Cow is either for the dairy, or for the breed. The red Cow is generally supposed to give the best milk, and the black Cow to bring the best calves. The Cow that gives the milk longest is the best both for the breed and dairy; and, for the latter use, it is most convenient that the Cow should calve in the spring. Either in the month of March or April, when a Cow is near calving, she should be put into good grass three or four weeks before the time; or, if it happens in winter, she is to be fed well with hay. The day and night after she has calved, she should be kept in the house, and the water that she drinks should be a little warmed. The next day, at noon, she may be turned out; but she should be taken in at night, for three or four days afterwards, and then she may be left to herself. Every night that she is taken in, she should be kept till the cold of the morning is over, and a drink of warm water given her before she goes out.

CRAB, in zoology, a species of squilla. See SQUILLA.

The cancer major, or common large Crab-fish, has its abode from twenty to forty fathom water. These animals herd together in distinct tribes, and have their separate haunts for feeding and breeding, and will not associate with their neighbours. This has been carefully tried, by marking the shell of a Crab, and carrying it two or three miles distance, and there leaving it among the same species: this Crab has, after this, found its way home, and been caught in its old abode by the same fishermen.

The fishermen find the Crabs of this species from the size of a chesnut to twelve pound weight. Nothing, in the history of this creature, is so singular, as its breaking off its own limbs, which it occasionally does, in the following manner; the creature is able to do this in any position, but the most advantageous way of making the experiment is the laying it on its back; then, with a pair of iron pincers, break the shell, and bruise the flesh of one of the outer joints of a small leg; the wound will bleed, and the creature shew signs of pain, by moving it about; afterwards, it holds it quite still, in a direct and natural position, without touching any part of its body, or other legs with it; then, on a sudden, with a gentle crack, the wounded part of the leg drops off, at the internodium of the second joint, from the body. If a hole be pierced in the great claws, or legs, and an iron put in to lacerate the muscle, the effect is the same, and this large limb is thrown off in the same manner, only with more violence.

When the leg is off, a mucus overspreads the wound, and stops the bleeding; and a small leg is, by degrees, produced, which afterwards attains to the size of the former. Nature seems to have given this singular power to this creature for the preservation of its life, in the mutual quarrels it very frequently has with others of its own species: in these, one Crab lays hold of the claws of another, and crushes it in such a manner, that it would bleed to death, had it not this power of giving up the limb,

limb, and healing the wound. *Philosophical Transactions*, N°. 478.

CRAB, or *gin*, in mechanics, an engine used for mounting guns on their carriages. It is made of three pieces of oak, ash, or other strong wood, of about fourteen feet long, two of which are joined by transoms; so that they are wide asunder at bottom, and join at top, on a strong piece of wood, crooking forwards, called the head, in which are three brass pullies. Over these comes a rope called the gin rope, which likewise goes through other pullies in a block, and returns through the head, down the back of the gin, and then goes round a windlace. The third piece of the Crab is round; one end of it goes into the head, and the other stands on the ground; so that all three make a triangle called a pye. When a gun is to be mounted, a strong rope is rived through the block and the trunnions; and then, the windlace being turned round, the gun is lifted up, and placed in her carriage with ease. *Guillet*. The Crab is used also to launch ships, or heave them into the dock, or off the key. *Manœuvring*.

CRA'CKER, in zoology, the name of a fresh water fowl, of the duck kind, known by authors under the title of anas cauda acuta, and cauda lancea, and called in some parts of England the sea pheasant. It is of the size of the common widgeon; its head is all over of a ferrugineous brown, but behind the ears there is a slight tinge of purple; its neck is somewhat longer than in the widgeon, and its beak of a bluish colour; its head is small, and there is a white streak on each side of it, which reaches down to the throat; the throat is grey, variegated with transverse lines, as is also the back, but the shoulder feathers are, in a great measure, black. The tail is grey, with a mixture of white about the edges of the feathers, and is of a very different shape from that of all the other species of the duck kind, having two feathers much longer than the rest, and running out into narrow points, whence the fowl has the name of the pheasant. The female differs much in colour from the male, and much resembles the common tame duck; she has the same long feathers, however, in the tail. *Ray's Ornithol.*

CRA'DLE, in ship-building, a frame of timber raised along the outside of a ship, by the bildge, for the more commodious and secure launching of the vessel. The cradle is much used in Italy, Spain, and Turkey, where they also trim great ships in the cradle.

CRA'MBE, wild sea cabbage, in botany, the name of a genus of plants, the characters of which are these: the flowers consist of four leaves, and are of the cruciform kind: the pistil arises from the cup, and finally becomes an unicapsular fruit, containing one oblong seed.

This plant may be propagated in a garden, by sowing the seeds, soon after it is ripe, in a sandy or gravelly soil, where it will thrive exceedingly, and increase greatly by its creeping roots, which will soon overspread a large spot of ground, if encouraged; but the heads will not be fit to cut until the plants have had one year's growth; and, in order to have it good, the bed in which the plants grow, should, at Michaelmas, be covered over with sand or gravel about four or five inches thick, which will allow a proper depth for the shoots to be cut before they appear above ground; and, if this is repeated every autumn, in the same manner as is practised in earthing of asparagus beds, the plants will require no other culture. This may be cut for use in April and May, while it is young; but, if the shoots are suffered to remain, they will produce fine regular heads of white flowers, which appear very handsome, and will perfect thin seeds, by which they may be propagated. *Miller's Gard. Dict.*

CRANE, in mechanics (*Dict.*) — Mr. Padmore has made a very good improvement in Cranes, in a machine of that kind erected on the bank of the river at Bath, whereby Mr. Allen lets down his stone in the vessels that come for it.

The Crane itself is not of the uncommon sort, but a rat-tailed Crane, with a double axis in peritrochio and two handles, whereby four men may raise very great weights; and then, turning the whole Crane about upon its upright shaft, can fix it in any position, and let down the weights speedily into the boats or barges, which come near the wharf to receive them. See a view of this Crane (*plate* XI. *fig.* 5.) But this construction is not new. Neither is it a new invention to let down goods after they have been raised by a Crane, by pressing the arch of a circle strongly upon a wheel fixed to the principal axis, in order to retard and regulate the descent by a friction increased or diminished at pleasure, as is done in stopping windmills. The catch also, that hinders a Crane or capstane from going back, is of common use; but I do not know that any one has applied them both together in the same Crane, so as to depend upon one another, before Mr. Padmore did it, though many have done it since. Therefore I shall give a particular description of this contrivance, whose chief intent is to prevent the great mischiefs which often happen by the carelesness of the men employed to raise and let down heavy burthens by the use of the Crane. The *sixth figure* represents an upright section of so much of the Crane as the contrivance abovementioned is applied to.

A B is the great wheel, whose large axis A, moving on two iron center pins such as *a*, receives the rope, or lets it run down, according as it is turned, by the means of the handles fastened at C to the lesser wheel or pinion C, or as it is suffered to turn the other way by the gravity of the descending weight, when all obstacles are removed. Upon the axis of the pinion is the ratchet wheel D, whose teeth successively receive the iron catch *f* F (moveable on a pin at F on the iron standard G, and to be raised up occasionally by the upright iron H *h*) to hinder the weight from going back, when the handles are loosed. Upon the same axis behind the wheel D is a wooden wheel E *p*, over which hangs the half-ring of iron O P *o* with a groove or hollow made in it to fit the circumference of the said wheel, so as to retard, or stop, or any way regulate the motion of the wheel (and consequently of the axis and pinion C, and the great wheel and axis A B which has the rope V A) according as it is more or less strongly pressed down to make a friction on the wood, as it moves after the catch is raised out of the teeth of the ratchet. The horizontal lever K L governs all these motions in the following manner, viz. When the string Q *q* K, fastened to the said lever at K, is pulled, the lever, moving on its center M, does, by an horizontal pin fixed at right angles to its side at I, raise the piece H, and consequently release the ratchet by raising the catch at *f* out of the teeth: then the weight descends swiftly, moving the wheel and pinion round by its force; but, to prevent the two swift descent, the lever is pulled up a little more strongly by the guider who holds the string Q *q* K, which brings down the contrary end of the lever L, and consequently the iron N, so low as to make the semicircular ring O P *o* press hard upon the wheel E *p*, which it did not do when the catch was raised but just out of the ratchet. N. B. A strong pull stops the whole motion, and a more gentle one regulates the descent. And, if the guider should be careless and let go the string, then immediately the spring S *s*, whose end *s* had been depressed by the end L of the lever, will raise it up again (by its lateral pin X) and, restoring the whole lever to its first horizontal position, the other lateral pin I, in the long arm M K of the lever, will, through the notch H, press upon I the lower end of the upright piece H, and so bring down the catch F *f* into the ratchet wheel at *f*, the curved piece O P *p* at the same time flying up and no longer pressing the wooden wheel E *p*. Thus will mischief never be the consequence of carelesness, because of the catch; nor will the weight go down by jerks, which would have been the consequence of the catch used without the half-ring, because the catch is lifted quite out of the way, when the half-ring is brought down and applied by pulling the string at Q. N. B. T, *t* 1, *t* 2, is part of the upright section of the timber of the frame.

To make this the plainer, let us examine the *seventh figure* of *plate* XI. where we have an horizontal section of the parts above-mentioned. T *t* T is part of the timber of the frame. B B is the great wheel, whose axle that holds the rope is marked A A A, and its iron axis goes through bell-metal boxes at *a a*. C C is the small wheel or pinion, whose axis is *c c*. D *d* is the section of the ratchet wheel made of iron. Between the pricked lines A *p* and E *i* is supposed the wooden wheel upon the axis of the pinion (not drawn here to avoid confusion, no more than the semicircular pressing piece marked O P *o* in the last figure) the basis of whose upright fixed supporter is represented by R, and the end of the piece which brings it down upon occasion is shewn at N. K L is the horizontal lever, whose center is at M, moving vertically by a pull of the string fastened to it at K. I *i* is the first lateral pin of the lever, which at I goes through the bottom of the piece H, raiser of the catch F *f*, already described with its supporter G, on whose top the catch moves by a center pin. A *p* A is the second lateral pin of the lever, whose office is to press upon the end *s* of the crooked spring S *s* fastened to the bottom of the frame at the farther end S. So that, when the end K of the lever is pulled up, the end L which is depressed, must be lifted up again into its place by the force of the spring restoring itself.

N. B. The crooked figure of the spring, and the manner of its lifting the pin, is best shewn in *fig.* 6.

CRANE, *grus*, in zoology, the name of a genus of birds very tall, and remarkable for the length of their legs and neck. It is supposed by many, that this bird eats fish, but erroneously; the structure of its stomach plainly shews it to be a carnivorous bird, and its flesh is very delicate, and much valued in the Italian markets.

The ingenious Mr. Edwards, in his curious History of Birds, has figured different sorts of Cranes; one of which we shall give our readers. See *plate* XVI. *fig.* 3. It is called the brown and ash-coloured Crane. The bill of this bird has a channel on each side, with the nostrils placed therein; of a black or dusky colour, except the point of the lower mandible, which is light flesh-coloured. The top of the head from the bill to the ear-holes is covered with a bare skin of a reddish colour, thinly beset with black hairs; the sides of the head beneath the eyes, and the under side or throat, are white; the hinder-part of the head and the neck all round are ash-coloured; the bottom of the neck, or beginning of the breast, from ash-colour gradually becomes brown; the beginning of the back and covert-feathers of the wings are also of a light-reddish brown, their tips

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tips being something darker, which forms an agreeable variety; the greater quills are of a blackish brown with white shafts; those that fall next the back are brown, and of a loose, soft texture, whose points extend beyond the prime quills, when the wings are closed. In the lower part of the wing, there passes obliquely above the black quills a whitish ash-coloured plat of feathers; the inner coverts of the wings are ash-colour. The tail-feathers are of a brownish ash-colour. The breast from brown becomes of an ash-colour, which reaches to the covert-feathers of the tail inclusive, growing lighter in its advance backwards, so that the under coverts of the tail are whitish; the lower part of the back, the rump, and upper coverts of the tail are of a light ash-colour; the legs are bare of feathers above the knees, the outer toe is joined a little way to the middle one; the legs, feet, and nails, or claws, are all of a black colour. *Edwards's History of Birds.*

CRANE-*fly*, a name given by some to the creature we commonly call father long-legs, and the authors of histories of insects, tipula terrestris. This creature affords the microscopic observer many curious particulars; but the most remarkable is, the surprizing contraction of the muscular fibres in the legs. These being dissected in a drop of water, and placed before the microscope, the fleshy fibres contract and distend themselves in a manner not to be imagined, and continue this motion for several minutes; and this is constantly to be observed in this insect, and never in any other, so far as has been yet observed. *Lewenhoek, Arcan. Nat.*

The intestines of this creature are also very wonderful, consisting of numberless vessels and organs, which may be seen as plainly by the microscope, as the bowels of larger animals can by the naked eye. The tails both of the male and female are also of an amazing structure; the female's end in a sharp point, with which she perforates the ground, and deposits her eggs under the grass in meadows. *Baker's Microscope.*

CRA'NNY, in the glass trade, a round iron, whereon the workmen in the glass-houses roll the glass, to make the neck of it small. *Neri's Art of Glass, Append.*

CRASSIRO'STRÆ, in zoology, the names of a genus of small birds, distinguished by the thickness of their beaks, as the sparrow, green-fish, and the like. *Ray's Ornithol.*

CRAY-*fishes.* — The delicate flavour of these fish seems to be in a great measure owing to their food. When they have well tasted food, their flesh preserves the relish of it; but, when they feed on other things, they are often rendered of no value, by the flavour communicated to their flesh by them. There are great quantities of these fish in the river Obra, on the borders of Silesia; but the people find them scarce eatable, because of a bitter aromatic flavour, very disagreeable in food. It has been since observed, that the calamus aromaticus grows in vast abundance on the banks of that river, and that these creatures feed very greedily upon its roots. These have a very remarkable bitterness mixed with their aromatic flavour, while fresh, which goes off very much in the drying; and, on comparing the taste of these roots with that of the Cray-fish, there remains no doubt of the one being owing to the other. *Act. Lipsf.* 1690.

CREE'NGLES, in a ship, are small ropes spliced into the bolt-ropes of the sails of the main-mast and fore-mast, into which the bowling bridles are made fast; and are also to hold by when a bonnet is shaken off. *Manwaring.*

Indian CRESS.—The several kinds of this plant are easily propagated, by sowing their seeds in March or April, in a good soil, and warm situation, and should be planted near a hedge or wall, being great climbers, and their lying on the ground being subject to rot them. They flower in June, and continue flowering till October, when the frosts soon destroy the whole plant.

The double-flowered kind produces no seeds, and must therefore be propagated by cuttings of it. This may be done in any of the summer months; but the plants must be carefully preserved in winter, being very subject to rot. If this be confined in pots, and those filled with a poor soil, it will ramble less in the branches, and will produce more flowers. The flowers of this kind, though very beautiful, are not nearly so well tasted in sallads as those of the single kind, which are very warm and agreeable. *Miller's Gard. Dict.*

CRIB, in the English salt works, the name given to a sort of case used in some places instead of the drab, to put the salt into, as it is taken out of the boiling-pan.

These Cribs are like hay racks, wide at the top, and tapering to a narrow bottom, with wooden ribs on each side, placed so close, that the salt cannot easily fall through them. Through these apertures, however, the superfluous saline liquor drains out, and leaves the salt, after a few days, dry enough to be added to the heaps that stand ready for sale. At Limington, and some other places, they use, instead of these Cribs, a sort of wooden troughs with holes in the bottom, through which the saline liquor drains from the salt, and falls into vessels placed underneath to receive it; and in other places they use barrows or wicker baskets, out of which the liquor runs, with great ease, on all sides at once. See DRAB.

CRI'THE, in medicine, a small tubercle, hard, red, and immoveable, seated upon the eye-lid above the cilia, or range of hairs. It is always included in a kind of cyst, and by inflammation degenerates into a thickish matter, from whence frequently proceed intense pains, and various disorders of the sight. It is sometimes seated immediately under the skin of the eye-lid; sometimes it is within, under the muscle. When this tubercle is moveable, it is generally called chalazium, or in English stye, or stithe. *Heister's Surgery.*

CRI'THMUM, *samphire*, in botany, a genus of plants whose characters are: the leaves are thick, succulent, narrow, branchy, and trifid: the flowers grow in an umbel, each consisting of five leaves, which expand in form of a rose: the empalement of the flower becomes a fruit, consisting of two plain and gently striated seeds.

We have but one species of this plant common in England. This plant grows in great plenty upon the rocks near the sea-shore, where it is washed by the salt water; but will not grow to any strength in a garden, though it may be preserved several years, and propagated by parting its creeping roots in the spring. This should be planted in pots filled with gravelly coarse soil, and, in summer, plentifully watered: in this management it will grow tolerably well, and produce flowers; but rarely perfects its seeds in a garden, nor is the herb near so good for use as that gathered from the rocks. This plant is greatly esteemed for pickling, and is sometimes used in medicine.

CRI'ZZELLING, in the glass trade, a kind of roughness arising on the surface of some kinds of glass. This was the fault of a peculiar kind of glass made in Oxfordshire, and some other places, of black flints, a crystallized sand, and a large quantity of nitre, tartar, and borax. The glass thus made is very beautiful, but, from the too great quantities of the salts in the mixture, is subject to crizzel; that is, the salts in the mixture, from their too great proportion, are subject, either from the adventitious nitre of the air from without, or from warm liquors put in them, to be either increased in quantity, or dissolved, and thereby induce a scabrities, or roughness, irrecoverably clouding the transparency of the glass. This was what was called Crizzelling; but by using an Italian white pebble, and abating the proportions of the salts, the manufacture is now carried on with advantage, and the glass made with these salts is whiter than the finest Venetian, and is subject to no faults. *Plot's Oxfordshire.*

CRO'CODILE, *crocodilus*, a very large and terrible animal; its head is broad; its nose like that of a hog; the opening of its mouth monstrously large, reaching even to the ears, and the upper jaw moving in the opening it, which gives it a very terrible aspect. The teeth are large, white, and very numerous, and set by one another, like the teeth of a comb; the legs stand sideways; and the feet are armed with extremely sharp claws. The length of the tail is equal to that of the whole body; the skin of the belly is soft and easily wounded, but that of the rest of the body so hard as to be impenetrable to spears or darts, and is covered with strong prickly scales. The colour is in some a dusky reddish yellow, but in most a disagreeable brown, with a mixture of grey; and even those which, when alive, had much yellowness, always acquire this dusky colour in drying.

It is a very slow and unweildy animal, turning sideways with difficulty; it has an agreeable smell, but is a very terrible creature, tearing to pieces and devouring every living thing that is so unhappy to come in its way.

Its eggs are about the size of a goose egg, and it lays sixty of these for one brood, burying them in the sands, and leaving them for the sun to hatch them. The Crocodile is found in the great rivers of the Nile, the Niger, and the Ganges, and in some other places. *Ray's Syn. Quad. Werm. Musc.*

CRO'CUS, *saffron (Dict.)*— See *Plate* XVI. *fig.* 2, which represents the whole plant with its root, *d*, the flower, *c*, the stamina, or saffron of the shops.—In the Philosophical Transactions, N°. 405, we have the following method of cultivating saffron.

As saffron grows at present most plentifully in Cambridgeshire, and has grown formerly in several other counties of England, the method of culture does not, I believe, vary much in any of them; and therefore I judge it sufficient to set down here the observations which I employed proper persons, in different seasons, to make, in the years 1723, 1724, 1725, and 1728, up and down all that large tract of ground that lies between Saffron Walden and Cambridge, in a circle about ten miles diameter.

In that county saffron has been cultivated; and therefore it may reasonably be expected, that the inhabitants thereof are more thoroughly acquainted with it than they are any where else.

I shall begin with the choice and preparation of the ground; the greatest part of the tract already mentioned is an open level country, with few inclosures; and the custom there is, as in most other places, to crop two years, and let the land be fallow the third. Saffron is always planted upon fallow ground, and, all other things being alike, they prefer that which has borne barely the year before.

The Saffron grounds are seldom above three acres, or less than one; and, in chusing, the principal thing they have regard to, is, that they be well exposed, the soil not poor, nor a very stiff clay, but a temperate dry mould, such as commonly lies upon chalk,

chalk, and is of an hazel-colour; though, if every thing elſe anſwers, the colour of the mould is pretty much neglected.

The ground being made choice of, about Lady-day, or the beginning of April, it muſt be carefully plowed, the furrows being drawn much cloſer together, and deeper, if the ſoil will allow it, than is done for any kind of corn; and, accordingly, the charge is better.

About five weeks after, during any time in the month of May, they lay between twenty and thirty loads of dung upon each acre; and, having ſpread it with great care, they plow it in as before; the ſhorteſt rotten dung is the beſt; and the farmers, who have the conveniency of making it, ſpare no pains to make it good, being ſure of a proportionable price for it. About Midſummer they plow a third time, and, between every ſixteen feet and a half or pole in breadth, they leave a broad furrow or trench, which ſerves both as a boundary to the ſeveral parcels, when there are ſeveral proprietors to one incloſure, and to throw the weeds in at the proper ſeaſon.

To this head likewiſe belongs the fencing of the grounds, becauſe moſt commonly, though not always, that is done before they plant. The fences conſiſt of what they call dead hedges, or hurdles, to keep out not only cattle of all ſorts, but eſpecially hares, which would otherwiſe feed on the ſaffron leaves during the winter.

About the weather we need only obſerve, that the hotteſt ſummers are certainly the beſt: and therewith, if there be gentle ſhowers from time to time, they can hardly miſs of a plentiful crop, if the extreme cold, ſnow, or rain of the foregoing winter have not prejudiced the heads.

The next general part of the culture of ſaffron, is planting or ſetting the roots: the only inſtrument uſed for which is a narrow ſpade, commonly termed a ſpit-ſhovel.

The time of planting is commonly in July, a little ſooner or later, according as the weather anſwers. The method is this: one man with his ſpit-ſhovel raiſes between three and four inches of earth, and throws it before him about ſix or more inches; two perſons, generally women, following with heads, place them in the fartheſt edge of the trench he makes, at three inches diſtance from each other, or thereabouts: as ſoon as the digger or ſpitter has gone once the breadth of the ridge, he begins again at the other ſide, and digging, as before, covers the roots laſt ſet, and makes the ſame room for the ſetters to place a new row, at the ſame diſtance from the firſt as they are from one another: thus they go one, till a whole ridge, containing commonly one rod, is planted; and the only nicety in digging is, to leave ſome part of the firſt ſtratum of earth untouched, to lie under the roots; and, in ſetting, to place the roots directly upon their bottom.

What ſort of roots are to be preferred, ſhall be ſhewn under the fourth head; but it muſt be obſerved in this place, that formerly, when roots were very dear, they did not plant them ſo thick as they do now; and that they have always ſome regard to the ſize of the roots, placing the largeſt at a greater diſtance than the ſmaller ones.

The quantity of roots, planted in an acre, is generally about ſixteen quarters, or 128 buſhels, which, according to the diſtances left between them, as before aſſigned, and ſuppoſing all to be an inch in diameter one with another, ought to amount to 392,040 in number.

From the time that the roots are planted, till about the beginning of September, or ſometimes later, there is no more labour about them; but as they then begin to ſpire, and are ready to ſhew themſelves above ground (which is known by digging a few out of the earth) the ground muſt be carefully pared with a ſharp hoe, and the weeds, &c. raked into the furrows, otherwiſe they would hinder the growth of the plants.

In ſome time after appear the ſaffron flowers; and this leads us to the third branch of our preſent method. The flowers are gathered as well before as after they are full blown; and the moſt proper time for this is early in the morning. The owners of the ſaffron get together a ſufficient number of hands, who place themſelves in different parts of the field, pull off the whole flowers, and throw handful by handful into a baſket, and ſo continue till all the flowers are gathered, which happens commonly about ten or eleven o'clock.

Having then carried home all they have got, they immediately ſpread them upon a large table, and fall to picking out the filamenta ſtyli, or chives, and together with them a pretty long proportion of the ſtylus itſelf, or ſtring to which they are joined; the reſt of the flower they throw away as uſeleſs. The next morning they return into the field again, whether it be wet or dry, weather; and ſo on daily, even on Sundays, till the whole crop be gathered.

The chives being all picked out of the flowers, the next labour about them is to dry them on the kiln. The kiln is built upon a thick plank (that it may be removed from place to place) ſupported by four ſhort legs: the outſide of eight pieces of wood about three inches thick, in form of a quadrangular frame, about twelve inches ſquare at the bottom on the inſide, and twenty-two inches at top; which is likewiſe equal to the perpendicular height of it. On the foreſide is left a hole about eight inches ſquare, and four inches above the plank, through which the fire is put in. Over all the reſt laths are laid pretty thick, cloſe to one another, and nailed to the frame already mentioned; and then are plaiſtered over on both ſides, as are alſo the planks at bottom very thick, to ſerve for an hearth. Over the mouth or wideſt part goes an hair-cloth, fixed to the ſides of the kiln; and likewiſe to two rollers, or moveable pieces of wood, which are turned by wedges or ſcrews, in order to ſtretch the cloth. Inſtead of the hair-cloth, many people now uſe a net work, or iron wire, with which it is obſerved that the ſaffron dries ſooner, and with a leſs quantity of fuel; but the difficulty in preſerving the ſaffron from burning makes the hair-cloth be preferred by the niceſt judges in drying.

The kiln is placed in a light part of the houſe; and they begin by laying five or ſix ſheets of white paper on the hair-cloth, upon which they ſpread the wet ſaffron, between two and three inches thick; this they cover with other ſheets of paper, and over theſe lay a coarſe blanket five or ſix times doubled; or, inſtead thereof, a canvas pillow filled with ſtraw; and, after the fire has been lighted for ſome time, the whole is covered with a board, having a large weight upon it.

At firſt they give it a pretty ſtrong heat, to make the chives ſweat (as their expreſſion is;) and in this, if they do not uſe a great deal of care, they are in danger of ſcorching, and ſo of ſpoiling all that is on the kiln.

When it has been thus dried about an hour, they take off the board, blanket, and upper papers, and take the ſaffron off from that which lies next it; raiſing, at the ſame time, the edges of the cake with a knife; then, laying on the paper again, they ſlide in another board between the hair-cloth and under papers, and turn both papers and ſaffron upſide down; afterwards, covering them (as above.)

This ſame heat is continued for an hour longer; then they look on the cake again, free it from the papers, and turn it: then they cover it, and lay on the weight, as before. If nothing happens amiſs during theſe firſt two hours, they reckon the danger to be over: for they have nothing more to do, but to keep a gentle fire, and to turn their cakes every half-hour, till thoroughly dry: for the doing of which as it ought, there are required full twenty-four hours.

In drying the layer plump chives they uſe nothing more, but towards the latter end of the crop, when theſe come to be ſmaller, they ſprinkle the cake with a little ſmall beer, to make it ſweat as it ought; and they begin now to think, that uſing two linen cloths next the cake, inſtead of two innermoſt papers, may be of ſome advantage in drying: but this practice is followed as yet but by few.

Their fire may be made of any kind of fuel; but that which ſmokes the leaſt is beſt; and charcoal, for that reaſon, is preferred to any other.

What quantity of ſaffron a firſt crop will produce, is very uncertain; ſometimes five or ſix pounds of wet chives are got from one root; ſometimes not above one or two; and ſometimes not enough to make it worth while to gather and dry it. But this is always to be obſerved, that about five pounds of wet ſaffron go to make one pound of dry, for the firſt three weeks of the crop; and ſix pounds during the laſt week; and, now the heads are planted very thick, two pounds of dried ſaffron may, at a medium, be allowed to an acre for the firſt crop, and twenty-four pounds for the two remaining; the third being conſiderably larger than the ſecond.

In order to obtain theſe, there is only a repetition to be made every year of the labour of hoeing, gathering, picking, and drying, in the ſame manner as before ſet down, without the addition of any thing new; except that they let cattle into the field, after the leaves are decayed, to feed upon the weeds; or, perhaps, mow them for the ſame uſe.

About the Midſummer after the third crop is gathered, the roots muſt be all taken up and tranſplanted: the management requiſite for which is the fourth thing to be treated of. To take up the ſaffron heads, or break up the ground (as the term is) they ſometimes plow it, ſometimes uſe a forked kind of hoe, called a pattock, and then the ground is harrowed once or twice over; during all which time of plowing or digging, and harrowing, fifteen or more people will find work enough to follow and gather the heads, as they are turned up.

They are next to be carried to the houſe in ſacks, and there cleaned and raiſed: this labour conſiſts in cleaning the roots thoroughly from earth, and from the remains of old roots, old involucra, and excreſcences; and thus they become fit to be planted in new ground immediately, or to be kept for ſome time, without danger of ſpoiling.

The quantity of roots taken up, in proportion to thoſe which were planted, is uncertain; but, at a medium, it may be ſaid, that, allowing for all the accidents which happen to them in the ground, and in breaking up from each acre, may be had twenty-four quarters of clean roots, all fit to be planted.

The owners are ſure to chuſe for their own uſe the largeſt, plumpeſt, and fatteſt roots; but do leaſt of all approve the longeſt-pointed ones, which they call ſpickets, or ſpickards; for very ſmall round or flat roots are ſometimes obſerved to flower.

This is the whole culture of ſaffron in the country abovementioned; and we have only now to conſider the charges and profits which may be ſuppoſed, one year with another, to attend that branch of agriculture; and of theſe I have drawn up the following computation for one acre of ground, according to the price of labour in this country.

Rent

	l.	s.	d.
Rent for three years	3	00	0
Plowing for three years	0	18	0
Dunging	3	12	0
Hedging	1	16	0
Spitting and ſetting the heads	1	12	0
Weeding or pairing the ground	1	04	0
Gathering and picking the flowers	6	10	0
Drying the flowers	1	06	0
Inſtruments of labour for three years, with the kiln, about	0	10	0
Plowing the ground once, and harrowing twice	0	12	0
Gathering the ſaffron heads	1	00	0
Raiſing the heads	1	12	0
Total charge	23	12	0

This calculation is made upon ſuppoſition, that an acre of ground yields twenty-ſix pounds of net ſaffron in three years; which I ſtated only as a mean quantity between the greateſt and the leaſt; and therefore the price of ſaffron muſt be judged accordingly; which I think cannot be done better than by fixing it at thirty ſhillings per pound; ſince, in plentiful years, it is ſold at twenty, and is ſometimes worth three or four pounds: at this rate, twenty-ſix pounds of ſaffron are worth thirty-nine pounds; and the net profits of an acre of ground, producing ſaffron, will, in three years, amount to fifteen pounds thirteen ſhillings, or about five pounds four ſhillings yearly.

This, I ſay, may be reckoned the net profit of an acre of ſaffron, ſuppoſing that all the labour were to be hired for ready money: but, as the planter and family do a conſiderable part of the work themſelves, ſome of this expence is ſaved: that is, by planting ſaffron, he may not only reaſonably expect clear about five pounds yearly per acre, but alſo to maintain himſelf and family for ſome part of each year: and it is upon this ſuppoſition only, that the reſult of other computations can be ſaid to have any tolerable degree of exactneſs; but the calculations themſelves are undoubtedly very inaccurate.

I have ſaid nothing here concerning the charge in buying, or profits in ſelling the ſaffron heads; becauſe, in many large tracts of ground, theſe muſt at length balance one another, while the quantity of ground planted yearly continues the ſame; which has been pretty much the caſe for ſeveral years paſt.

Crocus *antimonii*, the name given, in the late London Diſpenſatory, to the preparation of antimony and nitre, commonly known by the name of Crocus metallorum. It is made of equal parts of antimony and nitre, powdered fine, and thrown, at times, into a red-hot crucible, and, when thoroughly melted, poured out, and ſeparated from its ſcoriæ. This looks more yellow, the longer it has been melted: it is but little uſed, except among horſes; but, when intended for internal uſe among men, ſhould be procured, faithfully prepared in this manner: for our chemiſts generally abate of the nitre to ſave charges, and render the medicine of a very different effect. *Pemberton's Lond. Diſ.*

Crocus *martis*, ſignifies alſo a chemical preparation, uſed by the glaſs-makers, to give a red-colour to glaſs. The glaſs-makers prepare this themſelves, and have four ways of doing it. The firſt is this: take filings of iron, mix them with three parts of powdered brimſtone, and keep them in a melting-pot, in a furnace, to calcine, and burn off the ſulphur; let them ſtand four hours in this ſtate, then take them out, and, when cold, powder and ſift them, and put the powder into a crucible, which lute over, and ſet in the leer of the furnace for fifteen days, or more; it will then be of a reddiſh purple, and muſt be kept for uſe. *Neri's Art of Glaſs.*

The ſecond way of making this, is by ſprinkling filings of iron with ſtrong vinegar, and ſetting them in the ſun to dry; when dry, powder and ſift them, and wet them again with vinegar, and, when dry, powder them again. Repeat this eight times, and then powder the whole, and ſift it fine for uſe.

The third way is to uſe aqua-fortis, inſtead of vinegar, in the ſame manner.

The fourth way, which is the beſt of all, is this: diſſolve filings of iron in aqua-regia, and let the ſolution ſtand three days in a veſſel cloſe ſtopped, ſhaking it about at times; then evaporate the liquor gently, and there will remain a moſt valuable Crocus martis. *Neri's Art of Glaſs.*

CRO'PPER, or *Dutch* Cropper, the name of a particular ſpecies of pigeon, called the columba gutturoſa Bataviæ, by Moore. It is naturally thick, and has its name from its large crop, or bag of wind, which it carries under its beak, and can, at pleaſure, either raiſe, or depreſs. Theſe are thick bodied and ſhort; their legs are alſo thick and ſhort, and are feathered down to the feet; the crop is large, and hangs low; the feathers on the thighs hang looſe; and their legs ſtand wide; they are gravel-eyed, and are generally very bad breeders.

There are of theſe pigeons of all colours, and thoſe who are careful of them, generally take them away from their proper parents, while young, and breed them under the females of other ſpecies. *Moore's Columbarium.*

CROPS *of corn.* The great buſineſs of the farmer is to produce the largeſt Crops he can, and, at the ſame time, to injure his land the leaſt. The common way of ſowing exhauſts the whole land, without giving half the nouriſhment it might give to the corn. Inſtead of the ſcattering way of ſowing corn by the hand, if it be let in with the drill, in ſingle, double, treble, or quadruple rows, and an interval of five feet of naked ground be left between theſe ſeries of rows, the uſe of horſe-hoeing in theſe intervals will be found to give all that the farmer requires: the Crop will be larger, though ſo great a quantity of ground is left vacant, than if all were ſoon over, as the plants will ſtand vaſtly thicker in the rows, and will have twenty or thirty ſtalks a-piece; and the more the ſucceſſive Crops are planted, and the oftener the ground is hoed in this manner, the better will the plants be maintained, and every Crop will be larger and larger from the ſame ground, without dunging, or without changing the ſort of plant, as is uſually neceſſary in other caſes. See AGRICULTURE.

This is very evident in ſeveral parts of the ſame field, where this ſort of huſbandry has been entered upon at different times; and ſome have a firſt crop, others a ſecond, and others a third, all growing up at the ſame time, the older worked land always invariably ſhewing the beſt crop. Dunging and fallowing are both neceſſary to recover land to its virtue, in the common way, after a few Crops. Theſe are both of them expences to the farmer; but the horſe-hoeing, when the corn is ſown in rows, anſwers all the intent of them, and is much leſs expenſive. It has, in ſhort, every year, the good effect of a ſummer fallow, though it every year produces a good crop, and no time, or uſe of it, is loſt to the farmer. *Tull's Horſe-hoeing Huſbandry.*

CROSS *Hairs*, in a teleſcope, are hairs drawn a-croſs the focus, for making more accurate obſervations.—In order to determine the right aſcenſions, &c. of the ſtars, it is requiſite to have four Croſs hairs in the focus of the teleſcope; of which *a b* (*Plate* XV. *fig.* 13.) and *c d* croſs at right angles, as alſo *e f* and *g h*; which are inclined to the two former in half right angles; and all croſs one another at the point *i*. Then having directed the teleſcope to make the preceding ſtar appear upon the hair *a b*, and having turned the teleſcope about its axis till the ſtar moves along *a b*, let it remain fixed; and obſerve by a pendulum clock the time of this ſtar's appulſe to the center *i*; and alſo the time of the ſubſequent ſtar's appulſe to the perpendicular hair *c d*. The interval of time between theſe appulſes to the hair *c d*, which coincides with part of an hour circle, being turned into degrees and minutes, gives the number of them contained in the correſponding arch of the equator that paſſed over the ſaid hour circle; which arch is the difference of the right aſcenſions of the ſtars. To find the difference of their declinations, the times of the ſubſequent ſtar's appulſes at *k* and *l* to the oblique hairs *e f*, *g h*, muſt alſo be obſerved; half of which is the time it ſpends in deſcribing half the line *k l*, that is, *m k* or *m l*. This half, being converted into minutes of an arch, gives the number of them contained in the correſponding arch of the equator that paſſed by the fixed hour circle *c d* in that time; and this number, being diminiſhed in the ratio of the radius to the ſine complement of the given ſtar's declination, gives the difference of their declinations, or the number of minutes in the arch *m i*. This rule may be eaſily demonſtrated, and is ſufficiently accurate, though the ſine complement of the given ſtar's declination is uſed inſtead of the ſine complement of the unknown ſtar's declination, becauſe their difference is but ſmall, in compariſon to the whole.

Signor Caſſini who firſt introduced this uſeful and accurate method of obſerving by 4 hairs, has ſhewn us how he applies it to determine all the particulars obſervable in eclipſes. See Phil. Tranſ. Numb. 236. It has one great advantage, that the obſervations are not liable to the uncertainty of the air's refraction. For, the teleſcope being fixed, all objects that appear in it, having nearly the ſame altitudes, are equally refracted very nearly; it is therefore the beſt method of obſerving the places of Mercury and Venus, or any other of the planets and comets, when near the ſun, and by conſequence but little elevated in the night time, as Dr. Halley has obſerved, Phil. Tranſ. Numb. 366. Where ſpeaking of the accuracy of this way of obſerving, he tells us, 'that he himſelf was preſent when Dr. Pound and his nephew Mr. Bradley did this way demonſtrate the extreme minuteneſs of the ſun's parallax ſo exactly, that, upon many repeated trials, it was not more than 12″ nor leſs than 9″. Theſe obſervations may be ſeen in the Phil. Tranſ. Numb. 363; from which Dr. Halley calculated the parallax by Caſſini's method (deſcribed in his book upon the Comet in 1680) which is very well explained in the 7th of Mr. Whiſton's aſtronomical Lectures.

The only trouble, in this way of obſerving, lies in turning the teleſcope about its axis in ſuch a poſition, that the ſtars ſhall move parallel to one of the hairs. But this difficulty is entirely removed, though the teleſcope be never ſo long, by a very pretty contrivance, invented by that ingenious and accurate aſtronomer the reverend Mr. James Bradley, Savilian profeſſor at Oxford. As near as I can remember, it is this: Let ABC (*Plate* XVII. *fig.* 4.) repreſent a flat ring of braſs fixed in the focus of the teleſcope; and *a b c* a ſmaller concentric ring lodged in a circular groove turned within the larger, and kept in the groove by three ſmall plates of braſs fixed to the

the outward ring and extended over the edge of the inner one. Upon the inner ring is fixed a concentric arch of a wheel *d e*, having teeth cut in its convexity, which are driven round by the threads of an endless skrew, whose axis D E F turns in a collar at E and upon a point at F, both fixed to the outward ring. The hairs *g h*, *i k*, cross at right angles in *f* the center of the rings, and, when the telescope is so fixed that the image of a star falls upon *f*, let it move along any line *f q*, and by turning the skrew D E F and by consequence the hair *f k* about the fixed point *f*, till it touches the star at *q*, it will then coincide with the tract of the star's motion; and then all other stars will move parallel to it, as was required.

To find the difference of declination of two stars, he observes the times of their appulses to the edges of two slender brass bars *g i o*, *g k p*, fixed to the inner ring, and equally inclined to its diameter *g h* in such angles that the perpendiculars *f i*, *f k*, on each side of *f g*, shall be severally equal to half *f g*; and consequently that the whole base *i k*, of the equicrural triangle *i g k*, shall be equal to its perpendicular height *f g*; and by consequence that the difference of any two bases *i f k*, *l m n*, shall be equal to *f m*, the difference of their height; so that the difference of the times of the transits of two stars over these bases may give the difference of their declinations. *Smith's Optics.*

CROSS-*trees*, in a ship, cross pieces of timber set on the head of the mast, and bolted, and let into another very strongly. They are four in number, and are generally called Cross-trees, but, strictly speaking, only those which go thwart ships, are Cross-trees; the other, in the largest ships, are called treisle-trees. Their use is to keep and bear the top-mast up; for the foot of the top-mast is always fastened into them, so that they bear all the stress. They also bear the tops, and are necessary to all masts which carry any other top or flag-staff. *Manwayring.*

CRU'CIBLE (*Dict.*)—These vessels, so much used by assayers, &c. are best made of a pure and well washed clay, with an admixture of the purest sand, powder of flint, or the powder of other broken Crucibles, which have already sustained a great fire, and are very clear. They are formed in wooden, or brass moulds, divided longitudinally into two parts, and to be disjointed or put together again at pleasure: for this purpose also a broad iron ring is adapted to the outside of the mould, in such manner, that the two sides are kept firmly together, while this ring is on, and fall asunder, as soon as it is taken off. This mould, however, gives only the outer shape of the Crucible; its cavity must be made by a pestle, or other similar instrument. See *plate* XVII. *fig.* 7.

When the vessels are to be made, the ring is put upon the mould, and the whole set upon a strong support: then the cavity of the mould is to be filled with the matter very stiff; this is to be pressed down first with the fingers, or with a stick, making a hollow in the middle, and leaving the edges of the matter above the sides of the mould; then apply to this hollow the pestle, rubbed over with the fat of bacon, and drive it in with several strong strokes of a mallet: then take away the pestle, and, taking the ring off from the mould, the Crucible is taken out perfect, and finished, and is to be dried, and baked in a potter's kiln. See Sections of these moulds, *plate* XVII. *fig.* 5, 6.

If, from the too great moisture of the matter, when put into the mould, or from any inequalities or roughnesses in the mould, the Crucible will not readily separate from its sides, as soon as made, place the mould, in a dry warm place, for a few minutes, and the vessel will, after that, come out easily.

In the making these vessels, a sufficient quantity of the matter must always be put at once into the mould; for, if you add to the matter once compressed a new lump of the same, it will not cohere with the first. If the matter be put into the mould in small masses, not moulded thoroughly together first by handling, these never cohere neither; but the vessel, when finished, will be full of chinks and pores, which, though not to be discovered either by the eye, or by the sound of the vessel when struck, yet let the salts in fusion pass through them.

If these vessels are not made with a large bottom, the concave mould must not be greased; for, if it be, the vessel comes out of it with the pestle, and sticks so firmly to it, as not to be got off without breaking. *Cramer's Art of Ass.*

CRU'CIFORM *Flowers*, in botany, a term for such flowers as are composed of four leaves, disposed in form of a cross. Some of these flowers have a cup, others have not; those which have cups, usually have them composed of four leaves, and placed in the same order and direction with those of the flower. Of this class of plants are the cabbage, rocket, wall-flower, &c. *Tourn. Inst.*

CRU'ISERS, in the navy, are small men of war, made use of to and fro in the channel, and elsewhere, to secure our merchant-ships, and vessels, from the enemy's small frigates and privateers. They are generally such as sail well, and are commonly well manned: and, indeed, the safety of the trade in the channel, and up and down the soundings, and other places, absolutely requires the constant keeping out of such ships at sea.

CRU'STA, *crusta lactea*, in surgery, signifies a crust of scabby ulcers, apt to affect the faces of children. The cure of it depends principally on regulating the diet of the nurse, and giving her gentle purges, and sweating powders; the infant ought also to take at times a few gentle doses of physic, and, in the intervals, between the purges, to take powder of crude, or diaphoretic antimony, with flour of brimstone, and crab's claws, and other of the testaceous powders. When this method has been pursued for some time, the parts may be anointed with cream, with a small quantity of chalk, or cerus, mixed in it, or with a mixture of oil of eggs, with a small quantity of oil of bricks. Ointments of mercury, or sulphur, are very dangerous in the beginning of this disorder, or to weakly infants; and, when such have been used by ignorant persons, the best method to be taken is the endeavouring to throw out the humour again by sudorifics. *Heister's Surgery.*

CRY'STALS, (*Dict.*)—The original coalescence and formation of those bodies of which spar is the basis, we well know may have been but of yesterday, since we have evident proofs, that spar is concreting to this day, and that sparry bodies are forming every moment. This is evident, from the sparry stalactitæ in the arches of modern buildings, particularly in one so lately built as the new bridge at Westminster, the roofs of the arches of which were filled with these spars, within a year after the arches were built; and there are evident proofs, that spars are not made of matter educed from stone, since brick arches equally abound with them; and the brick vault which supports part of the ground terrace at Windsor, has been of late so full of them, that there was not room to walk for them.

From these observations, as also those of the sparry incrustations round vegetable and other bodies in spring, and at the bottoms of our tea-kettles being all incrusted with it; we have evident proof, that sparry bodies are formed to this day, but we have no such clear evidence of the present growth of Crystal. Whether or not it is so, however, we may be led by a few propositions to prove, by the only sure test, experiments,

1. If crystallized spar can be at this day dissolved in water, or suspended in it, in their minima or ultimate particles, and again separated from it, these stony or other fossils, composed of Crystal and spar, may be formed at this day; if these bodies are not thus dissolved, they cannot.

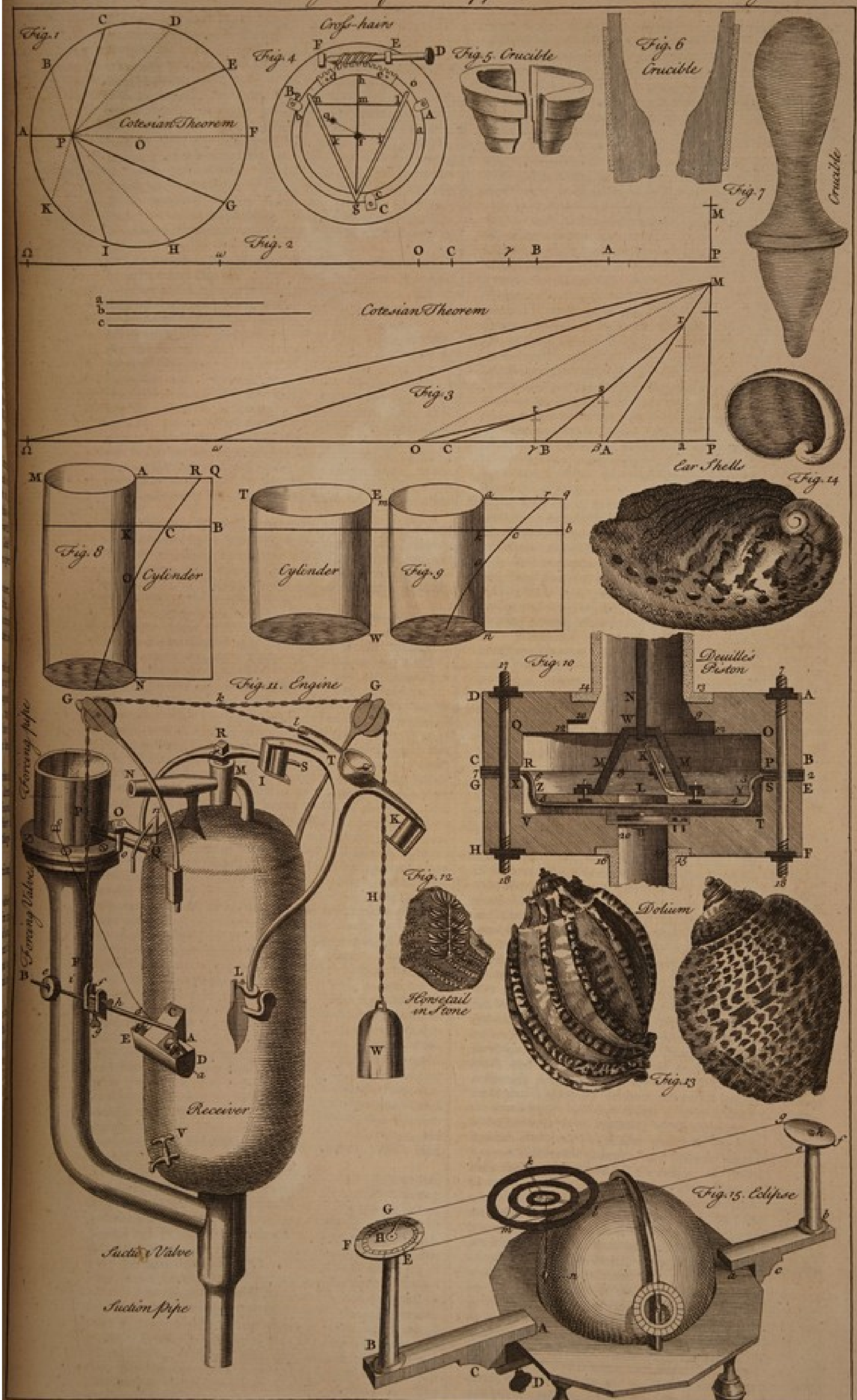
2. If Crystal and spar can be raised in vapour, or suspended in effluvia, then crystalline and sparry concretions may at this day be formed in places where water cannot be supposed to have come: if they cannot be thus suspended, then the Crystals and spars found in such places cannot have been formed at this day, but must have been there from some distant time.

The subject of enquiry is by these propositions reduced to a narrow compass; and all that experiments have to determine is: 1. Whether Crystal or spar are at this time found suspended in water, in imperceptible particles, or whether they are not; and 2. If they are thus suspended, whether they are or are not capable of being raised in vapour?

These things Dr. Hill has been at the pains to determine, by a great number of experiments.

The bottom of every tea-kettle, as has been before observed, informs us, that some solid fossil body is suspended in imperceptible particles in all, even the clearest water, and is easily separated from it by no other agent than heat; as heat therefore is found capable of separating this substance, and no other agent that we know of is so, that is the natural means to be used in the investigation of the subject.

The substance incrusting tea-kettles, &c. is found to be a genuine spar, with a greater or lesser admixture of earth, and is wholly the same with the incrustation on vegetables in springs, &c. Here, therefore, is a proof of spar and earth being suspended in common water, but none of Crystal. This was alone to be determined by repeated and cautious distillations. In distilling the water of the same spring, with different degrees of fire, a different quantity of matter was found at the bottom of the vessel. It appeared hence, that, in a greater degree of heat, a great part of the matter had been raised in vapour, and the remainder, on trial, always proved to be only spar and earth. Here, were therefore, both the questions answered in the affirmative, in regard to spar, viz. that it is continually suspended in water, and may be raised in vapour. The water of these distillations being returned into the cucurbit, and re-distilled, leaves a second sediment in small quantity, and of a white colour. This, being examined according to the known laws of fossils, proves to be part spar, and part Crystal, and undissolved powder remaining from it, after pouring on aqua-fortis to take up the spar; and this in all tests appearing to be true and perfectly pure Crystal. A third distillation of the same water produced not the least residuum. Hence, therefore, it is evident, that Crystal, as well as spar, is continually suspended in water, and may be raised in vapour, and separated by no other agent than heat. And hence the conclusion is plain, that crystalline as well as sparry bodies may be, and doubtless are, continually formed in the earth to



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this day, and need not be supposed all of as old a date as the creation or deluge. *Hill's Hist. of Foss.*

Having thus from experiments gone through the history of what may be the origin of many of the crystalline bodies we daily meet with, it remains to say something of their form.

The perfect regularity of the figures of Crystals cannot but be the effect of some fixed, permanent, and invariable cause; these being ever, unless altered by accidents, which rarely happens, the very same in the same genus. The antients esteemed Crystal a congelation of water, and thought it only ice harder than ordinary. Signior Lana, who had an opportunity, in the Valsabbia, of seeing many of the perfect double kinds, imagined, that they owed their origin to dews congealed by nitrous exhalations. Rohault imagines the figure of common Crystal the effect of six drops of water thrown together.

Others are for its being formed of radiations, others from all its parts being like the whole; and others from the mutual tendency of the parts of it towards the same center. But all these the laws of action in matter, and the structure of Crystal in the several species, easily shew to be erroneous.

Many think they have solved all difficulties, when they say, that Crystals are salts; but we know no more of the true figures of salts, than we do of those of Crystals. And it is to be added, that, if Crystals are salts, then salts are something else from what we have been taught to think they are, Crystals by no means answering to the definitions given us of them by authors. As we yet know so little of the causes of the regular crystallizations of salts, why are we to suppose no other bodies but salts capable of such crystallizations; and why may not the same almighty agent, who has implanted, in the minima of saline bodies, a tendency to these their several appropriated forms, have allowed the same tendency to other bodies?

How it is, that Crystal, in its smallest concretions, obtains its determinate figure, according to the genus it is of, is assuredly yet to us unknown; but how it is enlarged afterwards, yet still kept in its same form, seems not so difficult to be accounted for, and may indeed be traced from observations of the several bodies in their present state.

We are not to doubt, but that the smallest concretions are regularly formed in all Crystals, according to their kinds, and we see the smallest that even the microscope can discover to us, regularly are so. These are formed, among water or vapour, solid with the same particles, and only wanting a slow evaporation to part them from the water or vapour.

These particles, though, when collected in a body, they be more than twice the specific gravity of water, yet, while suspended in a vast proportion of water, attract the particles of the water more strongly than they do one another, and hence give way to that repulsive power so well known in nature, which is properly the effect of another attraction, by which all things are made to ascend in water, which are less than water attracted by the gravitating power of the earth: the particles of Crystal therefore, attracting the particles of water more strongly than one another, recede from one another, as far as the quantity of water they are suspended in will permit. When this quantity of water is so far evaporated, that the particles of Crystal are nearer to one another, and brought within the verge of one another's attraction, they become more attracted by one another, than by the particles of water, and thence form concretions. This they usually do in many parts of the same fluid at once; and hence it is, that we usually find many shoots in the same place. The whole crystalline matter might now be expected to form itself into these small concretions: but there is now a new law or power established in the evaporating fluid; for these small aggregates of bodies, now formed in separate concretions, attract the particles yet suspended in the fluid, more than they do one another: hence they naturally become applied to these, and, being every way equally extended over them by the ambient fluid, they no way alter their first figure, while they ever so much increase their bulk. And it is evident, from examining the columns of Crystals, which are ridged and striated across, while their pyramids are all smooth, that this new matter has ever been added to the pyramidal planes, and thence extended down the sides of the columns. *Hill's Hist. of Foss.*

When any piece of workmanship in Crystal is become foul and dark, the method of recovering its lustre, without hurting its polish, is this: mix together six parts of common water, and one part brandy; boil these over a brisk fire, and let the Crystal be kept in it, in a boiling state, a quarter of an hour, then take it out, and rub it carefully over, with a brush dipped in the same liquor; after this, it is not to be left to dry of itself, but to be wiped with a clean napkin, and its surface will by this means be perfectly cleansed, and rendered as bright as at first, without that injury to the points of the cutting, or to the surfaces of the planes or facets, which would naturally have been the consequence of doing it by mere rubbing or wiping. Natural Crystal may be reduced, by calcination, into the state of the bodies proper for making glass with alkaline salts, and makes a most fine and valuable fritt. The method of doing it is this: calcine natural Crystal in a crucible; when it is red-hot, throw it into cold water to quench it; repeat this eight times, covering the crucible, that no dust or ashes may get in and mix with the Crystal; dry this calcined mass, and reduce it to an impalpable powder; mix this powder with the pure salts of polverine, and with these make fritt, in the usual proportions, and with the common quantity of manganese; wash this often in cold water, and, after a proper time, work it; it will yield a most beautiful glass. *Neri's Art of Glass.* See FRITT.

Natural Crystal may be coloured of several colours, without melting or running it into glass, in the following manner: take a number of pieces of fine, clear, and pure Crystal of various sizes, of crude antimony and crude orpiment in powder, of each two ounces; sal armoniac one ounce; powder this also, and mix them well together; put this powder into a strong crucible, and lay upon it the pieces of Crystal in their natural state; then cover this crucible with another, mouth to mouth: lute them well, and, when the lute is dry, set them in coals, which kindle by little and little; and, when they begin to fire, let them kindle of themselves, and, they will then smoke very much. Let this be done in a large chimney, taking care to avoid the fumes. When it fumes no more, let the fire go out of itself, and all stand till cool; then unlute the crucible, and take out the Crystals; those at top will be coloured to a fine yellow, with a deep and pale red, the colours of the common fine and balass ruby, with beautiful spots; and those which be at the bottom upon the powder, will be of a watery colour, mottled like that of the viper. This Crystal comes out so fair from this process, that it may be cut as a gem, and, though many are spoiled, yet in making a large quantity, there are always some fair and perfect. *Neri's Art of Glass.*

Prepared Crystal, a term among the makers of counterfeit gems, for a powder of natural Crystal, made for their purpose. The manner of preparing it is as follows: take the purest and clearest natural Crystal, put it into a crucible covered at the top; set it among burning coals; let the Crystal be made red-hot, then plunge it into a large vessel of cold water. When the Crystal is cold, put it into the fire again, heat it red-hot, and quench it again; and repeat this operation twelve times, carefully keeping ashes or any other foulness out of the crucible. When the calcination is finished, the Crystal will be brittle and crumbly; powder it, and levigate it on a porphyry to an impalpable powder. This powder must be made perfectly fine, otherwise the gems made with it will be all foul and coarse; and no brass or copper vessels must be used about the operation. If the Crystal should be powdered in a brass or bell-metal mortar, there could be nothing but an emerald be made of it, from the quantity of copper it would take up in the powdering. When carefully prepared, it receives all the colours of the gems, by proper additions, and affords a mass softer indeed, but not less bright and pellucid, or not less beautifully tinged than the finest of the oriental gems. *Neri's Art of Glass.*

CRYPTOGA'MIA, in botany, a class of plants whose flowers are either wholly invisible, or scarce discernable by the eye.

CU'BITUS, (*Dict.*) — *Fractured* Cubitus. The lower part of the arm, which is called the Cubitus, contains two bones, the radius and ulna: fractures of this part, therefore, sometimes happen only to one, sometimes to both those bones, and that sometimes near their extremities, but oftener toward their middle: but, when they are both broke together, the bones are not only very easily distorted from each other, but they are not to be replaced without a great difficulty also: if one should, on the contrary, be broken while the other remains whole, the fractured parts do not much recede out of their places, nor are they very difficult to reduce and retain; for the bone, remaining sound, is found, in this case, to be a better direction and support than either splinters or bandages. When the fracture happens towards the lower head, near the pronator quadratus muscle, the fractured part is strongly drawn by that muscle, and the intervening ligament that is extended between the radius and ulna, toward the sound bone; and this makes it more difficult to replace. If the radius is to be replaced, whose fragment is contracted towards the ulna, an assistant must hold the arm, while the surgeon inclines the patient's hand towards the ulna, to draw back the contracted parts of the radius. When this is done, he must carefully reduce them by compression on both sides with his hands, so as to restore the compressed muscle between the radius and ulna, and the fragments of the radius, to their proper places. The arm is then to be bound up with the proper bandage, and the limb must afterwards be placed in a sort of case made of paste-board, or light wood, to be suspended in a sling put about the neck.

In setting a fracture of the ulna, the whole method must be the same with this of the radius, except that, in the extension, the hand must be bent toward the thumb, and radius, before the distorted part of the ulna can be compressed into its proper place. When both bones of the Cubitus are broken, the method of cure is much the same with that used to each of them, when broken singly; but there is required more strength and circumspection, both in the replacing them, and a great deal of caution in applying the bandage to retain them. Care must

muſt alſo be taken, that, while the arm continues in this caſe a great while, without motion, the mucilage of the joint does not harden, or the ligament become ſtiff, and the arm, or Cubitus, be thereby rendered immoveable. To guard againſt this, it will be proper to unbend the arm once in two or three days, and to move it a little carefully and gently, backwards and forwards, and ſometimes to foment it with warm water or oil; by which means its motion will be preſerved. *Heiſter.*

Luxated CUBITUS. The Cubitus conſiſting of two bones, the ulna and radius, is articulated by a gynglymus; and the connection of theſe bones is ſuch, that the ulna, or Cubitus, as being the largeſt bone, and ſeated in the lower part of the arm, does of itſelf perform the whole flexion, and extenſion of the arm, yet it cannot perform thoſe motions without carrying the radius along with it; but, on the other hand, the radius may be turned along with the hand both inward and outward, without at all moving or bending the ulna, as when the pronation and ſupination of the hand are made thereby. Both theſe bones of the Cubitus are ſo articulated with the lower head of the os humeri, that large protuberances are received into deep cavities, or grooves, and the whole inveſted and faſtened with exceeding ſtrong ligaments; ſo that, notwithſtanding the Cubitus may be luxated in all four directions, outward or inward, backward or forward, yet it is but ſeldom that it ſuffers a perfect or intire diſlocation, unleſs the upper part of the ulna be broken, or the ligaments of the Cubitus much weakened by ſome great external violence. The ſlighter and more recent luxations of this kind are, the more eaſy is the reduction of them. Be the caſe better or worſe, however, the patient muſt be placed in a chair, and both parts of the limb, the humerus and the Cubitus, muſt be extended in oppoſite or contrary directions, by two ſtrong aſſiſtants, till the muſcles are found pretty tight, with a free ſpace between the bones: then the luxated bone muſt be replaced, either with the ſurgeon's hands alone, or with the aſſiſtance of bandages, that the proceſſes may fall into their ſinuſes; and, when this is done, the Cubitus muſt be ſuddenly bent. But, if the tendons and ligaments are ſo violently ſtrained that they can ſcarce perform their office, it will be proper to anoint them with emollient oils, ointments, and the fat of animals; or to apply emollient cataplaſms and fomentations. As ſoon as the reduction has been effected, the articulation muſt be bound up with a proper bandage, and the arm afterwards ſuſpended in a ſling hung about the neck. But care muſt be taken that the bandage is not kept on too long, nor the arm kept intirely without motion all the time, but the mucilage of the joint ſhould become inſpiſſated, and the articulation rendered, by that means, ſtiff, or the motion of the part be intirely loſt. To prevent this, it will be proper to undo the bandage every other day, and gently to bend and extend the limb: afterwards, compreſſes dipped in warm wine may be applied, and held on with the bandage. *Heiſter's Surg.*

CUCU'RBITA, *the gourd*, in botany, a genus of plants whoſe characters are:

It hath a flower conſiſting of one leaf, which is of the expanded bell-ſhape, for the moſt part ſo deeply cut, that it ſeems to conſiſt of five diſtinct leaves: this, like the cucumber, has male and female flowers upon the ſame plant: the fruit of ſome ſpecies is long, of others round or bottle-ſhaped, and is commonly divided into ſix cells, in which are contained many flat oblong ſeeds, which have ſometimes a border round them.

There are ſeveral varieties of this plant, which are annually brought from America, where are numberleſs varieties of theſe, and of pumpkins and calabaſhes: but theſe ſorts are ſo apt to ſport, that there is no certainty of their producing the ſame ſhaped fruit for two years together, unleſs it is that with the long fruit, which I do not remember to have ſeen change or alter; but all the others will run from one ſhape to another, ſo as rarely to produce the ſame as thoſe which the ſeeds were ſaved from.

They may be all propagated by ſowing their ſeeds in March, on an hot bed; and, when the plants come up, they ſhould be tranſplanted on another moderate bed, where they ſhould have a great deal of air to ſtrengthen them; and, when they have got four or five leaves, they ſhould be tranſplanted into holes made upon an old dunghil, or ſome ſuch place, allowing them a great deal of room to run; for ſome of the ſorts will ſpread to a great diſtance. I have meaſured a ſingle plant, which had run upwards of forty feet from the hole, and had produced a great number of ſide branches; ſo that if the plant had been encouraged, and all the ſide branches permitted to remain, I dare ſay it would have fairly overſpread twenty rods of ground: which, to ſome people, may ſeem like a romance; yet I can affirm it to be fact. But what is this to the account printed in the Tranſactions of the Royal Society, which was communicated to them by Paul Dudley, Eſq; from New England, wherein mention is made of a ſingle plant of this kind, which, without any culture, ſpread over a large ſpot of ground, and from which plant were gathered two hundred and ſixty fruits, each, one with another, as big as an half peck. *Miller's Gard. Dict.*

CU'CULUS, *the cuckow*, in ornithology, a bird well known in England, by the ſingularity of its note; its beak is long and ſtrait, only it is a little hooked at the end, of a blackiſh brown above, and of a yellowiſh white below; its mouth is yellow within, and the iris of its eyes of a hazel colour; its noſtrils round, open, and ſtanding out beyond the ſurface of the bill, by which mark alone, it is to be diſtinguiſhed from all other birds; its throat, breaſt, and belly, are white, variegated with tranſverſe ſtreaks of brown; the feathers of its head are brown, with white edges, and its rump is grey; its back, neck, and wings, are of a browniſh hue; its long wing feathers have white tips, and are variegated with black, brown, and white; and the tail feathers are beautifully variegated with white. Its feet and legs are yellow. Its food is caterpillars, and other inſects. *Ray's Ornith.*

It never builds itſelf a neſt, but ſeizes upon that of any other ſmall bird, and, deſtroying its eggs, leaves its own in their place.

Whether it hides in hollow trees, &c. during the winter, with us, or whether it leaves us for a warmer climate, is not certainly known. It is pretended that many have been found in hollow trees, but the truth of it has never been well atteſted.

CU'CUMBER, *cucumis*, in botany, a genus of plants whoſe characters are:

It hath a flower conſiſting of one ſingle leaf, which is bell-ſhaped and expanded towards the top, and cut into many ſegments; of which ſome are male or barren, having no embryo, but only a large ſtyle in the middle, which is charged with the farina: others are female or fruitful, being faſtened to an embryo, which is afterwards changed into a fleſhy fruit, for the moſt part oblong and turbinated, which is divided into three or four cells incloſing many oblong ſeeds.

To raiſe Cucumbers you muſt provide in January a quantity of new horſe-dung, with the litter mixed together, in proportion to the number of plants you intend to raiſe, which, if for a private family, two loads will be full enough: this ſhould be thrown into an heap, mixing a few ſea coal aſhes therewith; in about four or five days after, the dung will begin to heat, at which time you may draw a little part of the heap on the outſide flat, laying thereon a little good earth, about two inches thick; this you ſhould cover with a bell-glaſs, laying a little dry litter thereon: and in a day or two after, when you perceive the earth to be warm, you muſt put your ſeeds therein, covering them, about a quarter of an inch, with the ſame earth; then put the glaſs on again: and alſo at night, or in bad weather, obſerve to cover the glaſs with dry litter or mats, &c. and in three or four days time, if the dung be in a good temper of heat, the plants will appear above ground; which when you firſt obſerve, you muſt immediately with the adjoining heap of dung make a bed for one ſingle light, being careful not to take the dung away too cloſe to the bell-glaſs, but obſerving to lay a little dung round about it, as alſo to keep it covered, that the young plants may not receive a check thereby. This hot bed will require to be three feet thick in dung at leaſt, which, in the making, ſhould be carefully mixed, and beat pretty cloſe with the fork, to prevent the heat from being too ſudden and violent: then lay ſome freſh earth upon the dung, about three inches thick, levelling it very even, and put on the frame, covering it over in the night, or in bad weather, with a mat, &c. as before, in order to excite an heat in the bed; and, as ſoon as you perceive the bed to be in a good kindly temper of heat, you ſhould prick your young plants thereon, at about two inches diſtance each way, obſerving to put them into the earth almoſt up to their ſeed leaves.

If the bed is of a good temper of heat, your plants will take root in leſs than twenty-four hours; after which time you muſt be careful to let in a little air, at ſuch times when the weather will permit, as alſo to turn the glaſs upſide downwards every day to dry; for the ſtem of the bed, condenſing on the glaſſes, will fall down upon the plants, and be very injurious to them; and, therefore, whenever the weather is ſo bad as not to permit the glaſſes to lie turned long, you ſhould at leaſt turn them once or twice a day, and wipe off the moiſture with a woollen cloth; but you muſt alſo be very careful how you let in too much cold air, which is equally deſtructive to the tender plants; therefore, to avoid this, it is a very good method to faſten before the upper ſide of the frame, where the air is ſuffered to enter the bed, a piece of a coarſe cloth, or a mat, ſo that the air which enters, may paſs through that, which will render it leſs injurious to your plants.

You muſt alſo be very cautious in giving water to the plants, while young; and, whenever this is done, it ſhould be ſparingly, and the water ſhould be placed either in the heap of dung, or in ſome other warm place, for ſome time before it is uſed, ſo as to be nearly of a temperature for warmth with the incloſed air of the hot bed; and, as the plants advance in height, you ſhould have a little dry ſifted earth always ready, to earth up their ſhanks, which will greatly ſtrengthen them.

These

These directions, if carefully attended to, will be sufficient for raising the plants in the first bed: you must therefore, when you perceive the third or rough leaf begin to appear, prepare another heap of fresh dung, which should be mixed with ashes, as was before directed: this should be in quantity according to the number of holes you intend to make. The common allowance for ridging out the earliest plants is, one load to each light or hole, so that the bed will be near three feet thick in dung; but, for such as are not ridged out till March, two loads of dung will be sufficient for three holes; for I could never observe any advantage in making these beds so thick with dung as some people do: their crops are seldom better, if so good, as those which are of a moderate substance; nor are they forwarder, and the fruit is rarely so fair; nor do the vines continue so long in health.

In four or five days time your bed will be in fit order to receive your plants; of which you may easily judge, by pulling out one of the sticks which was put in the middle of the holes, and feeling the lower part of it, which will satisfy you what condition your bed is in: then you must stir up the earth in the middle of the hole with your hand, breaking all clods, and removing all large stones, making the earth hollow, in form of a bason. Into each of these holes you must plant four plants; in doing of which, observe to make the holes a little slanting towards the middle of the bason, especially if your plants are long-shanked: this is intended to place the roots of the plants as far as possible from the dung, to which, if they approach too near, the lower part of their roots is subject to be burned off: then settle the earth gently to each plant; and, if the earth is dry, it will be proper to give them a little water, which should be warmed to the temper of the bed, as was before directed; and, if the sun should appear in the middle of the day, they should be shaded therefrom with mats until the plants have taken root, which will be in two or three days; after which, you must let them enjoy as much of the sun as possible, observing to turn the lights in the day-time to dry, as also to give a little air, whenever the weather will permit.

You must also observe to keep the glasses covered every night, and in bad weather; but be very careful not to keep them covered too close, especially while the bed has a great steam in it, which will cause a damp to settle upon the plants, which, for want of air to keep the fluid in motion, will stagnate and rot them.

When your plants are grown to be four or five inches high, you must, with some slender forked sticks, incline them toward the earth, each one a separate way; but this must be done gently at first, lest, by forcing them too much, you should strain or break the tender vessels of the plants, which would be very hurtful to them. In this manner you should, from time to time, observe to peg down the runners, as they are produced, laying each in exact order, so as not to interfere or cross each other; nor should you ever after remove them from their places, or handle them too roughly; whereby the leaves may be broken or displaced, which is also equally injurious to them; but, whenever you have occasion to weed the bed between the plants, do it with great care, holding the leaves aside with one hand, while with the other you pull out the weeds.

In about a month after they are ridged out, you may expect to see the beginnings of fruit, which very often are preceded by male flowers, which many people are so ignorant as to pull off, calling them false blossoms: but this I am fully convinced, by many experiments, is wrong; for these flowers are of absolute service to promote the welfare of the fruit; which, when these male flowers are intirely taken off, does very often fall away, and come to nothing: nor should the vines be pruned, as is too often the practice of unskilful people, especially when they are too luxuriant; which often happens when the seeds were fresh, or of the last year's saving, and the plants in good heart.

At this time, when your vines are spread, so as to cover the hot bed, it will be of great service, when you water them, to sprinkle them all over gently, so as not to hurt the leaves; but observe to do this not at a time when the sun is very hot; for hereby I have known a whole bed of Cucumbers spoiled. The watering of the beds all over will be of great service, by giving nourishment to those roots, which by this time will have extended themselves all over the bed: and if the warmth of the bed should now decline, it will be of great service to add a lining of fresh dung round the sides of the beds, to give a new heat to them: for, as the nights are often cold at this season, where the beds have not a kindly warmth left in them, the fruit will frequently drop off the vines, when grown to the size of the little finger: and, if upon this lining of dung there is a thickness of strong earth laid for the roots of the plants to run into, it will greatly strengthen them, and continue the plants in vigour a much longer time than they otherwise will do; for the roots of these plants extend to a great distance when they have room, which they cannot have in a bed not more than five feet wide; so that, when they have no greater extent for their roots, the plants will not continue in vigour above five or six weeks, which, if they have a depth and extent of earth, will continue three months in bearing; so that, where there are several beds made near each other, it will be the best way to fill up the bottom of the alleys between them with warm dung, and cover that with a proper thickness of earth, so as to raise them to the level of the beds.

The season for sowing the Cucumbers for the last crop, and for pickling, is towards the latter end of May, when the weather is settled: these are sown in holes dug to a little depth, and filled up with fine earth, in form of a bason, eight or nine seeds in each hole. These will come up in five or six days, and, till they are about a week old, are in great danger from the sparrows; after they require only watering now and then, and keeping clear from weeds. There should be only five plants, at first, left in each hole, and, when they are grown a little farther up, the worst of these is to be pulled up, that there may finally remain only four. The plants of this crop will begin to produce fruit in July. *Miller*.

CUNI'CULUS, in mining, a term used by authors, in distinction from puteus, to express the several sorts of passages and cuts in these subterranean works. The Cuniculi are those direct passages in mines, where they walk on horizontally; but the putei are the perpendicular cuts or descents. The miners in Germany call these by the names stollen and schachts; the first word expressing the horizontal, and the other the perpendicular cuts. It is an observation with our miners, that the damps, so much dreaded in all mines, happen generally in the horizontal cuts; but Dr. Brown, in his examination of the gold and silver mines in Hungary, observes, that they as often happen there in the putei or schachts, as in the Cuniculi or stollen. Another observation, as to the damps with us, is, that they are more frequent in clayey and soft places under ground; but in those mines they are as frequent where the matter is hard stone; and one of the most mischievous that had then lately happened, was in a place every-where surrounded with stone, so hard, that the tools of the miners could scarce work through it; and the descent had, in the very spot where the damp was, been made by means of gunpowder. In some of the Cuniculi in these mines, there are damps that regularly return on certain occasions; as, if the lower end of the Cuniculus be filled up with water, certain parts in going to it are always affected with damps, which will put out a lamp or candle, the moment it enters them, and often do great mischief to the miners in passing them. *Phil. Transf.* N°. 48.

CUP-*galls*, in natural history, a name given by authors to a very singular kind of galls found on the leaves of the oak, and some other trees. They are of the figure of a cup, or drinking-glass, without its foot, being regular cones, adhering by their point or apex to the leaf; and the top or broad part is hollowed a little way, so that it appears like a drinking-glass with a cover, which was made so small, as not to close it at the mouth, but to fall a little way into it. This cover is flat, and has in the center a very small protuberance, resembling the nipple of a woman's breast. This is of a pale green, as is also the whole gall, excepting only its rim which runs round the top; this is of a scarlet colour, and that very beautiful. Besides this species of gall, the oak leaves furnish us with several others, some of which are oblong, some round, and others flatted; these are of various sizes, and appear on the leaves at various seasons of the year.

CUPRE'SSUS, *the Cypress-tree*.— This tree is very proper to intermix with ever-greens of a second size next to pines and firs, to form clumps; in which class it will keep pace with the trees of the same line, and be very handsome. Besides, the wood of this tree is very valuable, when grown to a size fit for planks; which I am convinced it will do, in as short a space as oaks; therefore, why should not this be cultivated for that purpose, since there are many places in England where the soil is of a sandy or gravelly nature, and seldom produces any worth cultivating? Now, in such places these trees would thrive wonderfully, and greatly add to the pleasure of the owner, while growing, and afterwards render as much profit to his successors, as perhaps the best plantation of oaks; especially should the timber prove as good here, as in the islands of the Archipelago, which I see no reason to doubt of: for we find it was so gainful a commodity to the island of Candia, that the plantations were called Dos Filiæ; the felling of one of them being reckoned a daughter's portion.

The timber of this tree is said to resist the worm, moth, and all putrefaction; and is said to last many hundred years. The doors of St. Peter's church at Rome were framed of this material, which lasted from the great Constantine to pope Eugenius IV's time, which was eleven hundred years, and were then found and intire, when the pope would needs change them for gates of brass. The coffins were made of this material, in which, Thucydides tells us, the Athenians used to bury their heroes; and the mummy-chests, brought with those condited bodies out of Egypt, are many of them of this material.

This tree is by many learned authors recommended for the improvement of the air, and a specific for the lungs, as sending forth great quantities of aromatic and balsamic scents; wherefore many of the ancient physicians of the eastern coun-

tries

tries used to send their patients, who were troubled with weak lungs, to the island of Candia, which at that time abounded with these trees, where, from the effects of the air alone, very few failed of a perfect cure.

CU'RRAN-*tree*, *ribes*, in botany, a genus of plants, whose characters are:

It hath no prickles; the leaves are large; the flower consists only of five leaves, which are placed in a circular order, and expand in form of a rose: the ovary, which arises from the center of the flower cup, becomes a globular fruit, which is produced in bunches.

All sorts of Curran-trees may be easily propagated by planting their cuttings, any time from September to March, but the autumn is the best, upon a spot of fresh earth, which, in the spring, must be kept very clear from weeds; and in very dry weather, if they are watered, it will greatly promote their growth. These may remain two years in the nursery; during which time, they must be pruned up for the purposes designed, i. e. either to clear stems, if for standards; or, if for walls, pales, or espaliers, they may be trained up flat.

Then they should be planted out where they are to remain; the best season for which is soon after the leaves begin to decay, that they may take root before winter, so that they may be in no danger of suffering from drought in the spring.

These plants are generally planted in rows about ten feet asunder, and four distance in the rows; but the best method is to train them against low espaliers, in which manner, they will take up much less room in a garden, and their fruit will be much fairer.

The distance they should be placed for an espalier, ought not to be less than ten or twelve feet, that their branches may be trained horizontally; which is of great importance to their bearing.

Those that are planted against pales or walls, should also be allowed the same distance; if they are planted against a south-east wall or pale, it will cause their fruit to ripen, at least a fortnight or three weeks sooner than those in the open air; and those which are planted against a north wall or pale, will be proportionably later, so that by this method the fruit may be continued a long time in perfection; especially if those against the north pales are matted in the heat of the day.

These plants produce their fruit upon the former year's wood, and also upon small snags which come out of the old wood; so that, in pruning them, these snags should be preserved, and the young shoots shortened in proportion to their strength. The only method, very necessary to be observed in pruning them, is, not to lay their shoots too close, and never to prune their snags to make them smooth: this, with a small care in observing the manner of their growth, will be sufficient to instruct any person how to manage this plant, so as to produce great quantities of fruit.

These plants will thrive, and produce fruit, in almost any soil or situation, and are often planted under the shade of trees; but the fruit is always best when they are planted to the open air, and upon a dry soil. *Miller's Gard. Dict.*

CU'RRIERS, mechanics, or artificers, who prepare, after the tanners, the leather chiefly used for the upper parts of shoes and boots, saddles, &c. a pretty hard, dirty business, though not numerous, but profitable.

They take with an apprentice ten or fifteen pounds, and pay a journeyman fifteen shillings a week, who work from six to eight. To set up a master, it will take from 200 to 500 pounds; and some of them are also leather-cutters.

They were a brotherhood in the year 1367, in the reign of king Edward III, and were not incorporated into a company, till 1605, by James I. Livery fine 9 l. 13 s. 4 d.

Their hall is over-against London wall, near Cripplegate; and their court-day on the Saturday next after quarter-day.

Arms. Sable, a cross ingrailed or, between four pair of sheaves in saltier argent.

Motto. Spes nostra Deus: God is our hope.

CUT-*water*, the sharp part of the head of a ship below the beak. It is so called, because it cuts or divides the water before it comes to the bow, that it may not come too suddenly to the breadth of the ship, which would retard her.

CU'TLERS, artificers, whose business is making, forging, tempering, in which part some have been remarkably famous, and mounting all sorts of knives, razors, sheers, scissars, surgeons instruments, and sword-blades; but making the hilts is a different trade; and, formerly, cutlery was divided into blade-smiths, haft-makers, and sheath-makers.

It is an ingenious branch of the smithery, and not hard work; many Cutlers also keep handsome shops, and deal in divers other things, as buckles, buttons, canes, &c. though not very numerous.

They take with an apprentice ten or fifteen pounds, who must work from six to nine: of journeymen there are but few, and about fifty pounds will make a master of him; but many shopkeepers employ a great deal more.

They were incorporated into one joint company in the year 1417, in the reign of king Henry V. Livery fine 10 l.

Their hall is in Cloak-lane, or Dowgate-hill, Thames-street; but their court-day uncertain.

Arms. Gules, six daggers in three saltier crosses argent, handled and hilted or, pointing toward the chief.

Motto. Pour parvenir à bonne foy: to arrive at good faith.

CY'ANUS, *the blue-bottle*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the flosculous kind, being composed of a number of floscules; but these of two different kinds: those which stand in the middle of the flower are small, and divided into a number of equal segments; but those placed nearer the edges are much larger and more conspicuous, and are, as it were, bilabiated: both kinds, however, are placed on the embryo's, and all are contained together in a general cup, which is scaly, and not prickly. The embryo's afterwards become seeds winged with down.

CY'BELE, generally called the mother and grandmother of the gods, was by the ancients thought to be Saturn's wife; they called her Ops, Rhea, Dyndimene, Berecynthia, Good-goddess, &c. They represented her crowned with towers, with a key in her hand, and clad in flowered stuff, placed upon a chair drawn by four lions. The pine-tree was consecrated to her; after Atis, whom she loved so well, was metamorphosed into it. Her priests were eunuchs, and they, as well as their sacrifices, are laughed at by Tertullian in his Apologetic. The pagan divinity, which always conceals some natural truth in its fabulous mysteries, teacheth us, that this goddess called Cybele, either from the mountain of this name, whereon she was sacrificed to, or from the word cube, was the earth which produces all things; and it was for this reason she was called the great mother. Her crown of towers and cities represents what the earth is covered with. The key she holds in her hand, implies that she locks up all her fruitfulness during winter, which in the spring begins to appear, and then it is said the earth opens. This painted or flowered garment can become nothing so well as the earth, which is variegated with all kinds of flowers. The four beasts that draw the chariot, mark the four seasons of the year, wherein the earth appears so differently. Some take them for the four qualities of the earth, the four elements, four cardinal winds. And, if the ancients had known the four parts of the world, they might have been compared to them. In fine, Saturn, which signifies time, is believed to be the earth's husband, to shew that it must have time to bring forth its productions. Eusebius believes with Diodorus Siculus, that Cybele was a woman who had very good remedies for young children, and that the ancients had all their philosophy from this source. *Eusebius, Diodorus.*

CYCLA'MEN, *sow-bread*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is globose, and of a rotated form, and usually divided into five segments, which all bend upwards; from the cup there arises a pistil, which is fixed, in the manner of a nail, to the hinder part of the flower, and afterwards becomes a roundish membranaceous fruit, which contains numerous seeds, usually of a longish figure, and angular, and fixed to a placenta.

There are several species of this plant cultivated in gardens, for the pretty appearance of its flower: they are propagated by the curious from seed, in the manner of the xyphium. See XYPHIUM. But they are four or five years before they come to flower, and, for the first year or two of their flowering, their roots are so small, that the flowers they produce are but few: the roots, however, annually increase in bulk, and the number of flowers increase in proportion, so that they will grow to fourteen inches in diameter, and, when of this size, will produce upwards of an hundred flowers in one season. The best season for transplanting these roots is in June and July, soon after the seed is perfected; but they should not be kept long out of the ground, for the roots are disposed to shoot out fresh fibres, with the first moist weather after the seeds have fallen, and in about six weeks produce their flowers, which appear upon long single footstalks before the leaves appear: these sprout up after the flower is fallen, and remain green all the winter, and being of a fair green, and spotted in the middle with white, they make a very pretty appearance during that dead season. The pedicle of the flower afterwards twists like a skrew, inclosing the embryo of the fruit, which is buried among the leaves, and, by that means, screened from the severity of the winter, and ripens its seed in June. *Miller's Gard. Dict.*

CY'CLE, *Chinese*, a period of 60 years, whose use had some relation, or at least resemblance, with that of the olympiads, indictions of the solar and lunar cycles, or the golden number. This cycle is composed of ten repeated letters, and twelve Chinese characters that mark the hours. Each year is distinguished by a letter and chifre, continuing until they come to a year that has the first letter and chifre, which is the 60th. These Cycles have their perpetual revolution from sixty to sixty years, and are very certain rules for chronology; for, marking the number of the Cycle with the letter and chifre of the year, they give an infallible knowledge of the time a thing is done in. As, for example, in saying 1 Cycle K. 2,

K. 2, I mark the 50th year of the firft Cycle, which begins the year 2697 before Chrift's birth; fo that the 50th year of this Cycle is the 2648th before the Meffias, which is known by fubtracting 49 from 2697. *Couplet. Confucius.*

CY'DER.—Under the article CIDER, in the Dictionary, we have given its chemical analyfis, and ufes; we fhall here give the method of making this liquor.

As it has been thought neceffary, in every part of England, to lay the harder Cyder-fruits in heaps for fome time before breaking their pulps, the Devonfhire people have much improved the practice; in other counties the method is to make thefe heaps of apples in a houfe, or under fome covering inclofed on every fide; this method we found defective, becaufe, by excluding the free air, the heat foon became too violent, and a too great perfpiration enfued, by which, in a fhort time, the lofs of juices was fo great, as to reduce the fruit to half their former weight, attended with a general rottennefs, rancid fmell, and difagreeable tafte. In the South-Hams, a middle way has been purfued to avoid the inconveniences and lofs attending the aforementioned practice; they make their heaps of apples in an open part of an orchard, where, by the means of a free air and lefs perfpiration, the defired maturity is brought about, with an inconfiderable wafte of the juices and decay of the fruit, intirely free of ranknefs; and, though fome apples rot, even in this manner, they are very few, and are ftill fit for ufe; all continue plump and full of juices, and very much heighten the colour of Cyders, without ill tafte or fmell.

In purfuing the Devonfhire method, it is to be obferved,

1. That all the promifcuous kinds of apples that have dropped from the trees, from time to time, are to be gathered up and laid in a heap by themfelves, and to be made into Cyder after having fo lain about ten days.

2. Such apples as are gathered from the trees, having already acquired fome degree of maturity, are likewife to be laid in a heap by themfelves for about a fortnight.

3. The latter hard fruits, which are to be left on the trees till the approach of froft is apprehended, are to be laid in a feparate heap, where they are to remain a month or fix weeks, by which, notwithftanding froft, rain, &c. their juices will receive fuch a maturation, as will prepare them for a kindly fermentation, and which they could not have attained on the trees by means of the coldnefs of the feafon.

It is obfervable, that, the riper and mellower the fruits are at the time of collecting them into heaps, the fhorter fhould be their continuance there; and, on the contrary, the harfher, immaturer, and harder they are, the longer they fhould reft.

Thefe heaps fhould be made in an even and open part of an orchard, without any regard to covering from rain, dews, or what elfe may happen during the apples ftaying there, and, whether they be carried in and broke in wet or dry weather, the thing is all the fame; if it may be objected, that, during their having lain together in the heap, they may have imbibed great humidity, as well from the air, as from the ground, rain, dews, &c. which are mixed with their juices; the anfwer is, this will have no other effect than a kindly diluting, natural to the fruit, by which means a fpeedier fermentation enfues, and all heterogeneous humid particles are thrown off.

It is a conftant practice, in the Ifles of Jerfey and Guernfey, to put a pail of water into every fermenting hogfhead of Cyder, to dilute and fet its parts more quickly at liberty.

By purfuing the above methods, befides making the beft Cyder, hurry and expence will be prevented, as they require no room within doors.

Among other improvements in Cyder-making, the people in Devonfhire have been fuccefsful in their invention of an engine, which leaft bruifes the fkin, pulp, and kernels of the apples; for fuch as leaft do fo are to be preferred, becaufe from an immoderate breaking of them, in fome kinds of apples, there proceeds fuch an aufterity and bitternefs, as the Cyder never can be cured of.

To evince, that there is fuch aufterity attending the fkins or rinds of fome particular fruits, the pear called the winter rouffelit is an inftance; this fruit, when the fkin is taken off, is in efteem at the table, but without this treatment it has fuch a roughnefs as renders it uneatable.

The engine I here recommend is worked by coggs and rounds, which turn two or more tumblers ftuck full of teeth. In fome places it is worked with horfes, but, where moderate quantities of Cyders only are made, it it worked by hand. I forbear a further defcription of it, fuppofing it to be at prefent in ufe where-ever Cyder is made in the different counties in England. Its further excellencies are, it quicker difpatches the work; the pummice of the apples, broke therewith, produces lefs foul Cyder when it comes from the wring, alfo much fooner, and it certainly becomes fine after; and is lefs liable to harfhnefs and ill taftes in the vat and cafks, than what is broken by any other engines.

The pummice of the apples is to be received into a large open-mouthed veffel, capable of containing as much thereof as is fufficient for one making, or one cheefe. Though it has been a cuftom to let the pummice remain fome hours in the veffel appropriated to contain it, yet I would by no means advife the practice; for if the fruits did not come ripe from the trees, or otherwife matured, the pummice, continuing in the vat too long, will acquire fuch harfhnefs and coarfenefs from the fkins as never to be got rid of; and, if the pummice is of well-ripened fruit, the continuing too long there will occafion it to contract a fharpnefs that very often is followed with want of fpirit, and pricking, nay, fometimes it becomes arrant vinegar, or always continues of a wheyifh colour; all which proceeds from the heat of fermentation that it almoft inftantly falls into on lying together; wherefore I recommend, that the pummice remain no longer in the vat, than until there may be enough broke for one preffing, or that all be made into a cheefe, and preffed the fame day it is broken.

Of all the preffes now in ufe throughout the kingdom, there is none to be compared to the great wring or prefs with two fcrews, worked or brought home with a capftan, either for a quicker difpatch of the work, as frequently a cheefe or cake is made that produces a tun and half of Cyder, or for preffing dry, and keeping the cheefe upright and together, or with more eafe, as it requires but two men to work it.

A defcription of fuch a Cyder-prefs, and its feveral parts. See the *Plate* XV. *fig.* 12.

The great or upper beam, in which are female fcrews, fhould be feventeen feet four inches in length; and two feet fix inches or three feet fquare, either of one folid piece of timber or more; when formed of feveral pieces, they fhould be firmly united with wooden keys, and bound about with iron braces, near and on each fide each hole where the fcrew paffes.

The whole length of the pieces, out of which each fcrew is is to be formed, ought to be fourteen feet fix inches, viz. ten feet the fhaft of the fpiral line, or fcrew. Two feet the fquare part, containing the holes for letting in the hand-fpikes for turning the fcrews, and two feet fix inches for the fpindle.

The fpindle of the fcrews, which fhould have the fame diameter as the ftem of the fpiral line, muft be let into fockets made in a large beam of equal dimenfions with the upper beam. This great beam is to reft on the floor. The diftance between the fcrews fhould be eleven feet ten inches.

The reafon for leaving the upper and under beam fo long on the outfide of each fcrew, and the fpindles, is, to give the ends of the beams more ftrength, as the fcrews and fpindles otherwife would be apt to make the ends open.

The holes for admitting hand-fpikes fhould be quite through, one hole above another, that the fcrews may be turned with two hand-fpikes at the fame time.

The holes fhould be guarded by two iron plates to prevent their wearing, which fhould be faftened with two iron bands, bracing round that part of the fcrew, and neceffary to ftrengthen it.

The buckler, which is to cover the top of the cheefe or cake, is an affemblage of thick planks, united and ftrengthened by fubftantial traverfe pieces of eight inches fquare, to which the planks are faftened by oak pins. On the traverfe pieces are laid two floors of blocks of wood, each croffing one the other, on which depends the upper beam.

The buckler is fometimes made round, and fometimes fquare; in the dimenfions of either, great allowance muft be made for the fpreading of the cheefe or cake, when very much preffed. The round buckler may be fomething more in diameter than five feet, and the other five feet fix inches fquare.

The floor of the prefs may be compofed of elm planks, three inches thick and feven feet fquare, joined together by fubftantial traverfe pieces of eight inches thick or fquare, placed about the diftance of one foot from each other, to which the planks of the bafon are faftened by oak pins. Every part fhould be very firm and well connected, as the floor muft refift a very great force and preffure, when the upper beam is fcrewed down upon the cheefe.

The floor is to be borne up to the heighth of two feet fix inches from the ground, and fupported partly by the under beam, where are fpaces to be cut for letting down the traverfe pieces of the bafon, and partly by blocks of wood, or ftillings laid under it for that purpofe; there muft be care in fixing the bafon, that every part bears equally on each other.

Between the fcrews and the bafon, on each fide, will be a fpace of two feet clear, for a paffage round the bafon, except where the under beam croffes.

The ftage or bafon is to be floped with a gentle declivity from the feat of the cheefe to a groove or gutter, which is made near the edges of the bafon, to convey the expreffed juice of the apples into a veffel fixed under the middle of the fore part of the bafon.

Befides this groove or gutter, there muft be a ledge nailed round

round the sides of the bason, to prevent the Cyder from overflowing the bason, which it will be apt to do on the first pressing.

In fixing the bason on stillings or blocks, it should be observed, that it stoops a very little on the fore part, that the Cyder might tend that way in draining from the cheese.

The capstan is placed at about twelve feet distance, more or less, from one of the screws, and is made use of after two men, or more, have used their utmost efforts to screw down the great beam; then they have recourse to the capstan, by which they screw down the great beam something lower, and the Cyder runs a-fresh, and the cheese is squeesed quite dry.

The length of the capstan depends, as does its distance from the screw, on the conveniency of fixing a beam for taking in the upper spindle; it ought to be eight or ten feet; the under spindle is let into a socket made in a square block of wood sunk into the ground. It ought to be so large as not to be apt to start.

The end of the rope which is round the capstan is fastened to the end of a hand-spike which is in a hole of the screw, and the capstan turned till the hand-spike is brought so near the capstan as to have no more purchase; then the hand-spike is put into another hole, and the same repeated. The capstan is turned by poles of about twelve feet in length, run through the square, or holes of the capstan, and form a cross. These poles are fixed about two feet ten inches above the floor, which should be considered when the capstan is making, that the square and round parts of it may have proper situations.

This press requires a spacious house for its reception, which is the only inconvenience that attends it. Other presses may be commodious enough for making small quantities of Cyder; but this is necessarily required where it is made in abundance.

As the Cyder runs from the wring or press, it is to be received into a vessel fixed within the ground for the more commodious dipping of a ladle or bucket, and, as it fills, from time to time, to be taken from thence and put into another vessel or cask that stands on its bottom, the head being struck out, over the top of which, is to be laid a-cross a frame, or two simple sticks, a coarse hair sieve for straining the Cyder, that the pummice, or grosser part of the pulp of the apples, mixed with the juice, may be kept back.

I would caution every one against mixing the last expressed juices or droppings with the Cyder intended for keeping, because it is of too weak a nature; but yet it makes a pleasant beverage, by which name it is known in Devonshire, and, if assisted with a small quantity of spices, will continue good two months. If it could be had in summer, or would keep so long, it would serve as an agreeable, cool, refreshing liquor.

I come now to treat of that, on which the whole success depends, in making sweet Cyder, viz. fermentation, which is attended with no manner of difficulty; but care and watchfulness is absolutely required, and to be well furnished with clean casks in proper readiness.

In order to avoid a great deal of trouble, and to perform the work more effectually, by divesting the new made Cyder of what pummice and other impurities remain; after straining it through a hair sieve, on its coming from the wring, or press, it is necessary to be provided with a large open vat, keeve, or clive, which will contain a whole pounding, or making of Cyder; or as much as can be pressed in one day: after the Cyder has remained in this vat a day, or sometimes less, according to the ripeness of the fruit, of which it has been made, and the state of the weather, you will find rise to the top the pummice, or grosser parts of the pulp, &c. of the apples; and in a day or two more, at most, grow very thick; and when little white bubbles or fermentations, of the bigness of the top of your finger, break through it, then presently draw it off through a cock or faucet-hole, within three inches of the bottom, if large; but, if small, not nearer than four inches of the bottom, that the lees may not be drawn off, but quietly remain behind.

If the Cyder is not immediately drawn off, on the first appearance of these white fermentations, all the head which is then become a thick crust, will sink to the bottom; so that, if this crisis, which happens but once, of the first separation of the Cyder from its lees is neglected, the opportunity of making sweet Cyder will be lost and irrecoverable.

On drawing off the Cyder from the vat, it must be tunned into close casks well scented, wherein, on letting it remain a shorter or longer time, with what lees and impurities it carried with it, depend the hardening or softening it at pleasure.

To have Cyder perfectly sweet, after it is tunned into close casks, you are again carefully to watch and observe its state, and when you find white bubbles or fermentations, as aforesaid, at the bung-hole, as before in the vat, immediately rack it off again into another clean and well scented cask; after which, by making frequent trials of its fineness (and it commonly happens to be fine in two, three, four, or five days, or sooner, according to the weather) by drawing some of it into a glass from a spile-hole, you will discover if proper to repeat the racking, which should again be immediately done, if found to be fine; which repetition of racking should be continued till the Cyder is as sweet as you desire, and ceases hissing.

It is to be noted, that the weaker Cyders cannot support themselves under many rackings, one or two being all they can bear, for they have not body enough to undergo the operation. But, as to the bolder and stronger Cyders, when you intend to render them very soft and mellow, and perfectly sweet, which these frequent rackings will effect, you may repeat them till they are brought to your palate, and quieted to such a degree as to be entirely mute, which is an infallible indication of their being absolutely free of impurities, and not liable to be troubled by any future commotions.

The manner of making rough Cyder differs from that of the sweet, as it is necessary to refrain drawing it off, on the first appearance of the white bubbles, as before mentioned; but, letting that crisis pass unregarded, do it on the next tolerable separation from the fouler and thicker lees, by which a luscious sweetness will be avoided. But, even in rough Cyder, the omission of one or two rackings is attended with a disagreeable coarseness, harshness, bitterness, fetidness, and sometimes with all these faults, which it can never be divested of. Wherefore I would propose, after racking out of the vat, to give it another clarification, at the end of November or December, if made very late.

There must be care taken, after the fermentation is over, to fill every hogshead in the cellar up to the bung, which is to be continued once a month, and without which the Cyder will be apt to grow flat and heavy, and likewise to contract an ill taste and smell, from an ingendered rancid air lodged in the cavity between the upper part of the cask and the Cyder. Vent should be sometimes given at a spile-hole during the first three months after the Cyder is made. Until it has done hissing, &c. the bung-hole would be best covered with a tile, slate, or flat stone, but, when found to be perfectly quiet, it should be closely bunged down. *Treatise on Cyder-making.*

Pepin CYDER. This is a sort of Cyder which, in many places, might be made in great quantities, where the red-streak Cyder-apple will not thrive: the harshness that is apt to be in this sort of Cyder, is the only objection to its value, it being of a good body, and otherwise, in all respects, commendable. The great reason of this harshness is the light foulness; or, as the Cyder people express it, the flying lee that always is in this sort. But it is easy, by watching a proper time, to draw of the liquor from this into other vessels, or to strain it through a cloth: in either case, much of the lee will be left out, and the Cyder lose its harshness. *Phil. Trans.* N°. 70.

CYDER-*spirit*, a spirituous liquor drawn from Cyder by distillation, in the same manner as brandy from wine. The particular flavour of this spirit is not the most agreeable, but it may, with care, be divested wholly of it, and be rendered a perfectly pure and insipid spirit, upon rectification. The traders in spirituous liquors are well enough acquainted with the value of such a spirit as this: they can give it the flavours of some other kinds, and sell it under their names, or mix it in a large proportion with the foreign brandy, rum, and arrack, in the sale, without danger of a discovery of the cheat.

CYDO'NIA, *the quince-tree*, a genus of trees whose character are:

The tree is of a low stature: the branches are diffused and crooked: the flower and fruit are like that of the pear-tree; but, however cultivated, the fruit is sour and astringent, and is covered with down. See *plate* XVIII. *fig.* 1. where *a* is the blossom, *b* the fruit, *c* the fruit open, *d* the seed.

All sorts of quince-trees are cultivated in most nurseries near London; but the Portugal kind is most valued for the goodness of its fruit.

They are all easily propagated, either by layers, suckers, or cutings, which must be planted in a moist soil. Those raised from suckers are seldom so well rooted as those which are obtained from cuttings or layers; and are subject to produce suckers again in greater plenty, which is not so proper for fruit-bearing trees. The cuttings should be planted early in the autumn, and in dry weather must be often watered to encourage their rooting. The second year after, they should be removed into a nursery at three feet distance row from row, and one foot asunder in the rows; where they must be managed as directed for apples. In two or three years time, these trees will be fit to transplant, where they are to remain for good; which should be either by the side of a ditch, river, or in some other moist place; where they will produce a greater plenty, and much larger fruit than in a dry soil; though those in the dry soil will be better-tasted, and earlier ripe. *Miller's Gard. Dict.*

CYLINDER *(Dict.)* — The ingenious Mr. Francis Blake, in the forty-seventh vol. of the Philosophical Transactions, has considered what are the best proportions for steam engine Cylinders, which, we presume, will not be unacceptable to the reader.

 The

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The fire-engine, or (to term it more properly) the ſteam-engine, for draining of mines, is a maſter-piece of machinery, a very capital contrivance in the work of art, and meriting our attention for further improvements. This is univerſally allowed, as well upon account of the theory it is founded on, as its uſefulneſs in practice. And is it arrived then at the laſt degree of perfection, that we appear at a ſtand? I think not. The prodigious veſſel of water to be kept always boiling, when only an inconſiderable part of it is employed in the work, favours too little of the frugality of nature, which we ought ever to imitate. But, waving that now, what I would inquire into here, and endeavour to regulate, is, the Cylinder's proportion of the altitude and baſe; which hath not, as I know of, been hitherto noticed.

It is evident, in the firſt place, from a fundamental law of mechanics, that, the content of the Cylinder remaining the ſame, the quantities of water diſcharged at each lift will in all caſes be equal, by only changing the diſtance of the center of the piſton from the fulcrum of the balance. You will agree likewiſe (for I ſuppoſe the principles and working-part to want no deſcription) that the exceſs of the pillar of the atmoſphere above that of the water is a weight on the piſton, driving it to a depth of five feet, or thereabouts, by the preſent conſtruction, with the cavity of the Cylinder; acceleratedly till friction and an impediment from the ſteam, which remains in the Cylinder even after the jet d'eau, and is increaſed in elaſticity, whilſt its bounds are diminiſhed, ſhall equal the accelerative force; and that then again the piſton is retarded the reſt of the way. It may be convenient to remark too, that, if the rarefaction be ſo complete, that the deſcent would be greater than the conſtruction admits of, the retardation is augmented by a brachium of the balance preſſing upon ſprings. But, to ſay nothing of friction here, we can, notwithſtanding this diminution of force by the remainder of ſteam within the cavity of the Cylinder, demonſtrate the ratio of the velocities, and the times of deſcent of the piſtons, in Cylinders of unequal altitudes, to be exactly the ſame, as if the reſiſtance was nothing; whence we ſhall without difficulty arrive at ſome concluſion in this matter.

M N (*plate* XVII. *fig.* 8.) is the working-part of a ſteam-engine Cylinder, of the uſual height, equal in diameter to a ſhorter one *m n*, *fig.* 9; and, the rarefaction in both being ſuppoſed the ſame, $AQ = aq$, $RQ = rq$, and $AR = ar$, may repreſent the exceſs of the atmoſphere's weight above the pillar of water, the reſiſtance to the piſtons from the remainder of ſteam, and the effective force, reſpectively, *e. g.* at the beginning of the deſcent. Take, then, every-where $ak : AK :: an : AN$, and at all ſimilar poſitions the reſiſtance *b c* of *m n* and the force *k c* on its piſton will equal the reſiſtance B C of M N and force K C on its piſton; and, by what Sir Iſaac Newton has demonſtrated (Book I. Prop. 39.) of the deſcent of bodies, we have $\sqrt{akcr} : \sqrt{AKCR} ::$ celerity in *k* : celerity in K. But, theſe areas being evidently as the correſponding parallelograms *k q* and K Q, and they again as their heights, the celerities generated are in the ſubduplicate ratio of $ak : AK$, as though the reſiſtance had been nothing; and, by an obvious enough reaſoning from the ſaid propoſition, the times alſo appear to be in the above-mentioned ratio; which ratio is not any way varied, though the reſiſtance prevails from the interſecting points O.

Now, to apply what has been ſaid to the buſineſs in hand; if T W be a Cylinder of equal content with the Cylinder M N, the quantity of water delivered by both will, as a conſequence of the fundamental law of mechanics obſerved above, be the ſame at each lift: but the Cylinder T W is no higher than *n m*, and, ex hypotheſi, their rarefactions are equal; and therefore, by what has been proved with regard to the times, the time of the piſton's deſcent in T W will be to that of the piſtons deſcent in $MN :: \sqrt{EW} : \sqrt{AN}$; whence, in any given time, the broad Cylinder T W will perform more than the longer one M N of equal content, and that in the ratio of their diameters; for $\overline{ET}|^2 \times EW = \overline{MA}|^2 \times AN$, ex hypotheſi, $EW : AN :: \overline{MA}|^2 : \overline{ET}|^2$, and, conſequently, $\sqrt{EW} : \sqrt{AN} :: MA : ET$. The friction too is diminiſhed with the ſlowneſs of the motion, and becauſe the periphery increaſes, in a leſs ratio than does the area of a circle.

The reſult of the whole then is in favour of the broad Cylinder; and ſtill the broader the better; for, unleſs ſome mechanical conſiderations ſhould limit the problem, it is evident in a geometrical ſenſe, that there is no limitation. A diſadvantage might ariſe perhaps to the effect of the jet d'eau from thus increaſing the breadth; which however would be remedied, I think, by a number of theſe jets: but, be that as it will, it is certain, that to augment the diameters, and diminiſh the lengths of the ſmaller kind of Cylinders, now uſed, could have no ſuch inconvenience, nor fail of being attended with an augmentation of force.

CY'LINDRUS, in conchyliology, the name of a genus of ſhell-fiſh, of which there are many very elegant and precious ſpecies. This genus is more generally, at preſent, called rhombus, though this is very improper, the word Cylindrus very aptly expreſſing the ſhape of the ſhell, which is cylindric and oblong; and the rhombus, which ſignifies that figure we call a lozenge, not being at all expreſſive of it.

CY'PRESS-*tree.* See CYPRESSUS.

CYST, in ſurgery, the bag, or membrane, in which an encyſted tumor of the ſteatomatous, atheromatous, or ſarcomatous kind, is included. In the extirpating theſe tumors, if, by neglect, or accident, the Cyſt, or any conſiderable part of it, be left behind, the tumor will not fail to return. Indeed, if the tumor be a ſchirrus, the contents are hard enough to make a clear extirpation of it, notwithſtanding its including coats be wounded: but, when the matter of the tumor is ſoft, or fluid, by its eſcaping the tumor will be come flaccid; ſo that it will be hardly poſſible to make a clear extirpation of the Cyſt, without leaving ſome fragments of it behind, which muſt, in that caſe, be brought away afterwards by ſuppuratives, digeſtives, and a proper treatment; and, when the ſinus is by this means cleared, the wound may be ſafely healed, without any danger of the return of the complaint. *Heiſter's Surgery.*

CY'TISUS, *ſhrub trefoil*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the papilionaceous kind; from its cup there ariſes a piſtil, which finally becomes a flat pod, which ſeparates, when ripe, into two parts, and is full of oblong ſeeds. The leaves ſtand three on every ſtalk.

We have ſeveral ſpecies of this plant cultivated in the gardens of the curious, where ſome ſpecies make a very agreeable figure, as they grow to be eight or ten feet high, and in May are beautifully loaded with long ſtrings of yellow flowers.

They are all propagated by ſowing their ſeeds, which they afford in great plenty, in March, on a bed of good, freſh, light earth, ſifting over the ſeeds about half an inch of fine mould: in a month's time the plants will come up; they muſt be kept clear from weeds, and watered at times, if the ſeaſon prove dry. They ſhould remain in the ſeed-bed, till the March following, when they ſhould be removed into nurſery beds of a foot diſtance, in rows three feet aſunder: here they muſt be watered, and the roots mulched till they are thoroughly rooted, and then the ground kept clear from all weeds. They ſhould remain here three years, and be then removed to the places where they are to remain, in October, or elſe in February.

The ancient botaniſts evidently were acquainted with two very different ſhrubs, under the name Cytiſus; and there have been no ſmall errors about the true meaning of ſeveral paſſages in Dioſcorides and Theophraſtus, on occaſion of the miſtaking one of theſe things for another.

Dioſcorides deſcribes the Cytiſus, as being a ſhrub with leaves white and hoary, both on the upper and under ſide, and of no uſe, or value, to mankind: as to its wood, Pliny tranſlates this account, and adds to it from Hyginus, that it was a very hardy and ſtrong ſhrub, not being affected by heat, or cold, ſnow, or hail, or any other injuries of the weather, nor of its enemies, as Pliny expreſſes it (hoſtium.) It is not very eaſy to conceive what enemies theſe ſhould be; but the moſt probable conjecture, as to this odd paſſage, is, that Pliny had tranſcribed it in his uſual careleſs way, and that what is called hoſtium ſhould be the word noſtrum.

The ſenſe then is clear enough; the author had juſt before ſaid that the wood was good for no uſe to mankind; and therefore, when he was ſpeaking of the trees ſtanding a long time, and fearing the injuries of no weather, he might very well add, nor of us; for, the wood being good for nothing, men would not be at the trouble of cutting it up. It is plain, however, that Theophraſtus means quite a different ſhrub by this name Cytiſus; for as Dioſcorides ſays that the wood of his was white throughout, and very light, Theophraſtus obſerves, that it was black at the heart, and as heavy and ſolid as ebony; and, in many places, where he ſpeaks of the hard and elegant woods uſed for inlaying, he mentions the Cytiſus wood, coupling it with the ebony, heart of oak, and other the hardeſt and moſt elegant woods known in his time. Pliny mentions no other Cytiſus than that of Dioſcorides, which was the common kind cultivated by the Greeks and Romans, as a food for cattle: he ſays, it was raiſed by ſeed, and came to its perfection in three years, and that it was gathered in the ſpring juſt after the time of its flowering; he adds, that this was uſually the office of children, or old women, unfit for other work, and was the cheapeſt of all the offices of huſbandry. It is eaſy to conceive that ſuch a ſhrub as the Cytiſus of Theophraſtus, with a wood as firm as the heart of oak, and hard as ebony, did not come to perfection in three years from the ſowing; nor could any more be cut up by boys and old women, than eaten by cattle, when taken up. There were, therefore, two kinds of Cytiſus among the ancients, the one ſown and cultivated as food for cattle; the other a wild tree, or ſhrub, growing in woods, and being larger than the ſown kind. Dioſcorides and Pliny deſcribe the firſt, and Theophraſtus alone the latter, except that Pliny has now and then taken a ſentence from Theophraſtus, when he mentions the Cytiſus occaſionally among other hard woods, and placed it to the account of his manured Cytiſus.

D.

DAA'LDER, a name given by the Dutch to pieces of thirty sols, coined by them, and which are worth one florin, or guilder and half, being equivalent to the small French crown of three livres Tournois, or sixty sols. Formerly, according to the old rate of money in that kingdom, the Daalder went for thirty-seven sols, six deniers.

Daalders are coined also at Hamburgh, called Daalders, lups, or lubs, of two marks lubs each. It is worth from thirty-two to thirty-three sols of Holland, and from sixty-six to seventy sols in France. It is used as current money in many other cities of Germany, and in keeping their books of accounts. Formerly, they went for forty French sols. The Hollanders call also every sort of crown a Daalder, which is worth no more than thirty sols; they denominate them differently, viz. ryks Daalder, that is to say, an imperial crown.

DA'BAS, cloths and woollen stuffs of the manufacture of Bas in Languedoc, are so called at Lyons.

DA'BUIS, a white cotton stuff made in the East-Indies. It is in the number of baffetas, and takes its name from the place where it is made.

DACE, in ichthyology, the English name for the fish called by authors the leuciscus. According to the new system of Artedi, this is a species of the cyprinus; and it is called by some albicula and albicilla.

This fish is extremely common in our rivers, and gives the expert angler great diversion. The Dace will bite at any fly; but he is more than ordinarily fond of the caddis, or May fly, which is plentiful in the latter end of April, and the whole month of May. Great quantities of these may be gathered among the reeds or sedges by the water side, and on the hawthorn bushes near the waters. These are a large and handsome bait, but, as they last only a small part of the year in season, recourse is to be had to the ant-fly. Of these the black ones, found in large mole-hills or ant-hills, are the best. These may be kept alive a long time in a bottle, with a little of the earth of the hill and some roots of grass; and they are in season throughout the months of June, July, August, and September. The best season of all is when they swarm, which is in the end of July, or beginning of August; and they may be kept many months in a wooden vessel, washed out with a solution of honey and water, even longer than with the earth and grass roots in the phial; though that is the most convenient method to be taken with a small parcel, procured for one day's fishing. In warm weather this fish seldom refuses a fly at the top of the water: but, at other times, he must have the bait sunk to within about three inches of the bottom. The winter fishing for Dace requires a very different bait: this is a white maggot with a reddish head, which is the produce of the eggs of the beetle, and is turned up with the plough in great abundance. A parcel of these put in any vessel, with the earth they were taken in, will keep many months, and are excellent bait.

Small Dace may be put into a glass-jar with fresh water, and there preserved alive a long time, if the water be properly changed. They have been observed to eat nothing but the animalcula in the water. They will grow very tame by degrees. See *Philos. Trans.* N°. 478.

DA'CZAJIE, a silver money current in Persia, worth five mamoudis; two Daczajies make the hasaer denarie.

DA'ILS. See DOTTLE *Fish*.

DA'LLE, a nominal money, used in keeping books of accounts in many cities of Germany: it is worth thirty-two sols lubs, which make forty French sols; the sol lubs being somewhat more than the sol Tournois.

DAMASQUE'TTE, a kind of stuff made at Venice, that sells well in the Levant, particularly at Constantinople.

There are two sorts of it; one with gold flowers, the other with silk: the pieces are eighteen ells long. Those with gold flowers are somewhat like the gold and silver stuffs formerly made at Lyons.

DAMASSE', or *Petite Venise*, a kind of wrought linen made in Flanders, so called from the fashion of its large flowers, something like those of damasks: it is used chiefly for tables. A table-cloth and a dozen napkins of this, is called a damask service.

There is also a silk stuff so called, which looks like a damask on one side, and on the other is plain.

DAMPS (*Dict.*) — Naturalists furnish us with very surprizing instances of the effects of Damps. In the History de l'Academie des Sciences Anno 1701, we read of a well in the city of Rennes, into which a mason, at work near its brink, letting fall his hammer, a labourer who was sent down to recover it, before he reached the water, was strangled. A second, sent to fetch up the corpse, met with the same fate, and so a third: at last a fourth, half drunk, was let down, and charged to call out, as soon as he felt any thing incommode him. He called accordingly, as soon as he came near the water; and was instantly drawn out: yet he died three days afterwards. The information he brought them was, that he felt a heat, which scorched up his entrails. A dog, being let down, cried about the same place; and died as soon as he came to the air; but, throwing water on him, he recovered; as happens to those thrown into the Grotto del Cani near Naples. The three carcasses being drawn up with hooks, and opened, there appeared not any cause of their death.—Now, what renders the relation the more considerable, is, that the water of this well had been drawn, and drunk several years, without the least ill consequence.

In the same history, anno 1710, a baker of Chartres, having carried seven or eight bushels of brands out of his oven into a cellar thirty-six stairs deep; his son, a robust young fellow, going with more, his candle went out on the middle of the stairs; having lighted it a-fresh, he was no sooner got into the cellar, than he cried out for help; and they heard no more of him: his brother, an able youth, run immediately after him; cried out he was dead; and was heard no more. He was followed by his wife; and she by a maid, and still it was the same. Such an accident struck the whole neighbourhood with a panic; and nobody was forward to venture any farther: till a fellow, more hardy and zealous than the rest, persuaded the four people were not dead, would go down to give them help: he cried too and was seen no more. Upon this a sixth man, requiring a hook to draw some of them forth without going to the bottom, drew up the maid: who, having taken the air, fetched a sigh and died. Next day, the baker's friend, undertaking to get up all the carcasses with a hook, was let down with ropes on a wooden horse, to be drawn up, whenever he should call. He soon called, but, the rope breaking, he fell back again; and, though the rope was soon pieced again, he was drawn forth dead. Upon opening him, his meninges were found extravagantly stretched; his lungs spotted with black, his intestines swelled as big as one's arm, inflamed and red as blood; and, what was most extraordinary, all the muscles of his arms, thighs, and legs, torn and separated from their parts. The magistrate, at length, taking cognizance of the case, and the physicians being consulted; they gave their opinion, that the brands had been but ill extinguished: the consequence of which must be, that, as all the cellars in Chartres abound with saltpetre, the unusual heat in this had raised a malignant vapour which had done the mischief: and that a good quantity of water must be thrown in to put out the fire, and lay the vapour. This performed, a dog and a lighted candle were let down without injury to either: an infallible sign the danger was over.

A third history we shall add from Dr. Connor, in his Differt. Med. Phys. Some people digging in a cellar at Paris, for supposed hidden treasure; after a few hours working, the maid, going down to call her master, found them all in their digging postures, but stark dead. The person who managed the spade, and his attendant who shovelled off the earth, were both on their feet, and seemingly intent on their several offices: the wife of one of them, as if a-weary, was sat down on the side of a hopper, very thoughtful, and leaning her head on her arm; and a boy, with his breeches down, was evacuating on the edge of the pit; his eyes fixed on the ground: all of them, in fine, in their natural postures and actions, with open eyes, and mouths that seemed yet to breathe; but stiff as statues, and cold as clay.

The German miners think themselves not qualified for their business, if they are not able to make their weather, as they express it; that is, to cure their Damps. These are of various kinds in their mines; some so strong that they suffocate the workmen; others less violent, and only making them faint without doing them any farther hurt, unless they are so imprudent as to continue a long time in the place. The common way of curing the Damps is by letting the air in and out, and, causing a circulation in it, they sometimes have cured very considerable Damps by blowing, for many days together, with large bellows: but the ordinary method of working is by means of long tubes communicating with the air above, by means of which they have continual fresh air, and are able to work on, as far as they please: some of the cuniculi of these mines are five

five-hundred fathoms long; and, in the silver Trinity mine by Sebemnitz, there is a passage quite through a very large hill, coming out on the opposite side to that where it enters. The tubes always answer very well in the horizontal cuts; but not in the perpendicular ones, when they go to great depths: in these they place a tube all the way down by one side, and they then fit a piece of wood work to the size of the hole or cut; and several times in a day they are forced to thrust this down, in order to force up all the foul air that is in the pit by the tube, to give room for fresh air in its place. *Phil. Transf.* N°. 48.

In some of the coal-pits in the neighbourhood of Mendip-hills, fire Damps almost continually happen, so that great numbers have been killed, maimed, and burnt by them. The colliers however continue their work notwithstanding, only using the cautions of renewing their air very quick, and using no candles in their work but those of a single wick, and of sixty or seventy to the pound; which notwithstanding will give as good a light there, as others of ten or twelve to the pound in other places. They always have the caution to place even these behind them, and never present them to the breast of the work. When any person is burnt by these Damps, they presently betake themselves to a good fire, and, sending for a large quantity of cows-milk, they bathe the burnt places with this, while warm; and, afterwards, the places will heal by the common cooling ointments, and healing plaisters.

In regard to the periodical return of these Damps, mentioned by some, we find that, by the caution of small candles, used by the colliers of these places, there is a continual propensity in them to take fire at all times of the year; and, though these works seldom do take fire, yet, as the colliers say, they are most subject to it in the violence of winter, and chiefly in a black frost. The danger of firing is alike both in wet and dry grounds. There are no flames coming out at the mouth of any shaft in these places, which will take fire at lighted torches or candles being held over them. They sometimes take fire of themselves, and set fire to the coal of the mine: they seem to be as frequently on or near the floor of the pits, as about their roofs; and no current of vapours, or wind, is to be met with at the mouths of the shafts by which they go down to these pits. In wet works there are many times bubbles standing on the surface of the water, which will take fire, if a candle be held to them; but these, on a close examination, do not appear to be occasioned by subterraneous vapours; but are owing to the dropping of water from the roof of the mine, or the falling in of pieces of coal. These Damps are commonly observed in our coal pits; but the lead-mines on Mendip-hills are also sometimes affected by them. *Phil. Collect.*

DANK, or DANCK, a little piece of silver current in Persia, and some parts of Arabia. It weighs the sixteenth part of a drachm.

DANK, is also a little weight, used by the Arabians to weigh jewels and drugs, when these last are used in the composition of medicines. It is the sixth part of an Arabian drachm, which is eight grains French weight.

DARIA'BANIS, a white cotton stuff that comes from Surat.

DARI'DAS, a sort of India taffeta, made of silk drawn from plants.

DARNA'MAS, the best sort of cotton that comes from Smyrna, is so called, from a plain near that city, where it is cultivated in such great quantities, that, one year with another, 10,000 bales are bought, though at least as much more is consumed in the manufactures of the country.

DAU'CUS, *the carrot*, in botany, a genus of plants, whose characters are:

It hath, for the most part, a fleshy root: the leaves are divided into narrow segments: the petals of the flower are very unequal, and shaped like an heart: the umbel, when ripe, is hollowed and contracted, appearing somewhat like a bird's nest: the seeds are hairy, and in shape of lice.

Carrots are propagated at two or three different seasons, or sometimes oftener, where people are fond of young carrots through all the summer months. The first season for sowing the seeds is soon after Christmas, if the weather is open, which should be in warm borders, under walls, pales, or hedges: but they should not be sown immediately close thereto; but a border of lettuce, or other young sallad-herbs, of about a foot wide, should be next the wall, &c. for, if the carrots were sown close to the wall, they would run up to seed without making any tolerable roots.

They delight in a warm sandy soil, which is light, and should be dug pretty deep, that the roots may the better run down; for, if they meet with any obstruction, they are very apt to grow forked, and shoot out lateral roots, especially where the ground is too much dunged the same year that the seeds are sown, which will also occasion their being worm-eaten; it is, therefore, the better method to dung the ground intended for carrots the year before they are sown, that it may be consumed, and mixed with the earth.

These seeds have a great quantity of small forked hairs upon thin borders, by which they closely adhere, so that they are difficult to sow even, so as not to come up in patches; you should therefore rub it well through both hands, whereby the seed will be separated before its sown; then you should chuse a calm day to sow it; for, if the wind blows, it will be impossible to sow it equal; for the seeds, being very light, will be blown into heaps. When the seed is sown, you should tread the ground pretty close with your feet, that it may be buried, and then rake the ground level.

When the plants are come up, you should hoe the ground with a small hoe about three inches wide, cutting down all young weeds, and separating the plants to four inches distance each way, that they may get strength; and in about three weeks after, when the weeds begin to grow again, you should hoe the ground over a second time, in which you should be careful not to leave two carrots close to each other, as also to separate them to a greater distance, cutting down all weeds, and slightly stirring the surface of the ground in every place, the better to prevent young weeds from springing, as also to facilitate the growth of the young carrots.

In about three weeks or a month after, you must hoe them a third time, when you must clear the weeds as before; and now you should cut out the carrots to the distance they are to remain, which must be proportioned to the size you intend to have them grow: if they are to be drawn, while young, five or six inches asunder will be sufficient; but, if they are to grow large before they are pulled up, they should be left eight or ten inches distant every way: you must also keep them clear from weeds, which, if suffered to grow amongst the carrots, will greatly prejudice them.

The second season for sowing the seeds is in February, on warm banks situated near the shelter of a wall, pale, or hedge; but those which are intended for the open large quarters, should not not be sown before the beginning of March, nor should you sow any later than the end of the same month; for those which are sown in April or May, will run up to seed before their roots have any bulk, especially if the weather should prove hot and dry.

In July you may sow again, for an autumnal crop; and in the end of August you may sow some to stand the winter; by which method you will have early carrots in March, before the spring sowing will be fit to draw; but these are seldom so well tasted, and are often very tough and sticky. Many people mix several other sorts of seeds, as leek, onion, parsnip, radish, &c. amongst their carrots; and other plant beans, &c. but, in my opinion, neither of these methods are good; for, if there is a full crop of any one of these plants, there can be no room for any thing else amongst them; so that what is got by one is lost by the other; and, besides, it is not only more sightly, but better, for the plants of each kind to be sown separate; and also, by this means, your ground will be clear, when the crop is gone, to sow or plant any thing else; but, when three or four kinds are mixed together, the ground is seldom at liberty before the succeeding spring: besides, where beans, or any other tall growing plants, are planted amongst the carrots, it is apt to make them grow more in top than root; so that they will not be half so large as if sown singly without any other plants amongst them.

But, in order to preserve your carrots for use all the winter and spring, you should, about the beginning of November, when the green leaves are decayed, dig them up, and lay them in sand in a dry place, where the frost cannot come to them, taking them out from time to time as you have occasion for them, reserving some of the longest and straightest roots for seed, if you intend to save any; which roots should be planted in the middle of February, in a light soil about a foot asunder each way, observing to keep the ground clear from weeds; and, about the middle of August, when you find the seeds are ripe, you must cut it off, and carry it to a dry place, where it should be exposed to the sun and air for several days to dry; then you may beat out the seeds, and put it up in bags, keeping it in a dry place till you use it. This seed is seldom esteemed very good after the first or second year at most; but new seed is always preferred, nor will it grow when it is more than two years old. *Miller's Gard. Dict.*

DAZE, in natural history, a name given by our miners to a sort of glittering stone, which often occurs in their works; and, as it is an unprofitable substance, is one of those things which they call weeds. The word Daze takes in, with them, every stone that is hard and glittering; and therefore it comprehends the whole genus of the telangia, or stony nodules, which have flakes of talc in their substance: these, according to the colour of the stony matter they are bedded in, and their own colour, give the name of black Daze, white, red, and yellow Daze, to these stones. The Daze stones, in general, much resemble some of those nodules with which the streets of London are paved. But in some, instead of the matter forming regular nodules of a compact substance, it forms itself into a vast number of thin plates, which are applied closely over one another, and form shelves or even series of planes, encompassing, sometimes a roundish, sometimes an oblong mass of ore.

DEA'CONS (*Dict.*) — The name of Diaconi is as old as the Apostles time; but whether it was always used as it is now, for the third order of the clergy, is a matter of some doubt. It is certain, Ignatius stiles them ministers of the mysteries of Christ, and of the church of God: though the council of Trullo says, the seven Deacons, spoken of in the Acts, are to be understood only of such as served at tables, and attended the poor. But the whole current of antiquity runs against this notion, as well as Ignatius. Cyprian calls them ministers of episcopacy, and

and of the church; and ſays they were called ad altirias miniſterium, to the miniſtry and ſervice of the altar. Tertullian join them with biſhops, ſtiles them guides and leaders of the laity, and makes them, in their degree, paſtors and overſeers of the flock of Chriſt: and St. Jerom does the ſame in ſome places, though he ſpeaks more contemptuouſly of them in others.

But, though they were eſteemed a ſacred order, the name of prieſts was not generally given them. They were commonly diſtinguiſhed from prieſts by the names of miniſters and levites. The fourth council of Carthage ſays, they were not ordained to the prieſthood, but only to the miniſtering office, or inferior ſervice.

Certain it is, the ordination of a Deacon differed from that of a preſbyter, both in the form and manner of it, and in the gifts and power conferred thereby. The ordination of a Deacon might be performed by the biſhop alone, becauſe, as the council of Carthage words it, he was ordained not to the prieſthood, but to the inferior ſervices of the church.

The moſt common office of a Deacon was to aſſiſt the biſhop and preſbyters at the altar; alſo to take care of the holy table. It was the Deacon's office alſo to receive the people's offerings, and preſent them to the prieſt, who preſented them to God at the altar: and, after that, to repeat publickly the names of thoſe that offered. In ſome churches, but not in all, the Deacons read the goſpel both in the communion ſervice, and before it alſo.

In the adminiſtration of the euchariſt, it was the Deacon's buſineſs to diſtribute the elements to the people that were preſent, and carry them to thoſe that were abſent alſo.

In ſome caſes Deacons had the power to adminiſter baptiſm ſolely.

Another office of the Deacons was to direct the people in the exerciſe of their public devotions in the church, by giving them notice when each part of their ſervice began, and exciting them to join them; which they did by certain known forms of words appointed for that purpoſe. The Deacons alſo were to give the catechumens, penitents, and energumens, notice when to come up and make their prayers, and when to depart; and in ſeveral prayers they repeated the words before them, to to teach them what they were to pray for. And this was called κηρύττειν, among the Greeks, and prædicare, among the Latins; not to ſignify preaching, but performing the office of a κήρυξ, or præco, in the aſſembly. And hence Deacons were called ἱεροκήρυκες, i. e. the holy cryers of the church.

Deacons were allowed to preach, only when they had the biſhop's licence, and not without it.

Deacons had alſo the power of reconciling penitents, with the ſame limitation. In caſes of extreme neceſſity, when neither biſhop nor preſbyter were at hand to do it, Deacons were ſometimes authorized, as the biſhop's delegates, to give men the ſolemn impoſition of hands, which was the ſign of reconciliation.

They might be deputed by their biſhops to be their repreſentatives and proxies in general councils: and then they ſat and voted, not as Deacons, but as proxies, in the room and place of thoſe that ſent them.

DEADS, in mining, is uſed to expreſs that part of the ſhelf or faſt ground which contains no ore, but which incloſes the view or bed of ore, like a wall, on every ſide. The drifts which they ſink for the tin ore in Cornwall are generally about three feet over, and about ſeven feet high; ſo that a man may conveniently ſtand upright at work, and manage his tools. In caſe the vein itſelf is not broad enough to allow this, as in many places it is not half a foot over, then they pick down the ſtrata that incloſe it, ſo as to make an opening of the ſame breadth. This work they call breaking up the Deads. *Phil. Tranſ.* N°. 69.

DECA'NDRIA *, in botany, a claſs of plants with hermaphrodite flowers, and ten ſtamina, or male parts, in each. See *plate* XXII. *fig.* 1.

* The word is formed of the Greek δέκα, ten, and ἀνδρός, male.

Of this claſs of plants are the judas tree, baſtard dittany, &c.

DECLAMA'TION (*Dict.*)—It is amazing that in all ages and nations of polite learning, no ſchools for Declamation have ever yet been eſtabliſhed: the maſters of public ſchools and colleges give boys ſome ſlight notions which they never reduce to practice in any of the ſtages of civil life; but indeed, as their principal employment is to teach the dead languages, they have no time to beſtow on other ſtudies: Beſides, the boys whom they have commonly under their care are too young, and incapable either to make ſolid reflections by themſelves, or to comprehend the precepts of their maſter. Should an old orator fill a public chair, and teach the art of Declamation, he would be as uſeful to ſociety as moſt of the fine eſtabliſhments that are in great cities: young people would then ſtudy oratory, when moſt of their own ſtudies were over, when they were advanced in age, and conſequently more capable to comprehend the reaſons that would be offered; but, above all, they would retain the natural and ſtriking impreſſions conveyed by animated ſpeech in the practice of declaiming, and all the different branches of that art.

Declamation, or manner of ſpeaking upon the ſtage, was by the ancients compoſed with notes; which, however, was not ſinging to muſic: In this ſenſe we ſhould often underſtand in the Latin poets the words canere, cantus, and even carmen, which do not always ſignify ſinging, properly ſo called, but a certain manner of ſpeaking or reading. According to Bryennius, this declaiming or ſpeaking was compoſed with accents, and in conſequence it was neceſſary, in writing it, to make uſe of the characters which expreſſed thoſe accents. At firſt they were only three, the acute, the grave, and the circumflex; they afterwards amounted to ten, each marked with different characters. We find their names and figures in the ancient grammarians. The acute is the certain rule by which the voice ſhould be raiſed or depreſſed in the pronunciation of every ſyllable: as the manner of ſounding their accents was learned at the ſame time, with reading, there was ſcarce any body who did not underſtand this kind of notes: beſides the help of accents, the ſyllables in the Greek and Latin languages had a determinate quantity, that is to ſay, they were either long or ſhort. The ſhort ſyllables had only one, and the long, two ſeconds of time: this proportion of ſyllables was as abſolute as that in theſe days between notes of different length, viz. that two black notes in our muſic ought to have as much time, as one white one in the muſic of the ancients; two ſhort ſyllables had neither more nor leſs than one long one. Hence, when the Greek or Roman muſicians were to compoſe any thing whatſoever, they had no more to do, in ſetting the time to it, than to conform to the quantity of the ſyllables upon which they placed each note. It is a pity the muſicians amongſt us, who compoſe muſic to hymns, &c. do not underſtand Latin, and are ignorant of the quantity of words; from whence it often happens, that upon ſhort ſyllables, over which they ought to run lightly, they inſiſt and dwell a great while, as if they were long ones: this is a conſiderable fault, and contrary to the moſt common rules of muſic.

We have obſerved, that the Declamation, or manner of ſpeaking of the actors upon the ſtage, was compoſed and wrote in notes, which determined the note it was proper to take. Amongſt many paſſages, which demonſtrate this, we ſhall only obſerve one from Cicero, where he ſpeaks of Roſcius, his contemporary, and intimate friend. Every body knows that Roſcius became a perſon of very great conſideration, by his excellency in this art, and his reputation for probity; the people were ſo much prejudiced in his favour, that, when he did not act ſo well as uſual, they ſaid it was either out of negligence or indiſpoſition. In fine, the higheſt degree of praiſe, that they gave to a man who excelled in his profeſſion, was to ſay he was a Roſcius, in his way. Cicero, after having ſaid, that an orator, when he grows old, might ſoften his manner of ſpeaking, quotes, to a proof, an example of it, what Roſcius declared, that, when he perceived himſelf grow old, he obliged the inſtruments to play in a lower key. Cicero, accordingly, in a later work than that now cited, makes Atticus ſay, that actor had abated his Declamation or manner of ſpeaking, by obliging the player on the flute, that accompanied him, to keep a ſlower time with the ſound of his inſtruments. It is evident that the ſinging, for it was often called ſo, of the dramatic pieces on the ſtages of the antients, had neither diviſions, recitatives, continued quaverings, nor any of the characters of our muſical ſinging: in a word, that this ſinging was only declaiming, or ſpeaking, as with us. This manner of utterance was, however, compoſed, as it was ſuſtained by a continued baſs, of which the ſound was proportioned, in all appearance, to that made by a man, who declaims or pronounces a ſpeech. This may ſeem to us an abſurd and almoſt incredible practice, but is not therefore the leſs certain; and, in matter of fact, it is uſeleſs to object any arguments. We can only ſpeak by conjecture upon the compoſition which the continued baſs might play, that accompanied the actor's pronunciations; perhaps it only played from time to time ſome long notes, which were heard at the paſſages, in which it was neceſſary for the actor to aſſume ſuch tones as it was not eaſy to hit with juſtneſs; and thereby did the ſpeaker the ſame ſervice as Gracchus received from the player upon the flute, he always had near him, when he harangued, to give him, at proper times, the tones concerted between them.

DEER, *cervus*, in natural hiſtory, the name of a genus of animals, comprehending the common Deer, and the elke. The characters of this genus are, that the horns fall off every year, that they are ſolid and branched, and that the animal chews the cud.

The word cervus, uſed alone, is underſtood by authors to mean the ſtag, or red Deer, the others being all diſtinguiſhed by their ſeveral adjectives; the common fallow Deer being called cervus, platyceros, or the broad-horned Deer. *Ray's Synopſ. Quad.*

The red Deer differs from the common kind in its ſize, and in the figure of its horns. The common Deer is more preſerved in England than in any other part of the world, and carries its diſtinction from the red Deer in the falcated figure of its horns.

We keep ſeveral ſpecies of thoſe however, and may perhaps increaſe them in ſome ſort to many more, as they are a very ſalacious falacious animal, and will be apt to mingle one species with another. The principal kinds we know at present, are 1. The Spanish Deer, which is almost as large as the red Deer, but has a very slender neck, and is of a deep dusky colour; the tail in this species is also longer than in ours, and is black all over, not white next the body. 2. The mottled Deer, which are beautifully variegated with black, white, and tawny. 3. The Virginia Deer, which are larger and stronger than ours, and have thicker necks, and are of a grey or ash colour rather than tawny, and remarkable for the largeness of their penis and scrotum. 4. A species which have their hinder hoofs marked with white on the outside; the ears and tails of these are long, their horns branched, and their forehead a little depressed or hollowed between the eyes. These will eat bread, fruits, and any thing that is offered them, and are often beautifully variegated; many of them have black variegations, and a black list down their back, with a series of white spots on each side; others are so beautifully marked with white spots and other variegations, as to equal the zelora in beauty: these they call monated Deer. *Ray's Synops. Quad.*

DELPHI'NIUM, *lark-spur*, in botany, the name of a large genus of plants; the characters of which are these: the flower is of the polypetalous anomalous kind, consisting of several irregularly sized petals, the upper one ending in a spur or tail, and receiving into its hollow another of the petals, which has also its tail or spur: the pistil which occupies the center of this flower, finally becomes a fruit composed of several vaginæ, which open lengthwise, and contain a number of seeds, usually of an angular form. The species of lark-spur, enumerated by M. Tournefort, are thirty-eight.

DELPHI'NUS, *the dolphin*, in the Linnæan system of zoology, makes a distinct genus of fishes of the plagiuri, or transverse-tailed order; the characters of which are, that the back has two fins, and there are teeth in both jaws. *Linnæi Systema Naturæ.*

In the Artedian system of ichthyology, Delphinus is also the name of a genus of the plagiuri, or cetaceous fishes; the characters of which are these: the teeth are placed in both the jaws, the pipe or opening is in the middle of the head, and the back is always pinnated.

The dolphin is a cetaceous fish, covered with a smooth but very tough and firm skin; its body is long and rounded, and its back prominent; its nose long, and rounded at the end; its mouth very large, but shutting very nicely and exactly; its teeth small and sharp, and placed like the teeth of a comb; its tongue broad and serrated; its eyes large, but so covered with the skin that the pupil only appears. Its eyes are placed near the angle of the mouth; and behind these are its ears, or auditory passages, which are very small. Above the snout it has a double pipe, by which it throws out the water necessarily taken in with food. It has two fins joined like the shoulders of a human body to the muscles, which move them. In the middle of the back it has also one fin, which is partly cartilaginous, and partly bony, but has no spines or prickles. Its back is black, and its belly white; the flesh is blackish, and it has a regular lungs in its breast of a more tough consistence than those of quadrupeds. These fish are supposed to live a great number of years. The figures of them on some antique marbles and coins, which represent them crooked, are unnatural; and have been conceived originally by persons who had seen them playing about on the surface of the water, in which case they sometimes deceive the eye, and appear crooked: from these probably our sign-painters took their idea of the dolphin. They are an extremely swift fish in swimming, and are able to live a long time out of the water, though they can continue but a little while under it without air; hence they are sometimes taken up dead by fishermen in their nets, having been suffocated by being forcibly kept under water: they have been known to live three days on dry ground. *Willughby, Hist. Pisc.*

DE'LVIN, in natural history, a name sometimes given by the miners of Cornwal to that sort of talky stone or slate, which they more generally call killas; but in some places, as at Lowancowiggan, they use it as the name of a coarse but very hard stone in which the ore lies. The ore is tin, and is considerably rich there, but the hardness of this stone makes it difficult to be got out.

DENDRANA'TOMY, a term used by Malpighi and others to express the dissection of the ligneous parts of trees and shrubs, in order to the examining their structure and uses.

DENS *Canis*, dog's-tooth, in botany, the name of a genus of plants: the characters of which are these: the flower is of the liliaceous kind, and is composed of six petals, which are pendulous, and bend backward. The middle of the flower is occupied by a pistil, which finally becomes a round fruit, or seed vessel, divided into three cells, and containing a number of oblong seeds: to this it is to be added, that the root is fleshy, and of the shape of a dog's fruit.

The species of Dens canis, enumerated by M. Tournefort, are eight.

The powder of the dried root of this plant is said to kill worms in children. Drank in wine, it is an approved remedy for the cholic. It is said to be restrictive and restorative, and, taken in water, cures children of the epilepsy: it is also esteemed a great provocative to venery.

DENS *Leonis*, dandelion, in botany, the name of a genus of plants, the characters of which are these: the flower is of the semi-flosculous kind, and the petals it is composed of are placed on the embryo-seeds, and surrounded by the cups. The embryo's finally become seeds winged with down, which are affixed to the thalamus, but expand their downy ends into a globular head, and the stalks are usually hollow and not branched. The species of Dandelion, enumerated by M. Tournefort, are twenty-two.

The common species of this plant has much the same virtues as the common endive, but in a greater degree: the roots eaten in spring are esteemed of great service in obstructions in the liver and spleen.

DENTA'LE, in natural history, the name of a genus of the tubuli marini: the characters of which are, that they are shelly tubes, resembling the tusks of elephants, or the horn of some animal which is a little bent. Some authors have called these elephants teeth.

DE'NTES *Canini*, dogs teeth, are so termed, because they are naturally a little pointed, and appear longer than the rest, almost in the same manner as in dogs: they might also be properly enough be called angular, because they make an angle, by which the incisores are separated from the grinders; the two superior have also been named eye-teeth from their situation. The bodies of the Dentes canini are thicker and more prominent than those of the incisores; they are convex, and a little rounded on the outside, and end in a short triangular point, one of the sides of which is a continuation of the convexity of the outside, and the other two are flatter and turned inwards. These points are often worn out by mastication: their roots are commonly larger, thicker, longer, and more pointed than those of the incisores, and sometimes perforate to the bottom of the maxillary sinus. *Winslow's Anatomy.*

Dentes incisores, the cutting teeth, have their name from their use; and are by some authors called risorii, because they appear in laughing; the four upper incisores are larger and broader than the four lower; and, of the upper, the two in the middle are larger than the other two: the bodies of these teeth resemble large cutting wedges, and their roots are pointed. Their bodies are so disposed that their sharp ends lie all in a line, making one uniform edge; each body has properly four sides; one anterior a little convex, one posterior a little concave, and two lateral much narrower than the former, and almost flat: the anterior and posterior sides decrease in breadth towards the neck, the lateral sides towards the edge; so that they represent in some degree four triangles, with their apices and bases reciprocally opposite.

These teeth have long roots, the lateral sides of which are broad and flat, the anterior and posterior narrower: they terminate by degrees in a point, in which a small hole is observable, in children pretty considerable, but almost obliterated in old age. *Winslow's Anatomy.*

DESIDERA'TUM, is used to signify the desireable perfections in any art or science: thus, it is a Desideratum, with the black-smith, to render iron fusible, by a gentle heat, and yet preserve it hard enough for ordinary uses; with the glass-man and looking-glass maker, to render glass malleable; with the clock-maker, to bring pendulums to be useful where there are irregular motions; with the brazier and coppersmith, to make malleable solder; with the shipwright, to build vessels that will sail under water: with the diver, to procure manageable instruments for conveying fresh air to the bottom of the sea, sufficient for respiration, and the burning of lights; with the assay-master, to melt or copel ores, immediately, without the use of bellows or furnace; and, with the carvers and joiners, to fashion wood in moulds like plaister of Paris or burnt alabaster, &c. And though, as Mr. Boyle observes, the obtaining of these Desiderata may be thought chimerical, yet it is proper they should be proposed; for, although perfection may not be attainable, yet approaches to it may be made, and arts thereby improved.

To this we may add, that the making iron malleable with pit coal was once perhaps looked upon as chimerical, yet it is now put in practice, to the great advantage of the owners of several mines in this kingdom.

It is a Desideratum, in the tin works, to find a method of obtaining the silver out of the tin, as it is now got out of the lead, in places where the ores are so rich as to make it worth the while.

In the glass-works, it is a Desideratum to solder up the cracks and flaws in the pots, while they are detained in the fire, and another to make glass without veins.

A tasteless and inodorous wine is a Desideratum among vintners, and a tasteless, acid, inodorous spirit among distillers.

The painters want a permanent green, and the callico-painters a lasting blue.

In short, all arts have their defects, and it is not at first to be guessed, for how many of these remedies may be found, by means of chemical researches properly directed.

Chemistry itself is greatly defective in many particulars, as in in an experimental history of general fermentation, separatory and combinatory, in subjects of the animal, vegetable, and mineral kingdoms. A history of putrefaction, rancidness, mustiness, mouldiness; and of the making of glues, mulages, and the like preparations, in the most perfect manner is also wanted.

The sublimer metallurgy is in particular yet greatly defective. It wants a more easy method of extracting the mercuries of metals, than those commonly described; a cheaper method of meliorations is wanted, and, in general, all the parts of this branch of the art seem equally defective.

The schemes for new trades will rise occasionally in the prosecuting many of the subjects; thus, it is natural for the common operations of brewing and sugar-baking to suggest that sugar may be procured from malt and other vegetables. That nurseries of peculiar ferments, both native and foreign, may be raised on the common principles; and it is evident, that the introduction of such new trades would greatly improve the business of brewing, sugar-baking, and the like.

If a proper number of persons duly qualified for making experiments, and improving from them, would set about each his particular share of the necessary experiments, and communicate the result of all their processes to one another, the business of chemical experiment would be much better directed in regard to future students, and many of the Desiderata in the art probably supplied. *Shaw's Chem.*

DESI'GN, or *Designing*, in the manufactories, expresses the figures wherewith the workman enriches his stuff or silk, and which he copies after some painter, or eminent draughtsman; as in diaper, damask, and other flowered silk and tapestry, and the like, &c.

In undertaking of such kinds of figured stuffs, it is necessary, says Monf. Savary, that, before the first stroke of the shuttle, the whole Design be represented on the thread of the warp; we do not mean in colours, but with an infinite number of little packthreads, which, being disposed so as to raise the threads of the warp, let the workmen see, from time to time, what kind of silk is to be put in the eye of the shuttle for woof.

This method of preparing the work is called reading the Design, and reading the figure, which is performed after the following manner:

A paper is provided, considerably broader than the stuff, and of a length proportionate to what is intended to be represented thereon. This they divide lengthwise, by as many black lines as there are intended to be threads in the warp; and cross these lines by others drawn breadthwise, which, with the former, make little equal squares.

On the paper thus squared the draughtsman designs his figures, and heightens them with colours, as he sees fit. When the Design is finished, a workman reads it, while another lays it on the simblot.

To read the Design, is to tell the person who manages the loom the number of squares, or threads, comprised in the space he is reading, intimating, at the same time, whether it is ground or figure.

To put what is ready on the simblot, is to fasten little strings to the several packthreads, which are to raise the threads named: this they continue to do, till the whole is read.

Every piece being composed of several repetitions of the same Design, when the whole Design is drawn, the drawer, to re-begin the Design a-fresh, has nothing to do but raise the little strings with slip-knots to the top of the simblot, which he had let down to the bottom. This he is to repeat as is necessary, till the whole be manufactured.

The ribbon-weavers have likewise a Design, but far more simple than that we have described. It is drawn on paper, with lines and squares, representing the threads of the warp and woof. But, instead of lines, of which the figures of the former consists, these are constituted of points only, or dots, placed in certain of the little squares, formed by the intersection of the lines. These points mark the threads of the warp that are to be raised, and the spaces left blank denote the threads that are to keep their situation. The rest is managed as in the former.

DE'TENTS, in a clock, are those stops which, by being lifted up or let fall down, lock and unlock in striking.

Detent-wheel, or hoop-wheel, in a clock, that wheel which has a hoop almost round it, wherein there is a vacancy, at which the clock locks.

DE'VENSHRING, or *Denshiring*, a term used by the farmers to express the burning land by way of manure: the method is to cut off the turf about four inches thick, and burn it in heaps, and then spread the ashes upon the land; they probably call it Devenshring, from its having been earliest practised in Devonshire. See the article BURNING *of land*.

DEUILLE's *Piston*, in hydraulics, a piston without friction invented by Messieurs Gosset and de la Deuille, and successfully made use of in the king of France's garden at Paris.

This piston may be made as big as you please, even to have 36 inches diameter; but I shall only give 15 to that I am going to describe, this bigness seeming most convenient for the reasons that will appear, as we describe this piston. As it is to act in a pump different from those commonly described, I will shew in what it consists. It is made of two boards of oak or elm, 20 inches diameter, and five inches thick: in the middle of each of these boards, you must cut a hollow cylindrical cavity 15 inches diameter, and 2½ inches deep, which forms two boxes, which must be applied to one another with their hollows together; their profile taken diametrically is represented by each of the rectangles A B C D, and E F H G (*Plate* XVII. *fig.* 10.)

The piston is made of a circular board Y Z, an inch thick, whose diameter must be a little less than that of the hollow T O Q V, to facilitate its play: this board is fixed to a great circle of leather (or to several, when one is not strong enough) in such manner that the leather may extend all round beyond it six or seven inches; then you must put the board Y Z in the bottom of the box S T V X, and what exceeds of the leather must be folded up all round the edge E X G of the same box. Then you put down the other box upon the first, so as to squeese the leather between; and, that it may be pressed the more strongly, so that the two boxes may make but one, they are drawn together by means of several iron pins 17, 18, whose ends are cut into screws, to fit into nuts; then the piston makes a sort of a purse 3, 4, 5, 6, which turns inside out every time the bottom Y Z is drawn upwards.

At the bottom of this purse there is an hole L, covered with a valve K, which, when it is raised, comes to lean against the handle M W M, which handle is fastened to the rod N, that works the piston up and down; for doing of which there is another hole 9, 10, in the bottom of the upper box, which answers to the rising pipe 13, 14, in which the rod N goes up. This hole is made spreading downwards, that the moveable board may apply itself close to the top O Q, when the piston rises. In the lower bottom of the box there is another hole 19, 20, which answers to the sucking pipe 15, 16, that stands in the water to be raised; this hole is covered with a valve I, as usual.

When the piston rises, the water from the sucking pipe opens the valve I, and passes into the hollow that is made in an height of four inches, which is all the play that the piston ought to have, not to weaken the leather too much, which would not hold out long, if it had too long a stroke; whereas, having at most but 2 inches and ½ to rise from 5 to X, it wears but little: when the piston comes down, the valve I shuts again, the other K opens, and the water which is between the bottom T V, and the leather 3, 4, 5, 6, goes through the hole L, and comes into the space O P Y Z Q, whence it is lifted into the rising, or forcing, pipe; thus you see that the piston, always moving between the water above, and that below, has no friction. I shall add, that, when it is made of good leather, it may be continually worked for three or four months, without repairing, as experience has shewn it in those pumps, that Messieurs Gosset and de la Deuille had made for draining the mines in Brittany.

The only fault to be found with this piston, is, that, of whatsoever diameter the rising pipe 13 and 14 is, the power is always loaded with the weight of a column of water, whose base is the circle O Q, and height the elevation of the reservoir above the spring; it is true, that one may increase the diameter of that pipe, and decrease that of the piston, that, when they are equal, the power may only raise its natural weight.

It may may yet perhaps be objected, that this piston, having so short a stroke, will give but a little water every time; but that is not a fault, since one may make the strokes more frequent; so that what may be lost on one hand may be gained on the other, and as much water be raised as if the stroke were longer.

As the rod of the piston goes through the rising (or forcing) pipe, water may not be raised to a considerable height by this pump, yet the rod of the pump, erected in the king's garden, is at least 25 feet long; and, if the same length be given to the sucking pipe, one may however raise water 50 feet above its spring, in a very plain and cheap way. For, if you make use of wood, such a pump will cost under ten pistoles: and that serves, upon many occasions, where a pump of great expence would raise no more water with the same power.

DEW (*Dict.*)—Those who have made no other reflections on Dew than such as present themselves naturally, think that all the moisture one finds in the morning on plants and upon the ground, comes in reality from above; but, when the affair is examined with more attention, one sees that at least a great part of the Dew arises from the earth itself and the plants, and keeps hanging to their surface. Mr. Gersten who hath made a dissertation on this subject in particular, hath even thought that there fell no Dew from above on the ground, and that all which we see under the form of Dew arose from the earth or plants, on which it keeps hanging in pearls till the heat of the day hath dispersed it.

This opinion of Mr. Gersten was not new, and we find, in the History of the Academy for 1687, that some persons of the company had advanced, that the Dew rose from the earth and did not descend from above, because they found under glass-bells as much Dew as in other places exposed to the air; it is probable, that since that time several persons have been of the same sentiment; one finds even traces of it in ancient authors:

thors: but Mr. Gerſten did not derive his notion from thence; he had given, in the work which we have cited, a new explication of the riſings and fallings of the barometer that did not agree with the deſcent of Dew; this made him think of examining the thing with more attention, than had hitherto been done. He had already obſerved in gardens that the graſs was full of a moiſture in the evening, and covered with very perceptible little drops, whilſt the leaves of trees, and plants that were more raiſed from the ground, had not the leaſt appearance of it; he remarked moreover that all the plants had it not equally, that on ſome it was very abundant, whilſt he could ſcarce perceive it on others.

We ſhall not relate a great number of experiments, that were made by Mr. Gerſten, although ſome of them are extremely curious; but the reader will ſee by thoſe which we ſhall give an account of afterwards, that it was neceſſary, in order to draw certain and exact conſequences, to have a knowledge of ſeveral facts, the diſcovery of which was reſerved for Mr. Muſſchenbroek; who after having verified the greateſt part of Mr. Gerſten's experiments, at firſt ſubmitted himſelf to his opinion, but he hath ſince changed, and is fixed in acknowledging ſeveral ſorts of Dews, of which one more denſe than all the others riſes from lakes, rivers, and marſhes.

And a third falls from above: Mr. Muſſchenbroek founds the exiſtence of this laſt on a great number of experiments which he hath made upon the leaden terras of the Obſervatory at Utrecht; it was not poſſible that any vapour ſhould riſe from this terras of lead, yet ſeveral bodies which he expoſed there received Dew on their upper ſurface; from whence Mr. Muſſchenbroek concludes that there is really a Dew that falls.

Several obſervations and experiments repeated very often, and which always proved uniform, leave no longer any doubt with me concerning the nature of Dew, at leaſt with regard to its riſing or falling; and I think one may be ſatisfied that it riſes only from the earth and plants; that this moiſture or this vapour conſiſts of an infinite number of little aqueous globules extremely light with which the air is loaded, and which it carries with it whitherſoever it is driven by its fluctuating motion: thus the bodies which are met by this aqueous vapour, receive it in all the parts of their ſurface, and are immerſed all at once.

In the experiments of Mr. Muſſchenbroek where bodies expoſed on the leaden terras received Dew on their upper ſurface, it is true, the moiſture did not come from the terras, but it roſe from the earth, and from the plants round about; it came ſucceſſively, and by the vehicle of air to the terras of lead; it was afterwards diffuſed through all the air that was above this terras, and faſtened to the bodies which were expoſed to receive it: if Mr. Muſſchenbroek had attended to the time when the Dew began to be perceived on the terras, he would have remarked, that it was ſenſible a long time before at the foot of the tower, on whoſe ſummit he made the obſervation; I even doubt not but, if he had raiſed a mirrour or piece of glaſs to ſix feet above the leaden terras, he would have found drops of Dew attached to the inferior ſurface of the glaſs, as ſoon and in as great quantities as on the ſuperior ſurface: this I cannot doubt of from experiments I have made along the different heights of the ſteps of a ladder. I placed two ladders oppoſite each other, joined at their tops, ſpreading wide aſunder at their bottoms, and ſo high as to reach thirty-two feet. To the ſeveral ſteps of theſe I faſtened large ſquares of glaſs, and ſet them in ſuch a manner that they ſhould not ſhade or over-hang one another. It was plain that, if the Dew deſcended without firſt riſing, the top ſquares muſt be firſt wetted, and that on their upper ſurface; but on the contrary, if the Dew firſt aſcended from the earth, the bottom ſurfaces of the lower panes muſt firſt receive it: and thus in fact it happened; the lower ſurface of the loweſt piece of glaſs was firſt wetted, then its upper ſurface; then the lower ſurface of the pane next above it, and ſo on gradually till the whole was wetted to the top of the ladders.

But, in order to aſſure myſelf more certainly, and leave no room for doubt on this ſubject, I have lately repeated the ſame experiments at Paris upon a leaden terras. I ſuſpended a glaſs upon a wooden frame, raiſed only two feet, and I conſtantly found drops of Dew pretty nearly in equal quantity on the under ſide as on the upper ſide of the glaſs; which is different from the former experiments that were made in the country, where the inferior ſurface was always ſooner and more abundantly moiſtened than the ſuperior; but the reaſon of this difference is very evident, for in the country the aqueous vapours roſe directly from the earth, and faſtened themſelves to the under ſurface of the glaſs; but it is not ſo on a terras of lead, and ſurrounded by lofty buildings; in this caſe, the air that is loaded with moiſt vapours cannot arrive thither but by long windings, and a very irregular fluctuation; ſo that there is no more reaſon why it ſhould faſten itſelf to the under than to the upper ſide of the glaſs; or, in other words, the vapour doth not riſe there perpendicularly as in the country, but is driven in a lateral direction.

Notwithſtanding all I have been ſaying, I do not pretend that there is but one kind of Dew, and deny not but there may be a Dew whoſe parts are groſs enough, and have ſufficient weight to fall to the ground; yet I think in that caſe it would be viſible, and form what we know by the name of fog: but our inquiry is at preſent of that kind of Dew, ſo ſtiled by all, which is imperceptible to the eyes, and becomes ſenſible only by wetting thoſe bodies that are expoſed to the air in the night. *Mem. Acad. Roy. Sciences.*

The reverend Dr. Hales, in his treatiſe of Vegetable Statics, tells us, that in order to find out the quantity of Dew that fell in the night, on the 15th of Auguſt, at 7. p. m. he took two glazed earthen pans, which were three inches deep, and twelve inches diameter in ſurface; that he filled them with pretty moiſt earth, taken from off the ſurface of the ground, and they increaſed in weight by the night's Dew 180 grains; and decreaſed in weight by the evaporation of the day one ounce + 282 grains.

He ſays likewiſe, he ſet theſe in other broader pans to prevent any moiſture from the earth ſticking to the bottom of them. He adds, the moiſter the earth is, the more Dew falls on it in a night, and more than a double quantity of Dew falls on a ſurface of water than there does on an equal ſurface of moiſt earth: the evaporation of a ſurface of water in nine hours winter's dry day, is $\frac{1}{31}$ of an inch: the evaporation of a ſurface of ice, ſet in the ſhade during a nine hours day, was $\frac{1}{21}$. So here are 540 grains more evaporated from the earth every 24 hours in ſummer, than fall in Dew in the night; that is, in 21 days near 26 ounces from a circular area of a foot diameter; and circles being as the ſquares of their diameters, 10 pounds + 2 ounces will in 21 days be evaporated from the hemiſphere of 30 inches diameter, which the ſunflower's root occupies; which, with the 29 pounds drawn off by the plant in the ſame time, makes 39 pounds, that is, 9 pounds and $\frac{3}{4}$ out of every cubic foot of earth, the plant's roots occupying more than 4 cubic feet: but this is a much greater degree of dryneſs than the ſurface of the earth ever ſuffers for 15 inches deep, even in the drieſt ſeaſons in this country.

In a long dry ſeaſon therefore, eſpecially between the tropics, we muſt have recourſe, for ſufficient moiſture to keep plants and trees alive, to the moiſt ſtrata of earth, which lie next below that in which the roots are.

Now, moiſt bodies always communicate of their moiſture to more dry adjoining bodies; but this ſlow motion of the aſcent of moiſture is much accelerated by the ſun's heat to conſiderable depths in the earth, as is probable, he ſays, from the twentieth experiment in the ſaid book.

Now, 180 grains of Dew falling in one night, on a circle of a foot diameter = 113 ſquare inches; theſe 180 grains being equally ſpread on this ſurface, its depth will be $\frac{1}{159}$ part of an inch $= \frac{180}{113 \times 254}$. He adds, that he found the Dew in a winter's night to be the $\frac{1}{90}$ part of an inch; ſo that if we allow 151 nights for the extent of the ſummer's Dew, it will in that time ariſe to one inch deep: and, reckoning the remaining 214 nights for the extent of the winter's Dew, it will produce 2, 39 inches deep; which makes the Dew of the whole year amount to 3, 39 inches deep.

And the quantity which evaporated in a fair ſummer's day from the ſame ſurface, being as 1 ounce 282 grains, gives $\frac{1}{40}$ part of an inch deep for evaporation, which is four times as much as fell at night.

He ſays likewiſe, that he found, by the ſame means, the evaporation of a winter's day to be nearly the ſame as in a ſummer's day; for, the earth being in winter more ſaturated with moiſture, that exceſs of moiſture anſwers to the exceſſive heat in ſummer.

It is very certain, that ſubſtances of a very different kind from the uſual and natural matter of the Dew, have ſometimes fallen in that form. Our Philoſophical Tranſactions give an account, that, in the year 1695, there fell in Ireland, in ſeveral parts of the provinces of Leinſter and Munſter, for a conſiderable part of the winter and ſpring, a fatty ſubſtance, reſembling butter, inſtead of the common Dew; it was of a clammy texture and dark-yellow colour; and was, from its great reſemblance, generally called Dew-butter by the country people. It always fell in the night, and chiefly in the mooriſh low grounds, and was found hanging on the tops of the graſs, and on the thatch of the houſes of the poor people. It was ſeldom obſerved to fall twice in the ſame place, and uſually, wherever it fell, it lay a fortnight upon the ground before it changed colour, but, after that, it gradually dried up, and became black. The cattle fed in the fields where it lay, as well as in others, and received no hurt from it: it fell in pieces of the bigneſs of one's finger end, but they were diſperſed ſcatteringly about, and it had an offenſive ſmell, like that of a church-yard. There were, in the ſame places, very ſtinking fogs during the winter, and ſome people ſuppoſe this no other than a ſediment or connection of the heavier matter of thoſe fogs. It would not keep very long, but it never bred worms. The country people, willing to have ſome good of it, tried it on their children's foreheads, and it always cured them of a ſcald-head. *Phil. Tranſ.* N°. 220.

Cryſtalline Dews, a term uſed by ſome modern writers, to expreſs certain Dews, or ſteams, which, in their fall upon the earth, become, as they ſay, cryſtal. This greatly favours the opinion of the ancients, that all cryſtal was only water frozen into a kind of ice harder than ordinary, but it is erroneous. Mr. Beaumont gives an account, in the Philoſophical Tranſac-

Tranfactions, of thefe cryftal Dews on Mendip-hills; in which he tells us, that the miners of that place find fometimes, in the roads where the earth is bare, triangular cryftals, about two inches in length, and an inch over, not with fharp angles, but roundifh and blunted ones, and carried up round at the ends like a cocoa-nut; and that none of thefe are ever found under ground in digging, but only lying on the furface. He tells us alfo, that he had feen fome taken up in Gloucefterfhire, and confirms the opinion of thefe cryftalline Dews producing real cryftals, by the account given of fome places in Italy, where cryftals are, as it is faid, frequently produced in clear evenings by a coagulation of the Dews falling on nitrous fteams. Whatever the cryftals are, which authors feem to fuppofe to have been generated in this manner, it is very certain, that they have in reality another origin; and thefe are only the accounts of ignorant and inconfiderate people, to give credit to the ftrange and unnatural method here given for their formation. *Phil. Tranf.* N°. 129.

DIA'BOLUS *Marinus*, the fea devil, in zoology, the name of an ugly and ftrangely ill-fhaped fifh, of the ray kind. Its nofe or fnout is bifid, and runs out into two horns, and its fides are both terminated by thin fins: its skin toward the head is variegated with dusky fpots. It grows to a very confiderable fize, being fometimes caught of fix or feven feet long. *Ray's Ichthyogr. Append.* p. 5. See *Plate* XXII. *fig.* 2.

DIADE'LPHIA, in botany, a clafs of plants with hermaphrodite flowers, whofe ftamina, by the conjunction of thin filaments, are formed into two bodies.

The characters of the Diadelphia are thefe: the perianthium confifts of one leaf, and is of a bell-like fhape, and gibbous at the bafe; this always falls with the flower. It ftands on a pedicle, is obtufe at the top, and carries a drop of honey-like juice at the bafe. Its mouth or rim is divided into five fegments, which are fometimes erect, fometimes oblique, and always irregular, and acute. The bottom fegment, which has no fellow, is longer than all the reft; and the top pair are fhorteft of all, and ftand fartheft afunder. The receptacle of the fructification is inclofed in the bottom, where it is wetted with the drop of honey. The flower is of an irregular fhape, and is of that kind called by authors papilionaceous, from its fomewhat refembling the wings of a butterfly.

DI'AMOND (*Dict.*)— *Valuation of* DIAMONDS. Mr Jeffries lays down the following rule for the valuation of Diamonds of all weights. He firft fuppofes the value of a rough Diamond to be fettled at two pounds per carrat, at a medium; then, to find the value of Diamonds of greater weights, multiply the fquare of their weight by two, and the product is the value required. E. g. to find the value of a rough Diamond of two carrats, $2 \times 2 = 4$, the fquare of the weight, which, multiplied by two, gives eight pounds, the true value of a rough Diamond of two carrats. For finding the value of manufactured Diamonds, he fuppofes half their weight to be loft in the manufacturing them; and, therefore, to find their value, we muft multiply the fquare of double their weight by two, which will give their true value in pounds: thus, to find the value of a wrought Diamond, weighing two carrats; we firft find the fquare of double the weight, viz. $4 \times 4 = 16$, then $16 \times 2 = 32$. So that the true value of a manufactured Diamond of two carrats is 32 pounds.

By this rule, Mr. Jeffries has conftructed tables of the price of Diamonds, from 1 to 100 carrats. *Jeffries on Diamonds, p.* 8, 9, *and p.* 11 *& feq. of his Tables.*

Rough Diamonds are more commonly found of a fix-pointed figure than of any other; and thefe are called fix-pointed rough Diamonds, the figure of which is compofed of two fquare pyramids, joined at their bafes. Hence the whole figure is compofed of eight triangular faces, or planes, four of which meet in a point above the bafe, and four below it, in another point. The diftance of thefe two points is the axis of the figure.

Shining of DIAMONDS *in the dark.*— The ancients having mentioned many precious ftones which fhone in the dark, the moderns have made a great number of experiments, in order to difcover whether Diamonds had really any luftre in the dark. The great Mr. Boyle made a multitude of experiments of this kind; and Mr. Du Fay has lately repeated thefe experiments, and added feveral others, an extract of which will not, perhaps, be difagreeable to the reader.

After having verified upon feveral Diamonds the experiments related by Mr. Boyle, I plainly difcovered that it was not neceffary that the Diamond fhould be heated, in order to contract a tranfient light, fuch as that which it produces, when rubbed upon glafs or metals; but I thought that it muft be fenfibly heated to acquire that permanent and durable light, which fubfifted for feveral minutes, when the Diamond had been near to a lighted candle, or expofed to any other heat. With this view I expofed to a very burning fun-fhine, for 22 minutes, feveral Diamonds, namely, one white, of a very beautiful water; two yellow, of which one was lefs coloured than the other, weighing about 60 grains; one of a rofe-colour, one green, and one of an amethyft-colour.

I examined afterwards all thefe Diamonds in the dark, and I found only the two yellow luminous, but they were extremely fo, and principally the fmalleft, which was of the deepeft colour; they were fo, to fuch a degree, that they enlightened the others which were placed near them, infomuch that it was neceffary for me to take thefe two away, in order to be affured that the others were not luminous: thefe two yellow Diamonds kept their light very perceptibly for more than 12 minutes.

Although every one knows how neceffary it is that thefe experiments be made in the moft perfect obfcurity that is poffible, yet I believe, that it will not be ufelefs to mention the precautions which it is neceffary to take, in order to fee thefe experiments in all their beauty, without which, I might be fufpected of exaggeration fometimes in the defcription I give, becaufe, without thefe precautions, the fame experiments fucceed much lefs perfectly.

It is neceffary to continue a quarter of an hour, at the leaft, in the moft perfect darknefs that is poffible, before you let the Diamonds be brought you which have been expofed to the fun; it requires fuch a time, in order to let the vibration ceafe, which the light of the day caufes in the eyes, and that the pupil, which had been extremely contracted, fo as to permit only a certain quantity of rays to pafs, whilft you was expofed to the light, might have time enough to dilate itfelf fufficiently to receive the moft that is poffible, from objects the leaft luminous, or the leaft enlightened. There is no one but muft have obferved, feveral times in his life, that, when he goes out of broad day-light, and enters into an obfcure place, he fees none of the objects which he eafily difcerns after having ftaid there a quarter of an hour, where the eyes no longer feel the impreffion of the day-light. I do not know whether others have remarked the little relation, and the independency there is in this refpect between the two eyes; for if you clofe one for a quarter of an hour, and the other continues open, the luftre of the Diamonds, and of other phofphori of the like nature, will be feen very diftinctly by the eye that hath been clofed, whilft the other will not perceive it in leaft degree; which proves, that the dazzling caufed by broad day-light, and which renders the eye infenfible of a weak light, acts upon each eye diftinctly, and that its action ceafes before the union of the two optic nerves. There refults from this obfervation a very great conveniency, with regard to the performance of thefe experiments; for you may clofe one eye, and yet make all the little preparations that are neceffary, and which it is often difficult to leave the care of to another perfon: this, at leaft, is certain, that the obfervation hath been of great fervice to myfelf, ever fince I made the difcovery.

As I had obferved, in the firft experiment I have related, that the Diamonds, although they had been 22 minutes in the fun, had not acquired any fenfible heat, I tried the effect of expofing them to the fun for a lefs time; I left them there only 10 minutes; there were two large white Diamonds, weighing between 70 and 80 grains; two blue, one of which weighed 18 grains, but the other was fmaller and deeper in colour; one green, one of a rofe-colour, and two yellow; the two white Diamonds did not take any luftre at all, nor did the deepeft-coloured of the two blue; the green and the rofe-coloured affumed a little fplendor; but two fmall carrat Diamonds that were fet round one of thefe rings, the two yellow, and above all, the large and bright-blue Diamond, appeared extremely luminous, and their luftre continued twelve or thirteen minutes, growing weaker by imperceptible degrees.

I tried afterwards feveral other Diamonds of various fizes, and of all the colours I could meet with; I found feveral of them extremely luminous, and others that were not fo at all. But hitherto I have not difcovered any difference in this refpect, which could be attributed to the colour alone of the ftone, except that the yellow Diamonds which I have tried have all been luminous; there were, indeed, fome more luminous than others, but they were not always thofe whofe colour was the deepeft. Befides a great number of yellow Diamonds, weighing from 8 or 10 to 80 grains, which I have tried, I have had the opportunity of having in my hands about four hundred yellow carrat Diamonds, and there was not one of them but was luminous; fo that we may eftablifh it as a general law, that all yellow Diamonds, having been expofed to the light, are impregnated with it in fuch a manner, that they preferve it in the dark for a confiderable time.

Artificial DIAMONDS.— Art, which imitates nature in fo many things, hath attempted alfo in this admirable production, but very imperfectly, the beft of them being far fhort of the natural; for which reafon they bear no price, in comparifon to the other. There is, however, a pretty great trade in them for mafquerades and play-houfe habits.

There is a particular fort of falfe Diamonds, called Alencon Diamonds, made of ftones or cryftals, found near Alencon, a city of Normandy. The village where they are produced, and which is about two leagues from the city, is called Hertré; the foil is full of glittering fand, and of a hard and grey rock. There are of thefe Diamonds fo clean and brilliant, that fome are deceived herein.

On the coast of Medoc, also are found certain hard and transparent flints, which, being properly cut, are not to be distinguished, among false Diamonds.

Method of making the DIAMONDS *of Alencon.*—Take an earthen glazed pot, set it on a little furnace, put in it filings of steel, with some vine ashes at discretion; place therein by one another crystals cut and polished; then pour common water gently upon them, which keep boiling during the space of twelve hours, taking care to add boiling water fresh into the vessel, as the water in it consumes by boiling, and take care it boil continually. Then see if your crystals have acquired the colour and hardness you expected: if not, continue the fire some hours longer, and they will be like the true Diamonds of Alencon; taking care to polish them again at the wheel, to give them colour and brightness.

A method of giving the true colour and hardness of a DIAMOND *to crystals and Diamonds of Alencon.*— There are crystals and precious stones, which have neither the colour nor natural hardness of Diamonds, and which, some have asserted, may be imitated by art, according to the following process:

Take good Dutch tripoli, and make a paste of it with water out of the smith's forge; in this paste wrap up the quantity you design of crystal, or Diamonds of Alencon cut and polished; then set it in a crucible covered and luted on a gradual fire, where let it stand till the crucible becomes red-hot. A little time after take it out, and take out the stones; then polish them again at the wheel, to give them their colour.

To set them in work, take Indian paper, with leaves of tin, like those you put behind looking-glasses; then let them be set by a skilful jeweller, and they will not be distinguishable from some natural Diamonds, but by nice discerners.

Another method of hardening crystals and DIAMONDS *of Alencon.*— Crystals also acquire hardness in the paste we are now going to describe, because their humidity exhales, and they become more fixed.

Take barley-meal well diluted, with petroleum, or rock oil; then cut that paste in the middle, and put all your stones in order, so that they may not touch one another. Then cover your stones with more of the same paste, and put them in a crucible covered with another, and luted well together, and let it dry. After which, set this crucible in a gradual wheel fire, from five to six hours; a small fire the two first hours, which increase every two hours, till the end of the six: let the whole cool of itself. Then break your crucibles, and you will find your stones mended beyond expectation, which repolish at the wheel, and let them be set by an experienced jeweller.

Another process said to answer the same end as the preceding, and to give a superior lustre.— Although this is said to be an important secret, and may be abused, yet we shall communicate it; because, if true, it will put people upon their guard, and convince them of the necessity of dealing only with people of honour and credit in the Diamond way.

Take one pound of loadstone, a pound of quicklime, and half a pound of common sulphur, the whole reduced to powder, and well mixed. With this powder cement your crystals and Diamonds of Alencon well cut, in a crucible covered and well luted: being dry, set it in a glass-house furnace, if you have not one ready for the purpose, three days, in a place where the matter may be continually red-hot, without fusion; and take care not to take out the crucible all at once, but let it cool gently, otherwise the stones might break. Having broken the crucible, you will find your stones to have acquired an additional brilliancy as well as hardness, and will resemble the Diamonds of the old rock, which repolish at the wheel to give the colour, and let them be well set.

The method of making artificial DIAMONDS.— Take, of the finest natural crystal, calcined, and reduced to subtile powder, what quantity you please; fill a pot with it, and set it in a glass-house furnace twelve hours, to be melted and purified: then drop the melted matter into cold water, dry it, and reduce it again to powder; add to that powder its weight of fine salt of tartar. Mix these two powders well, and make little pills of them, with common water. Then wipe these pills, and put them into an earthen pot on a strong fire, there to grow red-hot for twelve hours space, without melting. Afterwards put them into a pot in a glass-house furnace, where leave them two days, to be well melted and purified. Then put the matter twelve hours in the annealing furnace, to cool very gradually. Break the crucible, and you will have a fine material for the imitation of Diamonds, which cut and polish at the wheel.

DIA'NDRIA *, in botany, a class of plants, which have hermaphrodite flowers, with two stamina or male parts in each.

* The word is formed of the Greek δὶς twice, and ἀνὴρ male.

Of this class of plants are, the jessamine, phyllerea, olive, rosemary, &c. See *Plate* XXII. *fig.* 3.

DICTA'MNUS *albus*, bastard dittany.— The roots of this dittany are pretty large, white, and spreading, sending forth long pinnated leaves, pretty much resembling the leaves of the ash-tree: the stalks arise to be about two feet high, having smaller leaves growing alternately on them: the flowers grow at the top of the stalks, in spikes, of an irregular shape, consisting of five pretty long and narrow leaves, set on like the flowers of violets, of a pale red colour, and several crooked stamina coming out of the middle, and turning upward: the seed is black, roundish, and shining, growing in long horned seed vessels. The whole plant has a strong and somewhat resinous scent. It grows wild in several places of Germany and France; but is only planted with us in gardens, and flowers in June and July. See *Plate* XVIII. *fig.* 2. where *e* is the flower, *f* the stamina, *g* the seed.

The root is esteemed a cardiac and alexipharmic, and serviceable against pestilential contagions, if it be taken any way. Matthiolus affirms it to be good against poisons, and the bites of venomous animals. Drank to the weight of a drachm, it kills worms in the intestines. It is prescribed in cold diseases of the uterus; for it provokes urine and the menses, promotes delivery, and brings away the secundines, and the dead child, if it be used either in a pessary, or in a suffumigation with penny-royal, or taken to the quantity of two drachms in pure wine; it is, also, good for the gripes of the belly, and to cleanse the kidneys of the gravel, and is a useful ingredient in potions for internal wounds. The women in Rome use the distilled water as a cosmetic, and for inflammations of the eyes; which is a plain argument, says C. Hoffman, that it cannot be used as a succedaneum to the true dittany; but, since it is bitter and acrimonious, says Ray, I see no reason why it should not be effectual for the same purposes as this plant. The pods and flowers excite an itching by their contact, and, in hot countries, exulcerate the skin: the plant varies with respect to its flower, which is sometimes white. *Raii Hist. Plant.*

The whole plant has a most fragrant smell, abounding with oil: the flowers and stalks are aromatic, balsamic, and sweet; whence it is reckoned among balsamic and vulnerary herbs. This species may be had in all the shops: it has a balsamic smell, and is very sweet and fragrant in all its parts: the bark is much commended for facilitating delivery, and purging the lochia; and, on account of its intense bitterness, is prescribed against worms: the seeds, leaves, and roots, are used in the shops; and the plant, for want of the true dittany, supplies its place in the Theriaca Andromachi: the conserve of the flowers, by its astringent virtue, corroborates the stomach and intestines. *Hist. Plant. ascribed to Boerhaave.*

DIDYNA'MIA *, in botany, a class of plants, whose flowers have two of their male parts or stamina of greater efficacy in the action of impregnation of the seeds than the others: they are known by the two efficacious stamina being always much longer than the others.

* The word is formed of the Greek δὶς twice, and δύναμις power or efficacy.

Of this class of plants are thyme, lavender, basil, &c.

DI'GGING, in minerology, a term appropriated by the miners, to express that penetrating into the earth, where they have the ore before them, and every stroke of the tools turns to account. They appropriated the word to this sense, expressing the random openings, which they make in search of mines, by the word hatching, or essay-hatching. See the article *Tracing of* MINES.

When the essay-hatches have been opened so long, that the orifice of the mine or load is found, the opening which has led to it, loses its name of essay-hatch, and is called a shaft or metal-hatch; this is to be sunk down about a fathom, and then they leave a square space, called a shamble, and so continue sinking from cast to cast; that is, as high as a man can conveniently throw up the ore with a shovel, till the load is found to grow small, or else to degenerate into some unprofitable substance, or weed, as they metaphorically express it. The degeneracy of the ore is soon perceived, by the finding mundic or marchasite growing more plentiful among it. This is a sulphureous mineral, of a yellow, whitish, or greenish colour, and is very troublesome to the Cornish miners. The other unprofitable substance found in the place of the ore, or mixed in large quantities with it, where it degenerates, are daze, which is white, black, or yellowish; iron mould, which is black or rusty; caul, which is red; glister, which is blood-red, or black, is also another degeneracy of the ore. In this case, they begin to drive either east or west, as the goodness of the land, or the convenience of the hill, unite. The drift or opening, on this occasion, is three feet over, and seven feet high, so that a man may conveniently stand and work: but in case the land is not broad enough of itself, as some are scarce half a foot; then they break down the deads, first on the north side of the lands, for the greater conveniency of the right arm working, and then they begin to rip the load itself; by the term deads, they mean that part of the shelf, which contains no metal, but incloses the load or vein as a wall between two rocks.

The instruments commonly used in mines with us, and that serve for ripping the lands, are the beele, or, as it is called in Cornwall, the tubber. This is a weapon of eight or ten pounds weight; well steeled and sharpened at each end, ending in a point each way, and having a hole in the middle: this

this will laſt half a year, but muſt be new ſharpened every fortnight. The ſecond inſtrument is a ſledge; this is uſually made from ten to twenty pounds weight, and will laſt ſeven years, if new ordered once in three or four months. Beſides theſe, they have gadds, or wedges; theſe are of about two pounds weight; they are made four-ſquare, and well ſteeled at the point, and they muſt have ladders and wheel-barrows to carry the deads and the ore out of the adits to the ſhambles. The general proportion of the workmen in Cornwall is this: two ſhovel-men, and three beele-men in a drift; theſe are as many as the drift will contain without ſtanding in one another's way. The beele-men rip the deads and the ore, and the ſhovel-men carry it off and land it, by caſting it up from one of the ſhambles to another all the way up; in ſome places they ſave the trouble of this caſting it to the ſhambles by a winder and two buckets; theſe are ſo contrived, that one goes up as the other comes down, and they are filled and emptied with great eaſe. *Phil. Tranſ.* N°. 69.

DIGE'STION, in chemiſtry *(Dict.)*—The chemiſts of late years have too much given into the more elaborate and forced proceſſes, and neglected the more natural and eaſy ones. Among theſe latter is Digeſtion; a proceſs ſo eaſy, that it requires ſcarce any quality in the operator but patience, and yet will do ſuch things, as all the elaborate proceſſes of that art can never arrive at without it. There is ſcarce a proceſs that has more puzzled the chemiſts of an age or two ago, than the volatalizing ſalt of tartar; yet Langelot aſſures us, that, after uſing all the caution in the common proceſſes that an earneſt deſire of ſucceſs could inſpire him with, he failed in them all, till, trying the effect of a long Digeſtion, he ſucceeded ſo well in the firſt attempt, that he converted almoſt the whole ſalt into a pure white volatile ſubſtance, leaving only a few earthy fæces behind.

Another great uſe of Digeſtion is, the duly preparing the eſſences of mineral ſulphurs; the ſtony ſea plants, which greatly reſemble the nature of foſſils, are alſo better treated by this proceſs than by any other; tartariſed ſpirit of wine receiving a very high tincture from red-coral, after a long Digeſtion, in any diſtilled vegetable oil, though it will not in the common way be at all coloured by it. *Philoſ. Tranſ.* N°. 87.

DI'GITAL *Arithmetic*, is a very ancient, as well as natural art; for this way of reckoning by the fingers ſeems to have been inſtituted by nature, which has given us this expedient as more eaſy than any of the reſt. The fingers are limited to ten, which is a myſterious number, and repreſents any thing that is moſt perfect and compleat: thus we plight our truth to one another, by joining our two right-hands together.

That Digital arithmetic is very ancient, is certain from Nicarthus, who, in a Greek epigram, tells us of an old man, who began again to reckon his years upon his left-hand. St. Jerom informs us, as to this matter, that the number of 100 was carried on from the left-hand to the right, and was reckoned upon the ſame fingers, but not upon the ſame hand; upon which account, Juvenal, ſpeaking of the happy old age of Neſtor, tells us, that he reckoned hitherto the number of his years upon his right-hand.

Numa erected a ſtatue of Janus, according to the relation of Pliny, whoſe fingers of its right-hand were ſo diſpoſed, as to ſignify the number 300, the thumb and fore-finger ſtanding out at full length, while the other three were bended towards the palm of the hand, and the fingers of the left-hand; ſignified fifty-five, the thumb and middle-finger being bended inwards, while the three others ſtood ſtraight. Beda treats of the ſame thing in the firſt book of the Nature of Things, but after a different manner.

It will not be impertinent to our preſent ſubject to relate a diſcourſe, which Francis the Firſt had one day at dinner, as it is ſet down by Viginere.

A diſcourſe was begun in praiſe of Auguſtus, whoſe cuſtom it was to keep always in his chamber two great regiſters; one, in which were entered the receipts; and the other, in which were the expences of ſo vaſt an empire. 'As to myſelf, ſaid the king, I have likewiſe two regiſters which I never part with night nor day, viz. my two hands, whereof the left repreſents to me my receipts; for the thumb, which is the ſtrongeſt of all the fingers, ſignifies my demains, which is alſo the moſt ſolid and lawful revenue a good prince can have; the fore-finger ſignifies my aids and ſubſidies; the the middle-finger, which is longeſt, denotes the taxes; the finger next to it, the caſual forfeitures; and, laſtly, the little-finger, the ſalt and exciſe. The right-hand repreſents to me my expences in general; the thumb ſignifies the maintenance of my houſe, the ſalaries of my menial ſervants, the great and little equerries, and the treaſury; the fore-finger ſignifies the fund reſerved for the neceſſities of the ſtate; the middle-finger, a fund for the armies by land; the ring-finger or the fourth, the payment of all officers of the kingdom, and particularly of the judges in the courts of juſtice, which I ought to adminiſter gratis to my ſubjects; and the little-finger, a fund for the armies by ſea'.

Now, if we reflect upon this way of counting, we may eaſily underſtand that it had its original only from hence, that men, having begun at firſt to reckon upon the fingers, they counted till it came to five upon one hand, and then, having added the other to that number, they made of them both ten, which is the double of the former; and this is the true reaſon why the progreſſion in theſe numbers is always from one to five, and then from five to ten.

All the Roman figures themſelves are alſo owing to the ſame original. For what can be more natural than to ſay, that the I is the ſame thing, as if a man ſhew one, by holding forth one finger only; and that the figure V is the ſame thing, as if a man, catching the three middle fingers, ſhould hold forth only the little-finger and the thumb, as containing the whole hand; and that, if you add to theſe the ſame two fingers of the other hand, joined to either at the top, they will make as it were two V's, whereof one will run acroſs under the other, and ſo make an X, which ſignifies ten.

There is a Digital arithmetic ſtill practiſed by ſome, and often found uſeful: it is the rule of multiplication performed by the fingers, which we ſhall always find ready at hand on all occaſions, when through ſtudy, long calculations, &c. our mind may ſometimes be ſo diſturbed as to be liable to make the greateſt miſtake. The rule is this:

Double down of one hand ſo many fingers as the multiplicant wants digits of ten; do the like with the other hand by the multiplier, and all the fingers that are left ſtanding will be tens, and the fingers doubled down digits to be multiplied, the one hand by the other; which will be eaſily done as the product will be but ſmall.

Example. Suppoſe the numbers 7 times 8
Double of
the right-hand 3, of the left 2, twice 3 — 6.
ſtanding 2 —— 3 —— 50.
——
56.

Again, 9 times 9.
Double down
right hand 1 left 1 —— 1
ſtanding 4 — 4 —— 80
——
81.

The like rule may alſo by a little alteration be made to ſerve for multiplying by 12, &c.

DIGITA'LIS, *fox-glove*, in botany, a genus of plants, whoſe characters are:

The leaves are produced alternately on the branches: the cup of the flower conſiſts of one leaf, which is divided into ſix ample long ſegments: the flower conſiſts of one leaf, is tubuloſe and compreſſed, and a little reflexed at the brim: theſe flowers are diſpoſed in a long ſpike, and always grow upon one ſide of the ſtalk: the ovary of the flower becomes a roundiſh fruit, which ends in a point, and opens in the middle: has two cells, in which are contained many ſmall ſeeds.

M. Tournefort has enumerated twenty ſpecies of Digitalis, and Mr. Miller ten.

Theſe plants may all be propagated by ſowing their ſeeds in March, in a freſh ſoil, that is not too ſtiff; and, when the plants come up, they ſhould be tranſplanted into beds ſix inches aſunder, where they may remain until the Michaelmas following, obſerving to keep them clear from weeds; then you may tranſplant them into the middle of large borders, intermixing the variety of colours at regular diſtances amongſt flowers of the ſame growth. In May following theſe will produce their flowers, which will continue near a month in beauty, if the ſeaſon is not too hot and dry, and in Auguſt the ſeeds will ripen; which, if permitted to fall to the ground, will come up in great plenty, and abundantly ſtock the garden with plants.

DILI'CTUM, a term uſed by Agricola, to expreſs a brine, made by pouring water upon ſand, ſtones, earth, &c. that had been before ſtrongly impregnated with ſea-ſalt; from this brine, a ſalt, for the uſe of the table, was made by evaporation in his time, and is ſo ſtill in many parts of the world. At Junthall in Germany they have a ſalt work of this kind, where they make at the rate of eight hundred loaves of ſalt in a week, each loaf weighing four hundred weight.

The ſand of the ſea is alſo in ſome places uſed as a ſubſtance to make ſalt from. There are works of this kind on the coaſt of Normandy, where a brine is made from the ſand, and evaporated at ſo ſmall an expence, that it is worth their while to export it to England and other countries. We had formerly ſome works of this kind in England, as at Wirewater, and ſome other places in Lancaſhire and Weſtmoreland, where, pit coal being ſcarce, they boiled it with turf fires; but ſince the works of the brine-ſalt, and purified rock-ſalt, have ſucceeded ſo happily with us: theſe are all laid aſide, except ſome inconſiderable ones in Lancaſhire. Theſe are near Ulverſtone, and the ſand from which they make their brine there, is extracted from the flat ſandy ſhores, which are only covered with water in the higheſt tides, which flow two or three days before, and three or four days after the new and full moon; for thoſe parts of the ſand which are overflowed by the neap-tides are ſeldom ſufficiently dried, and are at too great a diſtance from the ſalterns.

 This

This ſand they collect in flats and waſhes, or in parts of the ſands, which are perfectly plain, and in little hollows, where the ſea-water is left, and either ſinks into the ſand, or is dried up by the heat of the ſun, and leaves the ſalt behind. This is only collected in dry weather, and at ſuch times when the ſea-water has been exhaled from it by the ſun, and there have been no rains afterwards to waſh the ſalt out of it. They dig a pit adjoining to the ſaltern eighteen feet long, three broad, and one deep; the bottom of this they cover with ſtraw, or ruſhes, and then fill it up with ſand collected in this manner; they pour upon this ſea-water, and this, imbibing the ſalt from the ſand, is filtred through the ſtraw or ruſhes, and runs clear through a pipe at the bottom. *Brownrig of Salt*, N°. 136.

DIMI'NISHED *Interval*, is applied to ſuch as are leſſened by a ſemitone minor. Thus from C ♮ to E, being a third minor, if E be lowered by a ſemitone minor, we ſhall have E♭, and then from C ♮ to E♭ is called a Diminiſhed third, in the language of practical muſicians, and occurs frequently in their works. But, ſtrictly ſpeaking, in this caſe, the note E muſt be lowered more than a ſemitone minor.

DIMINU'TION *of a column*, in architecture.— *Plate* IV. *fig.* 6, in the Dictionary, repreſents an upright ſection of a column, in order to ſhew its Diminution, which decreaſes in proportion as the diameters *g g*, *f f*, *e e*, *d d*, *c c*, *b b*, *a a*.

DIOCTAHÆ'DRIA, in natural hiſtory, the name of a genus of ſpars. The word is derived from the Greek δὶς twice, ὀκτὼ eight, and ἕδρα a ſide. The bodies of this genus are ſpars compoſed of twice eight planes, or two octangular pyramids joined baſe to baſe, without any intermediate column. Of this genus there are three known ſpecies. 1. One with long pyramids, which is found in the mines of Rammelſberg in the Hartz foreſt in Germany, and no where elſe, ſo far as is yet known. 2. One with ſhort and ſharp-pointed pyramids found in many of the mines of the Hartz foreſt, and ſometimes tinged with the colours of the gems; and 3. One with ſhort and obtuſe pyramids, which is found in the mines of Cornwal, and lodged in the cotton-ſtone of Rutland. *Hill's Hiſt. of Foſſils.*

DIOE'CIA *, in botany, a claſs of plants which have the male and female parts, not in the ſame, but in different flowers, and thoſe not on the ſame individual, but on different plants of the ſame ſpecies; either of which, though they are called the male and female plants, from their thus carrying the ſeparate male and female flowers, might have ariſen from the ſame ſeed.

* The word is formed of the Greek δὶς twice, and οἶκος habitation. Among the plants of this claſs, are the willow, miſletoe, hemp, ſpinach, &c.

DI'PPING, in minerology, a term uſed to expreſs the deviation of the veins of ore from that regular and ſtraight line, in which they uſually run. A great deal of the ſkill of the miners conſiſts in the underſtanding this Dipping of the veins, and knowing how to manage it. In Cornwal they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down toward the north three feet in eight perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air ſhafts, when occaſion requires; yet, in the higher mountains of Dartmoor there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt.

Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances. *Philoſ. Tranſ.* N°. 69.

DI'PSACUS, *the teaſel*, in botany, a genus of plants, whoſe characters are:

The whole flower hath no proper calyx, but leaves repreſenting the perianthium encompaſſing the bottom of the head; the little flowers, which are produced ſingly from between the ſcales, are collected into an head ſomewhat like a bee-hive: theſe are ſucceeded by longiſh four-cornered ſeeds.

There are four ſpecies of this plant. But the fourth ſort only is cultivated for uſe, which is called carduus fullorum, or fullonum, being of ſingular uſe in raiſing the knap upon woollen cloth; for which purpoſe there are great quantities of this plant cultivated in the weſt country.

This plant is propagated by ſowing the ſeed in March, upon a ſoil that has been well dried: about one peck of this ſeed will ſow an acre; for the plants ſhould have room to grow, otherwiſe the heads will not be ſo large, nor in ſo great quantity. When the plants are come up, you muſt hoe them in the ſame manner as is practiſed for turnips, cutting down all the weeds, and ſingling out the plants to about ſix or eight inches diſtance; and, as the plants advance, and the weeds begin to grow again, you muſt hoe them a ſecond time, cutting out the plants to a wider diſtance; for they ſhould be, at laſt, left at leaſt a foot aſunder: and you ſhould be particularly careful to clear them from weeds, eſpecially the firſt ſummer; for, when the plants have ſpread ſo as to cover the ſurface of the ground, the weeds will not ſo readily grow between them. The ſecond year after ſowing, the plants will ſhoot up to heads, which will be fit to cut about the beginning of Auguſt; at which time they ſhould be cut, and tied up in bunches, ſetting them in the ſun, if the weather be fair; but if not, they muſt be ſet in rooms to dry them. The common produce is about a hundred and ſixty bundles or ſtaves upon an acre, which they ſell for about one ſhilling a ſtave. Some people ſow caraway and other ſeeds amongſt their teaſels: but this is not a good method, for one ſpoils the other; nor can you ſo eaſily clear them from weeds, as when alone.

The leaves of the common wild teaſel dried, and given in powder, or infuſion, are a very powerful remedy againſt flatus's and crudities of the ſtomach. There is alſo another, though ſomewhat whimſical uſe, for which this plant is become famous among the country people. If the heads are opened longitudinally about September or October, there is generally found a ſmall worm in them: one of theſe only is found in each head, whence naturaliſts have named it the vermis ſolitarius Dipſaci. They collect three, five, or ſeven of thoſe, always obſerving to make it an odd number, and, ſealing them up in a quill, give them to be worn as an amulet for the cure of agues. Faith has wrought ſo many cures for them, that they are in many parts of the kingdom of much higher reputation than the bark.

DIRE'CTOR, in ſurgery, a grooved probe, to direct the edge of the knife or ſciſſars in opening ſinus's or fiſtula's, that, by this means, the ſubjacent veſſels, nerves, and tendons, may remain unhurt. Sometimes one end is made in form of a ſpoon, to contain powders to ſprinkle upon wounds or ulcers. Sometimes alſo it is forked at the end to divide the frænum of the tongue. *Heiſter's Surg. Introd.*

DISDIACLA'STIC *Cryſtal*, in natural hiſtory, a name given by Bartholine, and ſome others, to the pellucid foſſil ſubſtance, more uſually called, from the place whence it was firſt brought, Iſland cryſtal; though properly it was no cryſtal at all, but a fine pellucid ſpar, called by Dr. Hill, from its ſhape, parallelopipedum.

This cryſtal is met with in other places beſides Iſland, but not ſo plentifully. It is there found in great abundance all over the country, but is particularly plentiful in a mountain, not far from a bay of Roeziford, where the fineſt and moſt pellucid pieces are found on digging. The mountain lies in 65 degrees of latitude, and has its whole outſide made up of it; but, though this makes a very bright and glittering appearance, it is not ſo fine as that which lies at a little depth, and is met with on opening the ſurface. This is generally taken up out of the earth in maſſes of a foot long, and its corners are very frequently terminated in theſe large maſſes, by a ſort of cryſtals, very different in figure and quality from the reſt of the maſs. The ſtone itſelf is of a parallelopiped figure; but theſe excreſcences are either ſingle pyramids affixed to columns, like common cryſtal or double pyramids, with or without columns between. The ſtone itſelf is ſoft; theſe are hard, and cut glaſs; the ſtone calcines to lime in the fire, theſe run into glaſs; in ſhort, the ſtone itſelf is true ſpar, and theſe are true cryſtal: beſide theſe, there ſometimes grows out of the end of the larger maſſes a pure and fine aſbeſtus. This likewiſe is the caſe ſometimes in the ſpar, found about Barege in France, and ſhews how nearly together the formation of bodies wholly different from one another may happen. The general figure of the ſtone is parallelopiped, or, as ſome expreſs it, rhomboide; and it retains this, not only while whole, but alſo when broken to pieces; every fragment it naturally falls into, though ever ſo ſmall, being truly of that ſhape. But it is remarkable, that, in ſome places of this mountain, the ſame ſort of matter is found in form of triangular pyramids, all which have the ſame property of the double refraction with the parallelopipeds of the ſame ſubſtance; ſo that the original error of ſuppoſing its qualities owing to its ſhape is refuted by this, as well as by the trials made with other pellucid bodies of the ſame figure, which do not ſhew this remarkable property. *Bartholine de Cryſtal. Iſland. Phil. Tranſ.* N°. 67.

DISH, in mining, is a trough made of wood, about twenty-eight inches long, four inches deep, and ſix inches wide; by which all miners meaſure their ore. If any be taken ſelling their ore, not firſt meaſuring it by the bar-maſter's diſh, and paying the king's duties, the ſeller forfeits his ore, and the buyer forfeits for every ſuch offence forty ſhillings to the lord of the field, or farmer. *Houghton's compl. Miner.*

DISPA'RT, in gunnery, is uſed for the ſetting a mark on the muzzle-ring of a piece of ordnance, or thereabouts; ſo that a right-line taken upon the top of the baſe-ring againſt the touch-hole, by the mark ſet on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing which, is, to take the two diameters of the baſe-ring, and of the place where the Diſpart is to ſtand, and divide the difference between them into two equal parts, one of which will be the length of the Diſpart, which is ſet on the gun with wax or pitch, or faſtened there with a piece of

twine

twine or marlin: but an inftrument may be made to do it to all poffible nicety.

DISSIPA'TION. Circle of Diffipation, in optics, is ufed for that circular fpace upon the retina, which is taken up by one of the extreme pencils of rays iffuing from an object.

To underftand which, it is to be obferved, that when the diftance of an object from the eye is too fmall, or too great, for perfect or diftinct vifion, the rays of each pencil iffuing from the object cannot be united at a point on the retina, but beyond it, or before they arrive at the retina; confequently the rays of each pencil will occupy a circular fpace upon the retina; and this circle is called the circle of Diffipation, becaufe the rays of a pencil, inftead of being collected into a central point, are diffipated all over this circle.

The confideration of the circles of Diffipation, formed by the rays coming from the extremities of objects, is of ufe to account for feveral curious phænomena of vifion.

DISTE'MPERATURE *of trees.*—Some of thefe are in the tree itfelf, and others in the foil and other things about it. Of the laft kind are weeds, which are of the utmoft ill confequence to all forts of trees, while young, and fhould be pulled up by hand after rain: if they are too ftrong rooted for this, they muft be dug up; and this will have a double advantage, as the ftirring the earth about their roots will do the tree a great deal of good. When the trees are grown to a tolerable height, they require no care about weeds, for they kill them with their own droppings. Suckers are another Diftemperature of trees arifing from the tree itfelf: they muft be pulled off, or cut up clofe to the place where they come out, opening the earth to come at them there. Over much wet often is a very great prejudice to trees, and efpecially to thofe kinds which naturally love a dry foil. This is to be remedied by cutting drains: and if a drip fret the body of the tree by the head, which will certainly decay it, the place muft be firft cut fmooth, and then fome loam or clay, mixed well with horfedung, is to be applied to the place, which will defend it from mifchief till a new bark is formed over it. All wounds, made in trees in winter, are much harder to cure than thofe made in fummer; and for thefe it is proper to add fome tallow to the mixture of loam and dung.

When trees are bark-bound, which is eafily feen by the unnatural tightnefs and ftraining of the bark over them, it is to be remedied by cutting through the bark with a knife, from the top to the bottom of the tree. This may feem a dangerous remedy to thofe who have not experienced it, but it never was found to do any injury to trees. It is to be done in February or March; and, if the wound gape very much, it may be filled up with cow-dung, which will defend the tree from injury till it heals. The digging about the root of the tree is a very good practice alfo on this occafion, and the cutting off the dead or withered branches.

The grubs of beetles, called teredines and coffi, which get between the bark and the tree, do great mifchief: if the places can be found out where they lie, it is proper to pierce into the bark with a pointed inftrument upon them, and then to open a fmall hole below, to let out whatever moifture may be there. When trees of the fruit kind are burnt up and bliftered on the bark with hot and dry feafons, and this is followed by a vaft number of pucerons or tree-lice, which feed on the juices, fome recommend the boring a large hole in the main root, and pouring in fome brandy, then ftopping up the hole with a pin of the fame wood. The tree fuffers nothing by this, but the juices are fo much altered for the prefent by it, that thefe animals do not like them, and confequently quit their habitation.

If a tree is, by any accident, barked or ftripped all round, fo that it cannot grow any longer, the proper method is to cut it off juft above fome principal branch; the ftump muft be cut off flanting, and covered with clay; and the branch will foon become the body of a tree in the place of the other: the place where the ftump is cut off being covered with a bark, in the manner of a tree that is grafted.

Deer and hares, as alfo rabbits, are apt to bark trees, and do them great mifchief. The defence againft deer is by paling them round, or painting the lower part of the tree; but the firft is much the better method. The hares and rabbits may be kept off by tying bands of ftraw round the foot of every tree, as far as they can reach. Evelyn recommends the rubbing them over with human dung made into a foft pafte with urine, fo that it may be laid on with a brufh; but this is attended with great trouble, as it muft be renewed after every hard rain. Some ufe tar and lime mixed together, but this always damages the tree more than thefe creatures would have done; and, in general, ftraw-bands, where any thing is neceffary, do beft. *Mortimer's Hufbandry.*

DISTILLA'TION (*Dict.*)—*Simple* DISTILLATION.—Simple Diftillation is the method of feparating and collecting the inflammable fpirit, clear of all the other parts of fermented liquors, by means of fire and the alembic.

This operation includes not only what in the language of diftillers is called working from wafh, and the producing of low-wines, or fpirits of the firft extraction; but alfo fimple rectification, or the production of fimple proof-fpirit, and fimple alcohol.

The common ways of charging, working, and managing a ftill, regulating the fire, &c. are here fuppofed to be underftood: but, in order to improve this operation, and bring it to a truth, feveral obfervations and methods are required, befides thofe vulgarly known and confidered.

1. It is remarkable that the action of fermentation works fuch a change in the body of the tincture or folution, as to render it feparable, by the action of the fire, into parcels of matter that are fpecifically different; and of a nature entirely foreign to what, by the fame means, the liquor would have afforded before fermentation.

2. The ftill being charged, luted, and brought to work, with a foft boiling heat, there firft comes over a quantity of intenfly pungent, aromatic, nidorous liquor; which, if received into a large proportion of cold water, throws off a copious, effential, acrid, or aromatic oil; though the original fubject were ever fo cooling, mild, or contrary to a fpicy nature.

3. This effential oil is, by experiment, found to be the principal thing that gives the predominant or peculiar flavour to fpirits; which are hence, by their tafte and odour, denominated malt-fpirit, melafs-fpirit, cyder-fpirit, wine-fpirit, arrack, &c.

4. The fineft, moft fubtile, and moft efficacious part of this effential oil is what comes firft; the fucceeding portions growing gradually more fluggifh, vifcous, refinous, naufeous, and terreftrial.

5. The fpirit running in a continued ftream from the nofe of the worm, being examined at different intervals, will be found greatly to differ from itfelf, both in fmell and tafte; as changing the nature of its oil, much oftener than, without trial, could have been expected.

6. Befides this effential oil, the fpirit of the firft running contains alfo an acid, more or lefs in quantity, and more or lefs pungent, volatile, and fenfible to the nofe, as the fermentation has been more or lefs continued, or according to the degree of acidity acquired in the operation. And this acid alfo may, along with the aqueous part that rifes with it, be in plenty kept back upon a gentle rectification; though, where the acid is very volatile, fome part thereof is ever apt to rife along with the totally inflammable fpirit, fo as to give it a vinofity, not unlike a dilute fpiritus nitri dulcis.

7. It is manifeft, both a priori, and a pofteriori, that brandies are a compound, confifting of at leaft four different parts; viz. totally inflammable fpirit, effential oil, acid, and water.

8. And as thefe feveral parts do not differ greatly in their fpecific gravity, or degree of volatility; a ftrong, tumultuary, boiling heat will drive them all over promifcuoufly together.

9. As, at the beginning of the operation, there ufually rifes more totally inflammable fpirit than water; fo, after fome time, the ftream contains more water than inflammable fpirit: and this gives the foundation for what they call low-wines, proof-fpirit, and faints: low-wines being the whole quantity of fpirit, weak and fmall mixed together; proof-fpirit, a mixture of about equal parts of totally inflammable fpirit and water; but faints all that runs after the proof is fallen off, where the proportion of water is much greater than of the totally inflammable fpirit.

10. Thefe low-wines are commonly rediftilled, to make what they call proof-fpirit, by leaving out their fuperfluous phlegm: and in the fame manner may the faints alfo be ferved; by which means they are fuppofed reducible to a certain ftandard, or ftated merchantable degree of ftrength, called proof.

11. When once the ftream falls off from proof, the liquor contains a groffer effential oil, which, though not fo communicative as the firft, never fails to impregnate the whole with its flavour.

12. Hence all common fpirits or brandies are really dilute quinteffences, as the chemifts call them; that is, a mixture of the ardent fpirit and effential oil of the concrete; only here let down to proof with water, and impregnated with a fmall proportion of a volatile acid.

13. When the proof falls off, the liquor grows milky; that is, the oil, which before remained diffolved by the ftrong fpirit, is fet loofe from it by an over-proportion of water; and may now be commodioufly feparated by the chemical glafs fitted for that purpofe.

14. It is cuftomary to continue the Diftillation fo long as the liquor that runs will take fire at the flame of a candle, applied to the vapour of a fmall quantity thrown upon the hot ftill-head: and indeed there is a certain point of time, when the fpirit obtained will not pay the fire and labour; viz. when not above a twelfth or fourteenth part of totally inflammable fpirit comes over in the water.

15. With other views however, as particularly the obtaining a more fixed vegetable acid, and a groffer effential oil, the operation might be continued, till the danger of an empyreuma comes on.

16. The matter remaining in the ftill, after the operation is ended, has feveral ufes; and might in particular be made to afford Mr. Boyle's acid fpirit of wine.

17. When by repeated Diſtillation, without addition, any ſpirit is entirely freed of its aqueous parts; it is then called totally inflammable ſpirit, alcohol, or perfect ſpirit of wine.

Upon theſe general obſervations may be formed ſome new practical methods for the improvement or perfection of Diſtillation.

1. And, firſt, as the fermented liquor affords different parcels of matter, of different ſpecific gravities or degrees of volatility; when a pure ſeparation of the lighteſt part is intended, the fire ſhould never riſe to a boiling heat, which jumbles and confounds all the parts together, rather than ſeparates them.

In the chemical way this rule may be practiſed to advantage; but great difficulties will attend the obſervance of it in the common buſineſs of Diſtillation.

To render it more commodiouſly practicable, theſe two methods are propoſed; viz. 1. Either to increaſe the height of the ſtill above the liquor; or, 2. To work in balneo mariæ.

1. By running the ſtill-head to the height of two or three yards above the liquor, it has been expected that a boiling heat would carry up the pure inflammable ſpirit, without any great mixture of phlegm, and yet continue to run a full ſtream. But this does not perfectly anſwer upon experience; though the thing is ſtill improveable, and has been attempted by the addition of a tall ſerpentine pipe, for the ſpirit to creep through and depoſit the phlegm, as it aſcends. And thus indeed the ſpirit may in a good meaſure be dephlegmed: but the great objection againſt this method, is, that it requires a boiling heat, which in the caſe of ſimple ſeparatory Diſtillation ſhould never be uſed: becauſe it throws up ſo much oil, as to foul at leaſt the breaſt and head of the ſtill and bottom of the pipe; whence it infects the ſubſequent ſpirit that waſhes them.

2. The other way by the balneum mariæ is preferable on many accounts; ſo that, by a proper regulation, we might hope for a pure ſimple ſpirit almoſt at the firſt extraction. Such an expectation will not appear unreaſonable to one who has ſeen what ſpirit is obtainable even in the common method of the balneum mariæ, where the water of the bath is made to boil with the utmoſt violence, and compared it with another parcel of ſpirit, prepared from the ſame fermented liquor in the common way of the hot ſtill. Indeed the difficulties of working from waſh in this way of the balneum mariæ are very conſiderable; eſpecially if cheapneſs and diſpatch be the principal thing in view. For at once to work both quick and perfect ſeems hitherto impracticable in the buſineſs of Diſtillation. The whole affair has a great dependence upon a ſuitable engine and apparatus. And perhaps a large or long rectangular boiler might commodiouſly be turned into the balneum we ſpeak of; and fitted with a number of low alembics, that ſhould all work, day and night, with a little fire and leſs attendance. The contrivance in general is obvious; but to avoid encumberance and loſs is the principal difficulty. A large number of veſſels or alembics is abſolutely neceſſary; but no worms and refrigeratories are required. And by an eaſy apparatus the whole number of the ſmall veſſels may be charged with nearly as much eaſe as a large one. When the operation proceeds ſo ſlow as not to quit the coſt, all the bottoms may be emptied into a common ſtill, and worked in the uſual way, for a coarſer commodity, that may afterwards be rectified at pleaſure. The heat of the balneum ſhould only be tepid, or at moſt but ſcalding.

By this means a ſurprizingly cool and almoſt inſipid ſpirit has been obtained, at the very firſt extraction, though mixed with a conſiderable proportion of phlegm; ſo that it needed no manner of rectification to fit it even for the finer uſes. The method, therefore, at leaſt is curious, and in ſome caſes uſeful, though it ſhould never be brought into a general practice. And indeed a thing of this nature deſerves to be kept in curious hands, as by a due application it may furniſh productions fit for the cloſets of princes.

In the common method of ſimple Diſtillation all proper means ſhould be uſed to prevent the groſſer eſſential oil from getting into the ſpirit. Theſe means have regard, 1. To the preparation of the fermented liquor: 2. The regulation of the fire: 3. The uſe of percolation: and, 4. To the keeping out the faints.

1. For the manner of preparing the fermented liquor, and clearing it of its groſs oleaginous fæces, before it is committed to the ſtill, ſee Brewing and Fermentation.

We ſhall only add that the liquor, thus fined, ſhould not poſſeſs above two thirds of the ſtill, that the groſſer oleaginous matter may the better be kept down, and the whole have free ſcope to work, riſe, and purge itſelf in the operation: which it never can do, if it wants room. 2. As in this Diſtillation a boiling heat is neceſſary, care ſhould be had that the liquor only boil gently and uniformly, without raiſing the fire by ſtarts; which never fails to throw over the coarſe oil in plenty, and foul the ſpirit: ſo that, if poſſible, the operation ſhould be begun and ended with the ſame uniform and invariable degree of heat.

3. The groſſer oil may in ſome degree be kept from mixing amongſt the ſpirit, by ſtretching a piece of very thick woolly flannel over the mouth of the ſtill, or by ſuffering the ſtream to paſs through ſuch a flannel, ſeveral times doubled and placed at the noſe of the worm: and it is ſurprizing what a quantity of groſs, offenſive, fœtid, unctuous matter may thus be collected, eſpecially in the Diſtillation of malt ſpirits.

4. The faints ſhould never be ſuffered to run among the finer ſpirit, on account of the large quantity of this groſs oil, or greaſy matter they contain; eſpecially if the fire be increaſed, as it uſually is to bring them over: though ſome, who value proof more than purity, will uſually have a doſe thereof to give their goods a face. Which prevailing fondneſs for a ſtrong hanging proof, however abſurd in itſelf, is one principal reaſon why the common malt-ſpirits are no cleaner.

This caution of keeping out the faints ſhould likewiſe extend to the keeping out a little of the firſt running, which too, in this operation, is a kind of faints; as containing largely of the oil of the concrete, though much more ſubtile than that in the proper faints. A farther regard muſt alſo be had to the ſtill-head and worm, through which the faints have once paſſed; as theſe all along depoſit ſuch a copious infecting oil, as gives a predominant flavour to an almoſt incredible quantity of pure ſpirit. Nor is this oil eaſily diſlodged from the pores of the ſpongy metal, by running hot water through the worm; but either requires a quantity of boiling lixivium, or elſe ſome highly rectified ſpirit to ſtand in the worm all night, to imbibe, diſſolve, and carry it away. And, if theſe cautions are carefully obſerved, a much better and purer ſpirit may be obtained after the common method, than thoſe who have not tried it would expect.

When, now the faints have run off, and it becomes unprofitable to continue the operation longer, the original maſs of fermented liquor is ſeparated into ſtill-bottoms and low wines, or ſpirit of the firſt extraction. The ſeveral parcels of ſpirituous liquor, come over, are then uſually mixed together, and thrown into another ſtill, to be rectified into what they call a ſaleable commodity, or proof goods.

This operation is a ſecond ſpecies of ſimple Diſtillation, which, without any addition, tends to cleanſe the whole body of the ſpirit from the groſſer oil of the faints, provided the work be carried on in a mild and gentle manner: otherwiſe it ſerves but to keep back the ſuperfluous phlegm that ſunk the ſpirit much below proof, rather than to improve its quality.

Combinatory Distillation, a term introduced into uſe by Dr. Shaw, in his Eſſay on Diſtillation, to expreſs that ſort of rectification of diſtilled ſpirits which is done with additions, and which he otherwiſe calls improper rectification, by way of diſtinction from that proper rectification, which is only the method of reducing a ſpirit to its utmoſt degree of purity and perfection.

In the combinatory Diſtillation many ingredients are added, in order to rectify the ſpirit, as the diſtillers expreſs it; and ſome parts of theſe actually come over and mix themſelves along with the ſpirit ſo intimately, as not to be ſeparable again without great difficulty. This is done with a deſign to alter, improve, or aboliſh the natural flavour of the ſpirit, but, inſtead of rectifying it, they only obſcure and pervert its true qualities. In the buſineſs of rectification, properly ſo called, of the malt ſpirit, all that is neceſſary is the rediſtilling the low wines procured from the waſh; the again diſtilling over the ſpirit thus obtained, and called proof-ſpirit, into a totally inflammable liquor called alcohol. This is done by the common proceſſes, only taking care not to increaſe the fire by ſudden ſpurts, ſo as to raiſe the oil with the ſpirit, which, if once mixed, will not be eaſily ſeparated again, and ſcarce ever perfectly, whatever care is uſed. *Shaw's Eſſay on Diſtillery.*

The methods of combinatory rectification, on the other hand, are very numerous, every diſtiller having his peculiar noſtrum about it. Malt ſpirit is the general ſubject of this proceſs, and the means uſed to rectify it on this plan may be reduced to three heads: 1. That by fixed alkaline ſalts alone. 2. That by fixed alkaline ſalts and acid ſpirits. And, 3. That by ſaline bodies and flavouring additions. The general method is that by fixed alkaline ſalts alone; but it is ſurpriſing to ſee in how careleſs and ſlovenly a manner this is done by the generality of our diſtillers, though we are allowed to excel all other nations in it. The effect of this operation, when carefully performed, is to attenuate and thin the ſpirit, and to keep back a part of its groſs and fœtid oil, and ſo far to alter the part of the oil which comes over, as ſcarce to leave the ſpirit diſtinguiſhable for a malt ſpirit.

This end is greatly promoted by a prudent and ſteady management of the fire, and by leaving out the faints; but this is a thing our diſtillers never attend to: they hurry over the operation, working the ſtill in its full force, and by this means raiſe and carry over the oil, though the whole buſineſs of the proceſs is to keep it back; and they even ſuffer the fulſome bitter oil, made into a kind of liquid ſoap with the ſalt in this proceſs, to run among the ſpirit with the faints; by this the whole intent of the proceſs is fruſtrated, and the ſpirit rendered much harder to clean than it was before.

This operation is uſually performed on proof-ſpirit, and the quantity allowed is from eight to fourteen pounds of ſalt of tartar,

tartar, fixed nitre, pot-aſh, or more commonly calcined tartar, to the piece. The tartar, being only roaſted to a blackneſs in this laſt proceſs, is ſold under the abſurd notion of a vinous ſalt, and the dealers will often praiſe the vinoſity of their ſpirit, becauſe diſtilled from this ſalt; but the truth is, that this ſalt never fails to give, inſtead of a vinoſity, a ſaponaceous, urinous, or lixivial taſte and ſmell. This is the great misfortune that attends the method of rectifying by means of fixed ſalt, for they all of them become volatile in part during the operation; and this volatile portion paſſes over the helm with the ſpirit, and impregnates it, uniting itſelf alſo with that portion of oil yet retained in the ſpirit, and much more firmly combining it and the ſpirit together than they were before; ſo that in reality the ſpirit thus rectified is no other than an alkaline or tartariſed ſpirit, as the chemiſts call it; a thing extremely different from a true vinous ſpirit.

This method therefore, though it were practiſed to the utmoſt perfection, would never do what was intended by it, but would alter inſtead of rectifying the ſpirit. Hence there appears the neceſſity of ſome acid to deaden the force of the alkali thus uſed in the rectification. The neceſſity of this gave occaſion to the method of mixing acids and alkalies together for theſe purpoſes. The acids uſed by our diſtillers on this occaſion are thoſe of the mineral kingdom, by reaſon of their cheapneſs; and the moſt common in uſe among them are oil of vitriol, ſpirit of nitre, oil of ſulphur, and the like. There is ſome choice however to be made of the ſpirits according to the greater or leſſer foulneſs and need of rectification, and they muſt not only be well proportioned, but carefully introduced, and regularly mixed; and indeed, without ſome ſkill and judgment in the management of the corroſives, no diſtiller ought to attempt to meddle with them.

Theſe ſtrong and violent acids, at beſt, are not ſo well adapted to the work as the milder ones, particularly the ſulphureous ſpirit of vitriol, which comes over in the rectification of the oil; to this may be added the common ſpiritus nitri dulcis, and Mr. Boyle's acid ſpirit of wine well prepared.

Some of our rectifiers inſtead of the fixed ſalts uſe quick-lime, which cleanſes and dephlegmates conſiderably: but this method requires the aſſiſtance of acids alſo afterwards, to take off not only the alkaline diſpoſition, but alſo the ſtinking flavour it leaves behind it. Some alſo uſe chalk, virgin earth calcined, and burnt animals bones. Theſe are of conſiderable uſe in the rectifying brandy without rendering the ſpirit any more unfit for the purpoſe of the compounders than before, or requiring much acid afterwards.

The great art of uſing the flavouring ingredients in rectification is, the proper admixture of ſalts in the operation, for, without theſe, the flavours added by this means do very little. The ſalts uſed on this occaſion are either the fixed alkalies, as pot-aſh and calcined tartar, or decrepitated common ſalt, or calcined vitriol, alum, or ſandiver. The flavouring ingredient is to be applied afterwards, and the whole quantity of the ſpirit either drawn over again, or not, as the occaſion and nature of the addition require. But theſe ſaline bodies perform ſo very little, that the ſpirit is uſually left impregnated with a flavour from its own oil, which is but badly hidden, or overpowered by the other ingredients. The moſt common flavourers, as they call them, are theſe, mace, orrice root, parſnip, artichoak, rhodium, raiſin-ſtalks, damaſk-roſes, wine-lees, rape or grape-huſks, and the oil of wine. The laſt of theſe is infinitely preferable to all the others, but is not ſo well known. Theſe and the like ingredients, judiciouſly mixed, will, when the ſpirit is very well purified firſt, give the flavour of foreign brandies with ſome tolerable exactneſs; but if this is not attained, their flavour will be loſt in the original one, and the general taſte reſulting from the whole will be like nothing at all. The ultimate perfection, aimed at in all the proceſſes of combinatory Diſtillation, is the depurating the Engliſh malt ſpirit at one operation, ſo as to render it taſtleſs and inodorous, and yet vinous; or elſe to make it reſemble the French brandy, arrac, or ſome other low-flavoured vinous ſpirits.

This is certainly practicable, though not uſually practiſed to the perfection that it might be: the principal thing, to be endeavoured after, is the obtaining a taſteleſs ſpirit, capable of receiving any impreſſion, and then the buſineſs of flavouring is eaſy. The method of rectifying, by fixed alkaline ſalts, is capable of great improvement, as by ſteeping the ſpirit firſt brought near to the ſtate of alcohol, upon a well dried ſalt of tartar, or any other cheaper, but pure fixed alkali; by this means, it will be almoſt totally freed of its oil without volatilizing much of the ſalt, as it does in the way of Diſtillation; by this means a weak tincture of ſalt of tartar may be procured, and an acid added to this, to take off the effects of the alkali in the ſpirit; the whole is then to be diſtilled; and, the fire being well managed, a very clean ſpirit will be thus procured at one operation, ſuch as can no way elſe be obtained at once.

The uſe of the compound neutral ſalts in rectification ſeems not yet to be ſufficiently known; what is meant by theſe ſalts is a fixed alkaline ſalt ſaturated with an acid one. Such a ſalt has indeed been expected from the caput mortuum, or white ſaline cake, remaining upon Diſtillation of the ſpirit of nitre with oil of vitriol; but it proves too hard, ſtony, and inſoluble, to be of any great uſe on this occaſion: a much better effect may be expected from ſoluble tartar, carefully prepared, and properly uſed; though even this is apt to render the ſpirit a little ſaponaceous. Some compound neutral ſalts have been made however upon this foundation, that would rectify common malt ſpirit from proof at a ſingle operation, much better than all the other more perplexed and tedious methods in uſe. A prudent uſe of fine dry ſugar may alſo be of ſome ſervice, as it readily unites with the eſſential oil, and detains and fixes it, without imparting any urinous or other nauſeous flavour to the ſpirit rectified upon it; another hint to this purpoſe, which may be made to turn to very good account, is, that given by the ingenious method invented by Dr. Cox, of taking all the oil out of the volatile ſalts, by firſt bringing them to a neutral ſtate with ſpirit of ſalt, and then ſubliming them with ſalt of tartar, which does the buſineſs to perfection. In the caſe of ſpirits the acid may be varied, and virgin earth, chalk, calcined flints, or the like abſorbents uſed in the ſtead of ſalt of tartar, and yet the general effect will be the ſame. *Shaw's Eſſay on Diſtillery.*

Compound DISTILLATION.—By compound Diſtillation, is meant that wherein the addition of certain ingredients gives the ſpirit ſome new properties, virtues, and uſes, different from thoſe of a ſimple ſpirit. Thus the cordial waters of the diſtillers, and the compound waters of the apothecary, are productions of this operation.

The apothecaries have long been ſubject to the ridicule of diſtillers, on account of their inelegant way of making compound waters; and at preſent ſeem to yield the diſtillers maſters of the art, without venturing farther to diſpute the point. But, as apothecaries are all expected to be chemical operators, I do not ſee how they can ſubmit to be out-done in a chemical branch of their buſineſs; eſpecially, how they can acknowledge the diſtillers to make better compound waters than themſelves; yet conſtantly ſupply their patients with thoſe of their own making.

The diſtillers uſually think themſelves ſo perfect in this art, as to need no farther inſtruction; but they will not, it is hoped, be unwilling that a little aſſiſtance ſhould be given the apothecary, in a point that concerns the health of his patients.

In all compound Diſtillation, it is a principal rule, that the ſpirit employed be well rectified, cleanſed, and rendered nearly inſipid; eſpecially if a malt-ſpirit be choſe: otherwiſe the oil of the ſpirit will prevent its being well impregnated with the virtues of the ingredients, and alſo be apt to taſte through them all. And for this reaſon, as well as others, the ſpirit ſhould be brought into the form of alcohol. At leaſt, if a clean proof-leſs malt-ſpirit cannot be procured, let a fine melaſſes ſpirit, which, though proof, ſhews thin and attenuated, be uſed without any farther addition of water in the ſtill. An additional quantity of water only takes up room to bad purpoſe, and not only prolongs, but prejudices the operation. And, when alcohol is employed, let it only be mixed with an equal quantity of fair water.

In the next place, due regard muſt be had to the buſineſs of digeſtion; without which the virtues of ſome ingredients will not riſe in Diſtillation. Thus, without good maceration, the ponderous oil of the cinnamon is not very ready to riſe with the ſpirit: whence the virtue of it ſometimes remains in the ſtill, and requires to be fetched out by cohobation. The apothecaries, to avoid this trouble, or for other reaſons, are uſually content to have their ſtrong cinnamon-water poor, that their ſmall cinnamon-water may be rich. But this is perverting the deſign of the phyſician, who expects both to be made in perfection, and ſecundum artem.

When the ingredients, according to their reſpective natures, have ſtood a due time in digeſtion, the ſpirit is to be drawn from them in the manner that beſt tends to bring over the virtues, whereon the character and expectation of the water are founded. So, if the ingredients naturally abound in a heavy viſcous oil, the operation ſhould be performed with a briſker fire, than when the oil is thin, light, and ethereal. Thus ſtrong cinnamon-water, after ſufficient digeſtion to looſen the oil, might be drawn over ſmarter than citron-water, the ſpirit of mint, or the like; where the eſſential oil aſcends much eaſier along with the ſpirit.

The capital thing of the whole reſts here, that a due proportion of the finer eſſential oil of the ingredients be received into, and embodied with the ſpirit; whilſt the groſſer, leſs ſubtile, and leſs agreeable oil is kept out. To effect this fully requires, 1. That the operation be well regulated from the firſt; 2. That the receiver be changed in due time; and, 3. That the ſpirit be prudently made up. When no regard is had to theſe ſeveral particulars, as it rarely ſeems to be among the apothecaries, the conſequence is the production of a milky, thick, turbid liquor, that taſtes more like what the diſtillers call faints than a cordial water; and, indeed, ſeems more fitted to give ſickneſs, than to cure it. At leaſt, before it can be uſed, it muſt either ſtand a long time to fine of itſelf, if ever it will fine; or have its groſs, unctuous,

unctuous, and terrestrial parts precipitated by art. On the contrary, when these rules are prudently observed, the water proves, without farther trouble, clean-tasted, clear, brisk, pleasant, and refreshing; supposing it intended for a common cordial, and not for physic.

What seems to have led the distillers into this clean way of compounding, is their particular esteem and fondness for the bubble-proof; a thing little understood by apothecaries, and less regarded in their productions. The distillers, in the making of compound waters, find, if they suffer their faints to run among the high spirit, this procedure kills their proof before its time. Hence they are instructed to leave them out, and make up with fair water; reserving their faints for other uses, to which, as containing a copious oil, they are better adapted: so that, by a little management, they may be turned into waters themselves, or made to give out their essential oil. In which manner, and by continuing to run the still longer than the advantage from the spirit requires, a large quantity of oil may frequently be procured. And this piece of knowledge among the distillers, or their servants, has sent many parcels of oil of aniseed, oil of juniper, oil of caraway, oil of cloves, &c. to the druggist, the chemist, and the apothecary, at such an under-price, as ought to shew them the trick; if they could not otherwise distinguish between a perfect essential oil, and one that has by spirit been robbed of its more subtile and ethereal part. And this may serve to shew the nature of that extemporaneous method of making some compound and cordial waters with the essential oils of aromatics, and certain plants. The common practice is to rub these oils into a kind of elæosaccharum with sugar, and thus dissolve it in a proof-spirit. And if the essential oil be fresh and genuine, the spirit clean and thin, and the operation dextrously performed; better waters may be made in this manner than are vulgarly found, either at the distillers or apothecaries: the chief fault being, that they contain too little of the fine ethereal oil, and too much of the grosser unctuous matter of the ingredient.

The fine light oil, of which this grosser is robbed by a careful Distillation, is the very thing that gives the flavour, virtue, and specific difference of the compound spirit: and this is generally found to come over with the spirit, while the fire is kept moderate, or so as to cause only a simmering, and not a boiling, in the liquor of the still. When once the fire is raised, as it usually is, when the still works slow; part of the grosser oil also comes over, and thus impregnates the spirit. In general, it may be a rule to change the receiver, as soon as ever the stream appears proof: though there are some cases, as particularly in cinnamon, where a little of the faints ought to be mixed in among the water. But this is universal, that so much of the faints should in no case be used, as to bring a cloudiness or milkiness upon the water, usually kept in the state of full proof: this state being supposed to mellow and ripen it sooner; as indeed it does much sooner than a lower state would, because the oil could not then remain dissolved. But most cordial waters, for the apothecaries use, had perhaps better be preserved in the condition of a three fifth of brandy, that is, as they come from the still unmade up.

The water employed for making up should either be soft river-water, or spring-water, softened by art or Distillation; otherwise it is apt to turn the spirit thick, and precipitate a sediment; especially if made below proof: or if the spirit partake of an alkaline nature, from the manner of its rectification. But when this happens, or there is a necessity for making goods below proof, they may be fined in a day or two, either with a small proportion of alum, the white of eggs, or with jelly of ising-glass, beat up to a froth, and applied in the same manner as in the fining of wines.

All compound waters should likewise be a little edulcorated with the finest sugar; as this serves to unite the essential oil of the ingredients more intimately with the spirit, and at the same time makes the water taste softer and pleasanter in the mouth.

DITCH. — In marshes, and other wet land, where there are no hedges, the common fence or inclosure for land is a Ditch. They allow these Ditches six feet wide against highways that are broad, and against commons five feet. But the common Ditches about inclosures, dug at the bottom of the bank, on which the quick is raised, are three feet wide at the top, one at the bottom, and two feet deep; by this means each side has a slope, which is of great advantage; for where they neglect this, and dig them perpendicular, they are always washing down; beside, in a narrow-bottomed Ditch, if cattle get down into it, they cannot stand to turn themselves to crop the quick; but where the Ditch is four feet wide, it should be two and a half deep; and, where it is five wide, it should be three deep, and so in proportion.

DITRIHÆ'DRIA, in natural history, the name of a genus of spars. The word is derived from the Greek δὶς twice, τρεῖς three, and ἕδρα, a side, or plane. The bodies of this genus are spars composed of twice three planes, being formed of two trigonal pyramids joined base to base, without the intervention of any intermediate column.

DI'VER, in zoology, the English name of the colymbus, a genus of water birds; the characters of which are: they have narrow, straight, and sharp bills; their heads are small, their wings short, their feet placed far backward on the body, and near the tail; their legs broad and flatted, and their claws broad like the nails of one's fingers. They are called colymbi, and in English Divers, from their great expertness in diving, and long continuance under water.

DI'VING (*Dict.*)— Diving-bladder, a term used by Borelli for a machine, which he contrived for Diving under the water to great depths, with great facility, and prefers to the common Diving-bell. The vesica, or bladder, as it is usually called, is to be of brass or copper, and about two feet in diameter. This is to contain the Diver's head, and is to be fixed to a goat's skin habit, exactly fitted to the shape of the body of the person. Within this vesica there are pipes, by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by means of which he may make himself heavier or lighter, as the fishes do by contracting or dilating their air bladder: by this means, the objections all other Diving machines are liable to, are obviated, and particularly that of the air; the moisture by which it is clogged in respiration, and by which it is rendered unfit for the same use again, being here taken from it by its circulation through the pipes, to the sides of which it adheres, and leaves the air as free as before. *Borelli Opera Posthuma.*

DIURE'TICS (*Dict.*) — The medicines of this kind are, by Celsus, in the thirty-first chapter of his second book, characterized and enumerated in the following words: 'Every fragrant vegetable, which is cultivated in gardens, provokes a discharge of urine; such as smallage, rue, dill, basil, mint, hyssop, anise, coriander, cresses, rockets, fennel, asparagus, capers, cat-mint, thyme, savory, nipplewort (lampsana) parsnip, skirret, and onions.' But, of the vegetable kind, I recommend, says Hoffman, as Diuretics, the roots of parsley, celeri, asparagus, grass, liquorice, madder, parsnip, crowfoot, pareira brava, acmella; the herbs, parsley, ground-ivy, horse tail, chervil, common nettle, all leeks, and all the species of garlic; the flowers of butchers broom, and blue bottles; the seeds of carrots, parsley, celeri, fennel, grumwell, common nettle, violets, the four greater cold seeds, the seeds of club-moss, winter cherries, dog-hips, juniper-berries, straw-berries, the wood of the juniper-tree, sassafras, and its bark. Among resins and balsams, mastic, amber, the balsamum de Mecha, and the balsum Capivi. In the animal kingdom, cantharides, millepedes, May-worm, scorpions, toads, earth-worms, cochineal, and whey. To the class of Diuretics, also, belong all alcaline salts prepared by incineration, as also the salt of amber, the arcanum duplicatum, a solution of crab's eyes and nitre. The compound medicines belonging to this class are, the lixivium benedictum of Mynsicht, the tincture of tartar, the acrid tincture of antimony, the terra foliata tartari, the liquor silicum, the lithontriptic liquor of Michaeli, soluble tartar, the spirits of turpentine, mastic, and amber, balsam of sulphur with oil of turpentine, balsam of juniper, oil of juniper, malvaticum juniperinum, the syrupus dialthææ of Fernelius, and the trochischi Alkekengi. As the discharge of the urine may be impaired and rendered difficult from several causes, such as, first, a defect of due moisture in the blood, or, secondly, thick and tenacious juices obstructing the small urinary ducts of the kidnies, thirdly, a violent spasmodic constriction of the renal ducts, or, fourthly, their preternatural relaxation and weakness; so also the medicines, calculated for restoring a due discharge of the urine, must be adapted to the removal of these several causes. Thus, for instance, some substances, by conveying a due degree of fluidity to the inspissated blood, augment the discharge of urine; of which kind are all aqueous diluting medicines, liberal draughts of spring water, whether cold or warm, especially, if herbs of a diuretic quality are infused in them: this intention is likewise answered by tea and coffee, as also by mineral waters, either hot or cold, as they not only dilute the blood, but, by their alcaline quality, dissolve the viscid and tenacious humours, and remove the obstructions of the kidnies. The same effect is produced by whey, which is possessed of an aqueous, abstergent, and gently stimulating principle, as also of a sweet nitrous salt. Other substances dissolve the tough and viscid humours which obstruct and block up the secretory ducts of the kidnies, and, by that means, render them fit for performing their functions. Of this kind are all fixed salts, and the lixiviums prepared from them; as also tincture of tartar, the acrid tincture of antimony, the liquor silicum, the terra foliata tartari, the tartarus tartarisatus, the arcanum duplicatum, a solution of crab's eyes, and the magnesia alba, which, with the acid of the primæ viæ, is converted into an aperient salt; as also the tincture of quick-lime, mother of pearl, and coral, prepared with citron juice; as also the salts obtained by exhalation from mineral waters. Other substances sooth and alleviate the spasmodic constrictions of the emunctories of the kidnies, which obstruct and prevent the due discharge of the urine. The most considerable and efficacious of this kind are, nitre, the four greater cold seeds, and emulsions prepared of them; the seeds of the white poppy, of carrot, and of club-moss, as also winter cherries, and troches prepared of them: the same

intention

intention is anſwered by the anodyne mineral liquor, which is both a ſafe and efficacious medicine; as alſo by ſaffron, and its eſſence; the juice of graſs, in conſequence of its nitrous ſalt; a decoction of the roots of graſs and aſparagus, and oil of ſweet almonds, which is a liquor of a highly demulcent quality. Other ſubſtances, by their oleous, ſubtile, and balſamic principle, corroborate and ſtrengthen the kidnies; ſuch as maſtic, amber, the balſamum de Mecha, the balſam of Capivi, turpentine, the wood and berries of the juniper-tree, ſaſſafras, parſley, parſnip, fennel, aniſe, crow-foot, celeri; and the oils, eſſences, ſpirits, decoctions, and infuſions of them. Other medicines corroborate the kidnies, by their ſtrengthening, fixed, terreſtrial, and ſulphureous principle. Of this kind are dog-hips, rob of juniper, and the malvaticum juniperinum prepared of it, dried ſtrawberries, pareira brava, ground-ivy, the bark of the root of Egyptian thorn, horſe-tail, Paul's betony, and chervil. Laſtly, other medicines powerfully ſtimulate the renal ducts, when they are ſo far weakened as to have their functions either impaired, or totally deſtroyed: of this kind are almoſt all inſects, eſpecially cantharides, millepedes, ſpiders, ſcorpions, and dried toads: and, in the vegetable kingdom, all the ſpecies of leeks and garlic.

Since there is ſo great a difference among Diuretic medicines with reſpect to their principles, and manner of operation, their uſe muſt, of courſe, be different, and they muſt be judiciouſly adapted to the particular natures of different caſes; for, if to plethoric patients, labouring under the ſtone, we ſhould, before veneſection, and the diminution of the quantity of the blood, exhibit hot ſubſtances impregnated with a ſubtile balſamic oil; ſuch as preparations of turpentine, and juniper, or the balſams of Mecha, Capivi, or Peru; or acrid ſubſtances; or ſuch inſects as abound with a cauſtic ſalt, garlic, onions, or leeks; we ſhould certainly injure the patient, bring on an inflammation of the kidnies, and promote the generation of ſtones. On the contrary, in moiſt, leſs delicate, and more robuſt patients, who live upon coarſe food; as alſo, in diſeaſes ariſing from a redundance of impure ſerum, a fluor albus, a gonorrhœa, a diſpoſition to an anaſarca, and leucophlegmatia; theſe draſtic medicines are of ſingular uſe and ſervice.

Still greater misfortunes are produced by acrid and ſtimulating ſubſtances, in caſes where, in conſequence of ſpaſmodic or nephritic pains, a diſcharge of the urine is ſuppreſſed. Diſorders of this nature are far more ſafely and efficaciouſly removed by ſuch medicines as alleviate pain, and relax ſtrictures; ſuch as winter cherries, the ſeeds of carrot, club moſs, white poppy, and grumwell; as alſo emulſions of the four greater cold ſeeds, the trochiſci Alkekengi with opium, antimoniated nitre depurated, the water of the leaves meadow ſweet, of the lime-tree, and of the Egyptian thorn; oil of ſweet almonds, ſweet ſpirit of nitre, the anodyne mineral liquor, whey; and externally, emollient baths, and fomentations; the virtues of all which are ſo great, that, by alleviating the racking ſpaſms, they not only reſtore the free diſcharge of the urine, but alſo facilitate the progreſs of the ſtone through the ureters, and promote its expulſion.

In diſorders ariſing from a redundance of ſalt and tartareous ſerum, which is generally the cauſe of arthritic and rheumatic pains, this peccant humour is carried off by gentle Diuretics, though not of the hot kind, leſt, by their means, the ſpiculæ of the ſalts ſhould be put into a briſker motion, and the parts in which they are lodged, be more violently racked. The gentle Diuretics, by which this intention is moſt effectually anſwered, are, the roots of ſarſaparilla, pareira brava, ſaſſafras, and China root; as alſo thoſe of liquorice, aſparagus, madder, ſuccory, fennel, parſley, and graſs, together with the wood of the juniper-tree, and the preparations of theſe boiled in broth made with fleſh, or in water. To this claſs, alſo, belong whey, and, more eſpecially, the temperate mineral waters and warm ſprings.

But in caſes where peccant, viſcid, and tenacious humours are lodged in the urinary bladder, and eſpecially when the intention is to expel the firſt beginning of a ſtone, more acrid and powerful medicines become neceſſary. This intention is anſwered by garlick, exhibited with ſpirit of juniper; as alſo by the powder of millepedes, May-worms, eſſence of cantharides, and tincture of antimony, liquor ſilicum, and tincture of quicklime; which may alſo be cautiouſly exhibited in a virulent gonorrhœa, when a viſcid and tenacious matter lodged in the proſtatæ, the neck of the bladder, or the urethra, is to be carried off by urine.

But the moſt ſafe and efficacious medicines for procuring a free diſcharge of the urine, are all kinds, not only of alcaline fixed ſalts, but alſo thoſe called neutral; for they not only diſſolve the tough and viſcid juices, which obſtruct the urinary ducts, but alſo, by a gentle ſtimulus, promote their diſcharge. This intention is excellently altered by ſolutions of the ſalt of tartar, pot-aſh, and fixed nitre, as alſo the tartarus vitriolatus, ſalt of wormwood, the arcanum duplicatum, a ſolution of crab's eyes, tartarus ſolubilis, the terra foliata tartari, antimoniated nitre, and ſal polychreſtum.

Theſe medicines not only contribute to reſtore a due and natural diſcharge of the urine, but alſo produce ſome other excellent effects in the cure of diſeaſes: for, as many of them are poſſeſſed of an aperient and inciding quality, as others of them are corroborative, balſamic, and reſtore the tone of the parts; and others of them of an anodyne nature; ſo they prove highly efficacious in thoſe chronical diſorders, which ariſe from an obſtruction of the glands of the viſcera, and emunctories, or from an impurity of the juices, or a redundance of ſaline, acrid, and tartareous ſerum. And certainly, if relief is to be expected from any medicines in dropſies, œdematous ſwellings, ſtony concretions, the gout and arthritic pains, we are to look for it from the prudent uſe of Diuretics: but we are to beware of all hot, acrid, and cauſtic Diuretics, and uſe thoſe which are of a milder nature, and fit for common uſe, ſuch as ſmall Moſelle wine, the Selteran mineral waters, and ſuch ales and decoctions as are gently Diuretic. *Frederic. Hoffman. Medicin. Rational Syſtemat.*

DO'BCHICK, in zoology, the common Engliſh name of a ſmall water fowl, the leaſt of all the diver kind, and known among authors by the name of colymbus minor. It ſeldom exceeds ſix ounces in weight, and has a ſhort beak not more than a finger's breadth long, large at the baſe, but tapering to a point at the end; its eyes are large, and it is covered with a very thick, downy plumage; it is of a very deep blackiſh brown on the back, and very white on the belly; its wings are very ſmall, and it has no tail.

DOCK-*yards*, in ſhip-building, are magazines of all ſorts of naval ſtores; the principal ones, in England, are thoſe at Chatham, Portſmouth, Plymouth, Woolwich, Deptford, and Sheerneſs. In time of peace, ſhips of war are laid up in theſe Docks, thoſe of the firſt rates moſtly at Chatham, where, and at the yards, they receive, from time to time, ſuch repairs as are neceſſary.

Theſe yards are generally ſupplied, from the northern crowns, with hemp, pitch, tar, roſin, and ſeveral other ſpecies. But, as for maſts, particularly thoſe of the largeſt ſize, they are brought from New England.

How much it imports the good of the public, to keep thoſe magazines conſtantly repleniſhed, every one is able to judge: and it were much to be wiſhed, the improving the forementioned commodities, in our Engliſh plantations, might meet with all poſſible encouragement, leſt, one time or other, it may prove difficult to get them elſewhere. It is reaſonable to think ſuch an undertaking will put the nation to ſome conſiderable charge, before it be brought to perfection; but, when ſo, many are the advantages that will ariſe from it.

DODECA'NDRIA *, in botany, a claſs of plants which have hermaphrodite flowers, with twelve ſtamina or male parts in each. See *plate* XXII. *fig.* 4.

* The word is formed of the Greek δώδεκα twelve, and ἀνὴρ male. Of this claſs of plants are the aſarabacca, agrimony, &c.

DO'DO, in zoology, the name of a bird, called alſo by ſome *cygnus cucullatus*, by others *gallus gallinaceus perigrinus*, and by Bontius *dronte*. It is a very ſingular bird, ſomewhat larger than a ſwan, but wholly different from the ſwan in ſhape, tho' by ſome eſteemed a kind of that bird. Its head is large, and is covered with a membrane reſembling a hood; its beak is of an oblong figure, and is yellow at its origin, and black at the point, and is ſomewhat crooked: it is very naked, having only a few feathers ſcattered over its body, and the rudiments of wings made up of a few naked quills; the hinder part of its body is very bulky and fat, and has a tail made of four or five curled greyiſh feathers, reſembling thoſe of the oſtrich. Its legs are very thick and ſtrong.

DOGS-BANE, *apocynum*, in botany, the name of a plant which conſtitutes a large genus, the characters of which are theſe: the flower conſiſts of one leaf, and is made in the faſhion of a bell, but not regularly figured in all the ſpecies.

In ſome the flower is bell-faſhioned, and divided into ſeveral ſegments; and from its cup there ariſes a piſtil, which perforates the bottom of the flower, and is fixed to its hinder part like a nail; this changes into a fruit, compoſed of two vaginæ, and opening from the baſe to the apex, and filled with large quantities of ſeeds, winged with down, and fixed to a rough placenta. *Tournefort, Inſt.*

In others the flower is bell-faſhioned, and is multifid and inverted; and its middle is filled by a very elegant head, compoſed of five little horns expanded into a circle; to the lower part of this head there is affixed a piſtil, which is joined to it in the manner of a nail; this ariſes from the cup, and finally ripens into a fruit, compoſed of two vaginæ, which open from the baſe to the apex, and contain numerous ſeeds, winged with down, and placed in the manner of ſcales, and affixed to a foliaceous placenta. To this it is to be added, that the apocynums all abound with a milky juice.

DOG-FLY, *cynomyia*, in natural hiſtory, the name of a ſpecies of fly common in woods and among buſhes, and particularly troubleſome to dogs. It uſually ſeizes upon the ears, and it is in vain to beat it off, for it returns in a moment, and cannot be prevented but by being killed. It ſtings very ſeverely, and always raiſes a bliſter in the part. It ſomewhat reſembles the flat black fly ſo troubleſome to cattle. It has no trunk, but has two teeth much reſembling thoſe of the waſp. Its wings are always placed ſo cloſe upon its body that they are not ſeen. There are two kinds of it, one larger and found in woods, and the other common in hedges.

DOG-*roſe*, a name of the common briar or hip-tree. It is obſervable

servable of some kinds of this shrub, that the flowers smell extremely sweet in the night, or very early in the morning, but not at all so in the day-time. The reason of which seems to be the same as in all the noctuolent plants, of which there are several kinds, as some of the geraniums, and of the jasmines, &c. that is, that the sun exhales and dissipates their odorous effluvia in the day-time, as soon as they are expanded from the flower; but that in these cold times the vapours are condensated, and reach our nose in an agreeable manner. *Phil. Transf.* N°. 114.

DO'GGERS, in the English alum works, a name given by the workmen to a sort of stone found in the same mines with the true alum rock, and containing some alum, though not nearly so much as the right kind. The county of York, which abounds greatly with the true alum rock, affords also a very considerable quantity of these Doggers; and in some places they approach so nearly to the nature of the true rock, that they are wrought to advantage.

DO'LIUM, in natural history, the name of a genus of shells, called by some conchæ globosæ, and by the French tonnes. The characters are these: it is an univalve shell, with a globose or round belly, with a lax aperture, sometimes smooth and sometimes dentated. The clavicle is either moderately umbonated or depressed; and the columella is, in some species, smooth, in others wrinkled. Some authors have called these conchæ ampullaceæ; and they have had, at times, many other names, but all tending to the same sense, and expressing the globular figure of the body, which is the great character by which these are distinguished from all other shells. See *plate* XVII. *fig.* 13.

DO'LPHIN, in ichthyology, the English name of a fish of the cetaceous kind, called also sometimes the porpesse, but improperly. The word porpesse is properly the name of the conicbodied Dolphin, with a broad back and subacute snout; but the Dolphin, properly so called, and to which the name porpesse is erroneously given, is the delphinus of Artedi, with an oblong and subcylindric body, and a long and acute snout. This is the delphis of Aristotle, and the other Greek writers; and the other properly called the porpesse is their phocæna. Ælian, Appian, and Athenæus, all join in calling this Dolphin, properly so named, the delphis, and the same name is preserved by all the more accurate of the Latin writers.

DOLPHIN, is also a name given by the English to the fish called hippuris, by the generality of authors; but by some hipposele, and equisele, and by others dorado.

DOMI'NICAN-CARDINAL, in ornithology, the name of a curious bird, found only in the Brasils, at a great distance from any habitation. See *plate* XVIII. *fig.* 3, where this bird is drawn in its natural size.

It hath legs and feet rather strong than weak in proportion to its size. The bill is of a moderate bigness, the upper mandible dusky, or horn-coloured, the lower whitish. The eyes are black with dark hasel-coloured irides. The whole head is of a very beautiful red, or scarlet-colour, which colour reaches down the fore-part of the neck or throat, as far as the breast, and ends in a point. The upper side of the neck, the back, wings, and tail, are all of a black colour. The quills that fall next to the back are bordered round with white, as are the covert-feathers next above them; the lesser covert-feathers of the wings and the back have a small mixture of grey, the feathers being as it were finely fringed with grey. The tail-feathers are edged with white. The sides of the neck, breast, and whole under side as far as the tail, are purely white. It hath four toes, three standing forward and one backward, after the usual manner, all of a brown colour. In brief it may be described thus: the head is red, the upper side black, and the nether white. *Edwards's Hist. of Birds.*

DOOR (*Dict.*)—*Plate* IV. *fig.* 16, in the Dict. represents folding Doors, adapted to the Ionic order.

DORA'DO, in zoology, the name of a large sea fish, called by the Brasilians guaracapema; and so much resembling the hippuris, as by many to be supposed to be the same fish; it grows to six or seven feet in length, and is of a somewhat broad and flatted form, being a foot and a half broad near the head; the head ends in a square, and is thinned away to an edge, for the advantage of the creature's swimming the more swiftly. Its mouth is but small for its size, and is furnished with very sharp teeth; its eyes are large and round, and placed but a little above its mouth; its gills are large. It has one long fin running the whole length of the back, and another answering it on the belly, reaching from the anus to the tail; the tail is long, large, and forked; its scales are very smooth, and scarce sensible to the touch; its head, back, and sides are of a silver green, its belly white; its back and sides are spotted with blue; it is a very swift fish in swimming, and is a very delicate and well tasted one. *Willughby, Hist. Pisc.*

DOREE', or *John Doree*, in ichthyology, a name given by us to a fish, called, by authors, the faber and gallus marinus. We have borrowed the name Doree from the French; and, as to the word John, by some writers prefixed to it, it seems only a corruption of the French word jaune, yellow. They expressing the colour of the sides of this fish, which is a gold yellow, by the phrase jaune Doree: this has given us the words John Doree, or, by those who spell yet worse, John Dory, as we see it in some authors.

DORO'NICUM, *leopard's bane*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind; its disk is composed of floscules, and its outer edge of semiflosculcs, all standing upon embryo's, and inclosed in a funnel-like or bason-like cup. The embryo's finally become seeds winged with down, and affixed to the thalamus of the flower.

DO'SSIL, in surgery, is lint made into a cylindric form, or resembling the shape of dates or olive-stones. Dossils are sometimes secured by a thread tied round their middle. *Heist. Surgery.*

DO'TTLE *Fish*, or DAILS, in natural history, a name given by the French to a particular species of shell-fish, which shines in the dark. They are of the genus called pholas by the ancients, and resemble in figure a truncated cone.

M. Reamur observes that it is not the shell, which is luminous, but the animal that it covers; and that it is more luminous in proportion as it is fresher, and but newly taken from the sea.

DOUBLE *Cast*, in husbandry, a term used by the farmers for that method of sowing that does not dispense the necessary quantity of seed for a piece of land at one bout, but requires the going over it every-where twice in a place. *Plot. Oxf.*

DRABS, in the English salt works, a name given to a sort of wooden cases into which the salt is put, as soon as it is taken out of the boiling-pan. These are partitions like stalls made for horses; they are lined on three sides, and at the bottom with boards, and at the front have a sliding board to put or take out occasionally. Their bottoms are made shelving, being highest at the backside, and gradually inclining forwards; by which means the saline liquor that remains mixed with the salt easily drains out from it, and the salt in three or four days becomes sufficiently dry, and is then taken out and laid in large heaps for sale. In some places they use cribs instead of the Drabs. See CRIBS.

DRA'CO *volans*, in natural history, a name given by some people to one of the flying Lizards. Others have applied the same term to a very different subject, expressing by it a sort of ignis fatuus very common in this island, and others of the more northern countries, which are much redder, larger, and more terrible than our common lambent fires, or will in the wisps, as our country people express them. This sort of exhalation is principally seen on the borders of rivers, and in marshy places, and seldom rises very high from the ground, but plays and dances about the surface in an agreeable manner; and, if people go up to it, will stick to their hands or cloaths without burning, or doing them any injury. They are more common in the summer months than in the winter, and are more frequently seen in thick weather than in clear.

DRACU'NCULUS, *dragon*, in botany, a genus of plants, whose characters are:

The leaves are like those of arum, but are divided into many parts: the stalk is spotted, but in other respects it agrees with the arum.

They are propagated by their knobby roots, which, if suffered to remain two or three years undisturbed, will afford many offsets. The best season for transplanting these roots is in autumn, soon after green leaves decay; for, if they are removed, after they have taken fresh root, and begun to shoot, they seldom produce flowers the succeeding summer; or, if they do, they are very weak: these will thrive almost in any soil and situation, but best in an open exposure, and a light soil.

DRAINS, a name given in the fen countries to certain large cuts or ditches, of twenty, thirty, nay sometimes forty feet wide, carried through the marshy ground to some river, or other place capable of discharging the water they carry out of the fen lands. Most of these Drains are made in our fen countries by a body of men called the undertakers, whose reward is one third of the ground they drain. They erect sluices also at a great expence, often not less than two thousand pounds each; yet these, with all the care they employ in erecting them, are subject to be blown up by the vast weight of water that lies upon them, when the lands are overflown. Some of these sluices have two or more pair of doors, of six, eight, or ten feet high, which shut, when the water in the river is higher than in the Drains, by the weight and force of it; and so, è contra, throw out a body of eight feet square of water for about six or seven hours during the ebb. The real use of these Drains is very evident from the present state of the land where they are cut, and that of it before. In Camden's time, all this was bog, and now it is all firm land. The country about Crowland was in that author's time so soft, that it was not passable by carriages; and thus grew a witticism upon it, that all the carts that entered this town were cased on the wheels with silver: but this is now so firm ground, that carriages of any kind pass over it. The duck-ponds used to be called the fen corn fields, and they now are such in reality, their bottoms being dry, and producing oats, and rape-seed, or cole-seed, with great increase. *Philos. Transf.* N°. 223.

DRANK, a name given by our farmers to the great wild oats. These are often very troublesome to the plowed lands, especially after wet seasons and much frost. Many to destroy this weed sow the land with black oats, which, being ripe much sooner than the seeds of this plant, are cut down, before it can

 sow

sow itself for another year; especially, if they are cut a little the earlier, which will do them no harm, if they be suffered to lie a little upon the ground a while afterwards for the grain to swell before they are carried in. But, in general, when plowed land begins to run to these weeds and thistles, it is a token to the farmer that it is time to fallow them, or else to sow them with hay seed, and make pastures of them. The sowing beans upon a land subject to these weeds is also a good method, because the farmer may send in his sheep, when they are about three inches high, which will eat up the Drank, and all the other weeds, and will not hurt the beans. The general method is to put twenty sheep to an acre; but they must be put in only in dry weather, and not left too long. *Mortimer's Husb.*

DRE'SSING *of ores*, the preparing them, as they come rough from the mine, for the working by fire. This is done several ways in different countries, and in respect to the different ores of the metals; in Devonshire we have a very easy method, which is so expeditious, and so good for all the purposes, that it is worthy copying in other places. After the ore is dug, it is tossed up by hand from shamble to shamble by the shovelmen in the mine, and drawn up in buckets by a winch at the top of the shaft. As soon as the whole quantity for one dressing is brought up, the large stones are broken, and the whole is then carried to the mills, where one horse turns a wheel that moves the machines for powdering a great quantity of it; these are called the stamping or knocking mills. The ore is unloaded at the head of the pass or entrance into these mills; this pass is made of two or three bottom boards and two side boards, in form of a hollow trough, and stands in a slanting direction. The ore by its own weight is carried down this trough, and lodges itself in the coffer. The coffer is a long square box made of the firmest timber, and of three feet long, and a foot and a half broad; the ore is not suffered to fall into this all at once, but is stopped over the mouth of the trough by a cross board, where a cock turns in a quantity of water at the same time, which washes down just as much of the ore with it into the trough, as there ought to be. In this coffer there are three lifters placed between two strong board leaves, having two braces or thwart pieces on each side to keep them steady, as a frame with stamp heads. These heads are of iron, and weigh about thirty or forty pounds a-piece, and serve to the breaking the lumps of ore in the coffer.

The lifters are about eight feet long, and half a foot square. They are always made of heart of oak, and have as many in timbers or guiders between them; they are lifted up in order, by a double number of toppits, which are fastened to as many arms passing diametrically through the greatest beam, which is either turned by the wheel and horse, or where there is conveniency of water, by an over-shot water wheel on two boulsters. The toppits exactly but easily meet with the tongues, which are so placed in the lifters, as that they easily slide from each other, and suffer the lifters to fall with great force on the ore in the trough. The frequent pounding of these soon reduces the large masses into a sort of sand, which is washed out of the trough by the continual current of the water from the cock through a brass grate, which is placed at one end of the coffer between two iron bars.

The powdered ore is conveyed out of the trough into the launder, which is a trench cut in the flower of eight feet long, and ten feet over; this is stopped at the lower end with turf, so that the water is all suffered to pass away, and the powder of the ore is stopped. Thus the launder by degrees fills up with the dressed ore, and this is removed out with shovels, as occasion requires. The launder is divided into three parts, the forehead, the middle, and the tail; that ore which lies in the forehead, that is, within a foot and half of the grate, is always the richest and best, and is laid up in a heap by itself; the middle and tail afford a poorer ore; and these are sometimes laid up in separate heaps; sometimes thrown into one heap together.

DRILL, or DRILL-*box*, a name given to an instrument used in the new method of horse-hoeing husbandry for sowing the land. The Drill is the engine that plants the corn and other seeds in rows; it makes the channels and sows the seeds in them, and covers them with earth when sown, and all this at the same time, and with great expedition. The principal parts of the Drill are the seed box, the hopper, the plow and its harrow. The seed box is the chief of these, it measures or rather numbers out the seeds which it receives from the hopper, and is for this purpose as an artificial hand, but it delivers out the seed much more equally, than that can be done by a natural hand. The plow and hopper are drawn by a horse, and by these the ground is opened, and the seed is deposited in it; the harrow follows, and lightly rakes in the earth over them. When the ground is fine, and the seeds small, a hurdle, with some prickly bushes fastened to its under part, will serve better than the harrow.

DRILL, in mechanics, a small instrument for making such holes as punches will not conveniently serve for. Drills are of various sizes, and are chiefly used by smiths and turners. *Moxon, Mechan. Exerc.*

It is a very well known fact, that a Drill, made of iron, has frequently not only a polarity, but so strong an attractive virtue of the magnetic kind, that it will suspend a common needle from its point. It is usually supposed that a Drill acquires this polarity by boring iron. But it is not only by boring of iron, that this power is obtained, but in the very making. As soon as one of them is finished and hardened, its point becomes a north pole before it has ever been worked either in iron or any other materials, so that, of the great numbers of these instruments found in a shop, endued with this power, it is to be supposed that more of them owe it to their original make, than any after use. All pieces of wrought iron which in shape resemble Drills, that is, which are of a long and slender form, will not only have this polarity, but they will change it on being placed for some time in an inverted posture, and that which was the opposite to the north pole, by standing downwards, will be the north pole. This has been an old observation, but, on a fair experiment, it does not prove to be true in all things without exception, though it be so in most particulars. The larger pieces of iron seem to be most easily influenced in their polarity, by changing their position; but the small ones will sometimes be found to have fixed poles, which no change of posture will alter. *Philos. Transf.* N°. 246.

DROCK, in husbandry, a name given by our farmers to a part of the common plow. It is an upright piece of timber, running nearly parallel with the hinder-part of the plow, but belonging to the right side of the tail, as that does to the left. The ground wrist of the plow is fastened to this, as is also the earth-board. *Tull's Husbandry.*

DRO'MEDARY, in natural history, a species of the camel, about which authors are divided in their opinion, some calling that which has one bunch on its back the camel, and that with two the Dromedary; while others call that with one bunch the Dromedary, and that with two the camel; we have followed the former, being the most general opinion, and shall give a description of the camel under the article HEGEN, the name given to that creature by the Arabians.

The neck of the Dromedary is long, the body very thick and broad, having two bunches on its back; his buttocks small, considering the bulk of his body, and his legs very long. See *plate* XXII. *fig.* 7.

The bunches on the Dromedary's back are generally supposed to be a callous sort of flesh; but the academists of Paris found it mere hair, and that, when this was pressed close down, the creature appeared no more bunch-backed than a swine.

Taverrnier assures us, on his own knowledge, that it will travel nine days without water; and, even in the coupling season, forty days without either drink or meat.

DRONE, in natural history, a bee of a much larger size than the common working bee, and of a lazy disposition. They are the males of the swarm, the common working bees being of no sex, and the female, generally called the queen bee, is only one in a hive. See QUEEN *Bee.*

The Drones are commonly a third bigger and longer than the bees; their head is rounder and more full of hairs. It is certain they have no sting, and their internal parts are very different from those of the common bees.

One rarely sees them go out of their hive, and, whenever they do go out, it is not till two or three o'clock in the afternoon, and never but in fine weather. They do not return loaded with wax; but we have found their bladder or reservoir full of honey as in the common bees, whether it be that they have collected it in the fields, or that they took it in the hive before they went out; which latter we are the most inclinable to believe, because we have never seen them settle upon flowers, and, after they have returned into the hive, we have never seen them lay the honey in the cells; we are even apt to think that they have not the organs for disgorging it, as the other bees do; for in the other bees you cannot compress, ever so little, that part of the body which is opposite the bladders, when it is full of honey, but you see the honey issue immediately at that part of the head by which they are accustomed to discharge it into the cell; whereas it is not so with regard to the Drones, although, after having opened them, their bladder hath been found quite full of honey.

In some hives the Drones are few in number, in others they are extremely numerous. During a part of the summer they are disposed in the hive. Afterwards, in proportion as their number increases, they assemble together in companies, in different parts of the hive, where they continue cantoned and almost intirely motionless.

At the time that the swarm sallies forth, and that the bees are all in motion, the Drones keep their place, and do not go out with the swarm, or, if any attend the colony, they are only a few in number. But, from the end of July to the middle of August, these Drones are attacked by the common bees; several bees fall upon a single Drone and seize him by his wings and body; and although the Drones resist as much as they are able, they are obliged to withdraw and leave the hive; they disappear so intirely, that we could never discover what was become of them.

When this sort of combat happens, you see all these animals in great commotion, as well without as within the hive. All the Drones are so generally expelled, that of several hundreds, which we have often remarked in one hive, by the end of October, we have not found a single Drone in several hives that we have examined.

Their origin is the same as that of the bees; they are the offspring of the queen, and produced in the same circumstances, with

with this difference alone, that the Drones are lodged in separate combs made expressly for them.

We have said that in an hive there are combs whose cells are a third or an half bigger and longer than the common cells. The pregnant bee chuses these great cells for depositing there, with all the state and attendance, that authors have observed with regard to the common bees, those eggs from which the Drones are to be hatched, and which cannot be distinguished by the sight from the common eggs; but it is probable that the mother hath some exquisite feeling to distinguish them, since she allots them abodes, proportioned to the size they are to have, when they are inclosed in the cell in their utmost perfection. The Drones undergo the same metamorphoses as the other bees; they are many days before they sally forth from their cells, and become recluses after the eighth day from their birth.

Lastly, they are nursed with the same care and tenderness as the common bees: but it is surprizing that this attention and love which the bees have for those little ones, should be turned, as I may say, into so great an hatred at the end of the summer. This hatred is so universal, that it spares not even the young Drones, who are yet only worms or nymphs included in the cells; for we have often remarked, that, at the time when a part of the bees have been expelling the great Drones from the hive, there were other bees employed in unstopping the cells, where the imperfect Drones were inclosed; in dragging them out of the cell, in killing them, and throwing their bodies out of the hive; where we have sometimes seen two or three hundred killed of different ages. *Mem. de la Acad. des Sciences.*

DRONE-*fly*, or *Bee-fly*, a two winged fly, so extremely like the common bee, as to be at first sight not easily distinguishable from it; the distinction between the two insects, however, besides the different number of the wings, is that the bee has a somewhat longer and less thick body, and the head is proportionably much smaller, than that of the fly which so much resembles them. The bee-fly, also, ever carries its wings parallel in their position, but without its body; whereas the bee itself usually carries its wings crossed on the back, and covers its body with them; this is not however an invariable posture with the wings of the bee, though it is the most frequent one. The bee-fly is found among the flowers, as is the bee, and, though it gathers no wax, it has a trunk by means of which it sucks the honey.

The trunk, by means of which the fly is enabled to do this, has no teeth, and consequently the fly belongs to Mr. Reaumur's first general class of the two-winged flies; and the form of its body, which is short and flat, determines it to be of his first subordinate genus of that class. This is properly a separate genus of flies, of which there are many species. Mr. Ray has described six, and a close observation will enable us to add much to that number. The different species vary extremely from one another in size. The smaller of them are not so large as the common blue flesh-fly; the others equal or exceed this fly in size. They differ also in colour, in different shades of brown; and some of them have spots of a fine deep black, and others of a fine glossy yellow, which make them very distinguishable from bees.

DROUGHTS. Great Droughts are very prejudicial to the farmer and his pasture, and such years afford but very little reward for the labour and expence of keeping it in order. The only remedies are high inclosures, and plenty of water at hand. The first of these is always in the farmer's power, and should be carefully provided by planting hedges in a proper manner, in countries most subject to suffer by this disadvantage. The other is not always so easy, but may be managed several ways, as by sinking wells; but these, when deep, are very expensive; or by bringing the water in pipes, gutters, or other conveyances: and this is easily done where there is a spring or brook in the neighbourhood higher than the lands. Pumps, wheels, and such other engines are also used in some places to bring on the water, and, in others, ponds, cisterns, and receptacles are made to take in the rains and winter floods, and retain the water till summer, when it is wanted.

The farmers of England are very deficient in this last method, which they might use to their great benefit in many places. In Spain they have no water in many parts but what they preserve in this manner. And at Amsterdam and Venice they have whole cellars made into cisterns, which receive the water that falls in rains, and preserve it all the year. Want of water for the earth in summer in many places might be easily remedied by some care of this kind, and many thousand acres of land made useful, which are now left as waste, by this means alone. It is very evident that this is feasible, because it is done in places where there falls much less rain annually than with us; and yet by this the inhabitants have always fresh water enough for the use of their houses, cattle, and gardens, none of which ever fail. *Mortimer's Husbandry.*

DRY-CUPPING, in surgery, the application of cupping-glasses to various parts of the body, and raising the common tumors under them without opening them with the scarificator.

The use of Dry-cupping is two-fold, either to make a revulsion of the blood from some particular parts affected, or else to cause a derivation of it into the affected part upon which the glass is applied. It is in the first sense that Hippocrates orders a large cupping-glass to be applied under the breasts of women who have a too profuse discharge of the menses, intending thereby to cause a revulsion of the blood upwards from the uterus. And upon the same principles hæmorrhages at the nose have been stopped by applying cupping-glasses to the legs and feet, particularly about the ancles and knees. Spitting of blood from the lungs has also been cured by the same method; and Scultetus gives a remarkable instance of a woman, who, by the repeated application of six cupping-glasses, without scarification, to her thighs, was not only relieved of the troublesome symptoms arising from an obstruction of the menses, but was also freed from the obstruction itself.

Dry-cupping is also used with success to make a revulsion by applying the glasses to the temples, behind the ears, or to the neck and shoulders, for the removal of pains, vertigo's, and other disorders of the head; they are also applied to the upper and lower limbs, to drive blood and spirits into them, when they are paralytic, and lastly to remove the sciatica, or other pains in the joints: the operation in these cases is to be repeated till the part looks red and becomes painful. *Heister's Surgery.*

DUCK, *anas*, in zoology, the name of a very large genus of birds, the characters of which are these: the beak is shorter, in proportion, than that of the goose, and the feet proportionably larger. The legs are shorter and are placed farther backward, and the beak is flatter, and the body more compressed. Some of these love the fresh water, others are found only at sea, and of both these there are very numerous species.

This fowl is furnished with a peculiar structure of vessels about the heart, which enable it to live without respiration a considerable time under water, as is necessary for it in diving. This made Mr. Boyle think it a proper object for experiments by the air-pump, than any of the other birds. A full grown Duck being put into the receiver of the air-pump, of which she filled one third part, and the air exhausted, the creature seemed to bear it better for the first moments, than a hen or other such fowl; but, after about a minute, she gave great signs of discomposure, and in less than two minutes her head fell down, and she appeared dying, till revived by letting in the air. Thus, whatever facility of diving this and other water fowl may have, it does not appear, that they can subsist without air for respiration, any longer than other animals. A young callow Duck was afterwards tried in the same manner, and with the same success, being reduced very near death in less than two minutes. But it is observable, that both birds swelled extremely on the pumping out of the air, so as to appear much larger to the spectators, especially about the crop. It not being intended that any water fowl should live in an exceedingly rarified air, but only be able to continue on occasion some time under water; nature, though she has provided them with the means of this, has done nothing for them in regard to the other.

Northern DUCK, *anas arctica*, a name given by Clusius to a water fowl well known on our coasts, and called by several other names both by authors and our own common people. Aldrovand calls it pica marina, and fratercula from Gesner, and Wormius and Hoier, the lunda. We call it in some places the puffin, and in others the golden head, bottlenose, helegug, coulta-neb, or counter-neb, and the mullet and pope. It is smaller than the common Duck; its beak is flatted sideways, and is broad and short, somewhat of a triangular figure, and ending in a point; it has a callous substance at its base, like that over the beak of the parrot. It is partly grey, partly red, and has three remarkable furrows on it. Its legs are placed very backward, and are yellow, when the bird is young; they afterwards are red, and have no hinder toe. Its head, neck, and back are black; its breast, throat, and belly white; but there is a remarkable black ring which surrounds the throat. The sides of the head are also whitish, or of a very pale grey. Its wings are extremely short, and furnished with very small feathers; yet by the help of these it flies very nimbly along the surface of the water, but it cannot fly at all, except its wings continually touch the water. It builds no nest, but lays its eggs on the naked earth, or in the deserted rabbit-holes; and, what is very remarkable, each lays only one egg. This is very large, and of a reddish colour. They breed with us, but are birds of passage, leaving us in autumn, and returning about March in small numbers, as if to examine the place, after which they again depart, and in May return with the whole numbers; and, if it happens to be a stormy season, multitudes of them are thrown dead upon the shores, for they are neither able to travel, nor to get food, except in calm weather.

The sharp-tailed DUCK, *anas cauda acuta*, in zoology, the name of a peculiar species of Duck, having a long tail like a pheasant. It is called in some places the sea pheasant, but more generally is known, with us, by the name of the cracker.

Horn DUCK, *anas Cornicensis*, the name of an American Duck, described by Nieremberg, and having its name from its imitating, with its note, the sound of the huntsman's horn. It is a very bold though weak bird, and is very difficultly tamed. This is one of the many birds mentioned by this author, which, from his imperfect account, it is impossible to know whether it be a new ſpecies, or ſome of thoſe deſcribed by Margrave or others.

Indian DUCK, *anas Indica*, the name of a bird of the Duck kind, deſcribed by Geſner and others, as a diſtinct ſpecies, but ſeeming by the deſcription to be the ſame with what we call the Muſcovy Duck.

Lybian DUCK, *anas Lybica*, a name given by Aldrovand, Bellonius, and ſome other authors to a ſpecies of Duck, brought from that part of the world, but which appears to be the ſame with what we commonly know by the name of the Muſcovy Duck. *Ray's Ornithology.*

Muſcovy DUCK, *anas Moſcata*, the name of a ſpecies of Duck, the largeſt of all the Duck kind. The general colour, both in the male and female, is a purpliſh black, though the female is ſometimes quite white. It has red fleſhy protuberances about its beak and eyes, and its voice is hoarſe, very ſoft, and ſcarce to be heard, unleſs when it is angry. The eggs of this bird are of a remarkably round figure. *Ray's Ornitholog.*

The fly-catching DUCK, *anas muſcaria*, a name given by ſeveral authors to a ſpecies of Duck, from its catching flies that play on the ſurface of the water. It is deſcribed as a diſtinct ſpecies, but Mr. Ray ſuppoſes it the ſame with our wild Duck.

DUCTILITY (*Dict.*)—DUCTILITY *of glaſs*.

We all know, that, when well penetrated with the heat of the fire, the workmen can figure and manage glaſs like ſoft wax: but, what is moſt remarkable, it may be drawn, or ſpun out into threads exceedingly fine, and long.

Our ordinary ſpinners do not form their threads of ſilk, flax, or the like, with half the eaſe and expedition, as the glaſs-ſpinners do the threads of this brittle matter. We have of them uſed in plumes for children's heads, and divers other works, much finer than any hair; and which bend and wave, like it, with every wind.

Nothing is more ſimple and eaſy than the method of making them: there are two workmen employed: the firſt holds one end of a piece of glaſs over the flame of a lamp; and, when the heat has ſoftened it, a ſecond operator applies a glaſs-hook to the metal thus in fuſion; and, withdrawing the hook again, it brings with it a thread of glaſs, which ſtill adheres to the maſs. Then, fitting his hook on the circumference of a wheel about two feet and a half in diameter, he turns the wheel as faſt as he pleaſes; which, drawing out the threads, winds it on its rim; till, after a certain number of revolutions, it is covered with a ſkain of glaſs thread.

The maſs, in fuſion over the lamp, diminiſhes inſenſibly, being wound out, as it were, like a pelotoon, or clue upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent with thoſe next to them, and this by degrees: the parts neareſt the fire are always the leaſt coherent, and of conſequence muſt give way to the effort the reſt make to draw them towards the wheel.

The circumference of theſe threads is uſually a flat oval, being three or four times as broad as thick. Some of them ſcarce ſeem bigger than the thread of a ſilk-worm, and are flexible to a miracle. If the two ends of ſuch threads be knotted together, they may be drawn and bent, till the aperture, or ſpace in the middle of the knot, do not exceed one 4th of a line, or one 48th of an inch in diameter.

DUCTILITY *of ſpiders webs.* — The ingenious M. Reaumur obſerves, that the matter whereof ſpiders and ſilk-worms form their threads, is brittle when in the maſs, like dry gums. As it is drawn out of their bodies, it aſſumes a conſiſtence, much as glaſs-threads become hard, as they recede from the lamp, though from a different cauſe. The Ductility of this matter, and the apparatus thereto, being much more extraordinary in ſpiders, than in ſilk-worms; we ſhall here only conſider the former. Something has already been ſaid of each under the article SILK in the Dictionary, which ſee.

Near the anus of the ſpider are ſix papillæ, or teats. The extremities of the ſeveral papillæ are furniſhed with holes, that do the buſineſs of wire-drawers, in forming the threads. Of theſe holes, M. Reaumur obſerves, there are enough in the compaſs of the ſmalleſt pin's-head, to yield a prodigious quantity of diſtinct threads. The holes are perceived by their effects: take a large garden-ſpider ready to lay its eggs, and applying the finger on a part of its papillæ, as you withdraw that finger, it will take with it an amazing quantity of different threads.

Hence M. Reaumur advances, that, as the flexibility of glaſs increaſes in proportion to the fineneſs of the threads, had we but the art of drawing threads as fine as thoſe of a ſpider's web, we might weave ſtuffs, and clothes hereof, for wear.— Accordingly he made ſome experiments this way: he could make threads fine enough, as fine, in his judgment, as any ſpider's web, but could never make them long enough, to do any thing with them.

M. Reaumur has often told 70, or 80, with a microſcope, but has perceived, that there were infinitely more than he could tell. In effect, if he ſhould ſay, that each tip of a papilla furniſhed a thouſand, he is perſuaded, he ſhould ſay vaſtly too little. The part is divided into an infinity of little prominences, like the eyes of a butter-fly, &c. each prominence, no doubt, makes its ſeveral thread; or rather, between the ſeveral protuberances, are holes that give vent to threads; the uſe of the protuberances, in all probability, being to keep the threads, at their firſt exit, before yet hardened by the air, aſunder. In ſome ſpiders thoſe protuberances are not ſo ſenſible; but in lieu thereof there are tufts of hair, which may ſerve the ſame office, viz. to keep the threads apart. Be this as it will, there may threads come out at above a thouſand different places in every papilla; conſequently, the ſpider, having ſix papillæ, has holes for above ſix thouſand threads. It is not enough that theſe apertures are immenſely ſmall: but the threads are already formed before they arrive at the papilla, each of them having its little ſheath, or duct, in which it is brought to the papilla from a good diſtance.

M. Reaumur traces them up to their ſource, and ſhews the mechaniſm by which they are made. Near the origin of the belly, he finds two little ſoft bodies, which are the firſt ſource of the ſilk. Their form and tranſparency reſemble thoſe of glaſs-beads, by which name we ſhall hereafter denote them. The tip of each bead goes winding, and makes an infinity of turns, and returns towards the papilla. From the baſe, or root of the bead, proceeds another branch much thicker; which, winding variouſly, forms ſeveral knots, and takes its courſe, like the other, towards the hind-part of the ſpider. In theſe beads, and their branches, is contained a matter proper to form the ſilk, only that it is too ſoft. The body of the bead is a kind of reſervoir, and the two branches two canals proceeding from it. A little further backward, there are two leſſer beads, which only ſend forth one branch a-piece, and that from the tip. Beſide theſe, there are three other larger veſſels on each ſide the ſpider, which M. Reaumur takes for the laſt reſervoirs, where the liquor is collected. The biggeſt is near the head of the inſect, and the leaſt near the anus. They all terminate in a point; and from the three points of theſe three reſervoirs it is, that the threads, at leaſt the greateſt part of the threads drawn out at the three papillæ, proceed. Each reſervoir ſupplies one papilla. Laſtly, at the roots of the papilla, are diſcerned ſeveral fleſhy tubes: probably, as many as there are papillæ. Upon lifting up the membrane, or pellicle, that ſeems to cover theſe tubes, they appear full of threads, all diſtinct from each other, and which of conſequence, under a common cover, have each their particular one; being kept like knives in ſheaths. The immenſe quantity of threads contained here, M. Reaumur concludes, upon tracing their courſe, does not all come from the points of the reſervoirs; but ſome from all the turns and angles; nay, probably, from every part thereof. But by what conveyances the liquor comes into the beads, and out of the beads into the reſervoirs, remains yet to be diſcovered.

We have already obſerved, that the tip of each papilla may give paſſage to above a thouſand threads; yet the diameter of that papilla does not exceed a ſmall pin's-head: but we were there only conſidering the largeſt ſpiders.

If we examine the young, riſing ſpiders, produced by thoſe; we ſhall find, that they no ſooner quit their egg, than they begin to ſpin. Indeed their threads can ſcarce be perceived; but their webs, formed thereof, may: they are frequently as thick, and cloſe, as thoſe of houſe-ſpiders; and no wonder: there being often four or five hundred little ſpiders concurring to the ſame work. How minute muſt their holes be? The imagination can ſcarce conceive that of their papilla! the whole ſpider is, perhaps, leſs than a papilla of the parent which produced it.

This is eaſily ſeen: each big ſpider lays four or five hundred eggs; theſe eggs are all wrapped up in a bag; and, as ſoon as the young ones have broke through the bag, they begin to ſpin. How fine muſt their threads be?

Yet is not this the utmoſt nature does: there are ſome kinds of ſpiders ſo ſmall at their birth, that they are not viſible without a microſcope. There are uſually found an infinity of them in a cluſter, and they only appear like a number of red points. And yet there are webs found under them, though well nigh imperceptible. What muſt be the tenuity of one of theſe threads? The ſmalleſt hair muſt be to one of theſe what the moſt maſſive bar is to the fineſt gold-wire drawn by art.

The matter whereof the threads are formed, we have obſerved, is a viſcid juice. The beads are the firſt receptacles where it is gathered, and the place where it has the leaſt conſiſtence. It is much harder when got into the ſix great reſervoirs, whither it is carried by canals from the former: this conſiſtence it acquires in good meaſure in its paſſage; part of the humidity being diſſipated in the way, or ſecreted by parts deſtined for that purpoſe.

Laſtly, the liquor is dried ſtill further, and becomes thread, in its progreſs through the reſpective canals to the papillæ. When theſe firſt appear out at the holes, they are ſtill glutinous; ſo that ſuch as ſpring out of the neighbouring holes, ſtick together. The air compleats the drying.

By boiling the ſpider, more, or leſs, the liquor is brought to a greater or leſs conſiſtence, fit to draw out into threads; for it is too fluid for that purpoſe, while yet incloſed in its reſervoirs.

The matter contained in theſe reſervoirs, when well dried, appears a tranſparent gum or glue, which breaks, when much bent: like glaſs, it only becomes flexible by being divided into

into the fineſt threads. And probably it was on this account nature made the number of holes ſo immenſe. The matter of ſilk formed in the bodies of ſpiders, being much brittler than that formed in ſilk-worms, needed to be wound ſmaller. Otherwiſe we do not conceive, why ſhe ſhould form a great number of threads, which were afterwards to be reunited: a ſingle canal might have done.

DUCTUS *Alimentarius*, in anatomy, a name given by Dr. Tyſon to the gula, ſtomach, and inteſtines; all which make but one continued canal or duct. This duct he makes the proper characteriſtic of an animal.

DUNG, in agriculture, &c. All kinds of Dung contain ſome matter, which, when mixed with the ſoil, ferments therein, and, by that fermentation, diſſolves the texture of the earth, and divides and crumbles its particles very much. This is the real uſe of Dung in agriculture, for, as to the pure earthy part of it, the quantity is ſo very ſmall, that it bears an extremely inconſiderable proportion to that of the earth it is intended to manure.

The fermenting quality of Dung is chiefly owing to the ſalts it contains, and yet thoſe or any other ſalts, applied immediately to the roots of plants, always deſtroy them. This proves that the buſineſs of the Dung is not to nouriſh but to divide and ſeparate that terreſtrial matter, which is to afford the nouriſhment to vegetables, through the mouths of their roots. And the acrimony of the ſalts of Dung is ſo great, that the niceſt managers of vegetables we have, (the floriſts) have wholly baniſhed the uſe of it from their gardens. The uſe of Dung ſhould be alſo forbid in kitchen gardens, for it is poſſible to ſucceed full as well without it; and it gives an ill taſte to all the excellent roots and plants, that are to ſtand in the earth in which it is an ingredient. The water of a cabbage raiſed in a garden, manured with Dung, if boiled, is of an intolerable ſtink; but this is not ſo much owing to the nature of the plant, as of the manure uſed to it; for, a field cabbage being boiled, the water has ſcarce any ſmell, and what it has, is not diſagreeable.

It is alſo a well known fact in the country, that a carrot, raiſed in a garden, has nothing of that ſweet flavour, which ſuch as grow in the fields have, but, in the place of this natural reliſh, the garden one has a compound taſte, in which the matter of the manure has no ſmall ſhare. And there is the ſame ſort of difference in the taſte of all roots, nouriſhed with ſuch different diet. Dung not only ſpoils the flavour of the eſculent vegetable, but it ſpoils the drinkables into the original compoſition of which it enters: they are obliged to uſe Dung to the poor vineyards of Languedoc, and the conſequence is, that the wine is nauſeous. The poor who only raiſe a few vines for the wine they drink themſelves, and cannot be at the expence of this manure, have the leſs of it, but then it is better by many degrees than the other; and it is a general obſervation which the French expreſs in theſe words, that the poor people's wine in Languedoc is the beſt, becauſe they carry no Dung into their vineyards. *Tull's horſehoeing Huſbandry.*

Another diſadvantage attending the uſe of Dung is, that it gives riſe to worms. It is for this reaſon, that garden carrots are generally worm-eaten, and field carrots ſound; and the ſame obſervation will hold good in other vegetables, in the field and in the garden. Vegetable and animal Dung are in fact only the putrefaction of earth, after it has been altered by paſſing through vegetable or animal veſſels. Vegetable Dung, unleſs the vegetable be buried alive in the ſoil, makes a much leſs ferment in it, than animal Dung does: but the Dung or putrid matter of vegetables is much more eligible and wholeſome for the eſculent roots and plants, than that of animals is. Venomous animals are found to be very fond of Dung, and are brought into gardens by the ſmell of the Dung uſed in them as manure. The ſnakes uſually frequent Dung-hills, and lay their eggs in them; and gardens, where Dung is much uſed, are always frequented by toads; whereas the fields where roots are planted, are much leſs infeſted by them.

However unneceſſary and prejudicial Dung is in gardens, it is however very neceſſary in the corn-fields, and little can be done without it in the old method of huſbandry. Dung is not ſo injurious in fields as in gardens; becauſe it is uſed in much ſmaller quantities in proportion to the quantity of ſoil, and cabbages, turnips, potatoes, and other things growing in fields, and intended only for the food of cattle, will not be injured by Dung, tillage, and hoeing all together; for the crops will by this means be the greater, and the cattle will like the food never the worſe. Dung is very beneficial in giving large crops of wheat; and it is found by experience, that the country farmers, at a diſtance from a large town, can never have ſo good crops by all their tillage, as thoſe who live in the neighbourhood of cities, where Dung is produced in great plenty, and eaſily had. The Dung uſed in fields, beſides its diſſolving and dividing virtue, is of great uſe in the warmth its fermenting gives to the young plants of the corn in their weakeſt ſtate, and in the moſt ſevere ſeaſons; the laſting of this ferment is not eaſily determined, becauſe the degrees of heat are very difficult to be judged of, when they become ſmall.

The farmers uſually underſtand, by the term Dung, not only the excrements of animals, with the litter, but every thing that will ferment with the earth, ſuch as the green ſtalks and leaves of plants buried under ground and the like, and every thing they add to it except fire.

The uſes of the Dungs of ſeveral animals are ſufficiently proved every day. They are uſed to repair the decays of exhauſted and worn out land, and to cure the ſeveral defects in different naturally bad ſoils; the faults of which are as different, as the nature of the different Dungs uſed to improve them. Some land is too cold, moiſt, and, heavy, and the other too light and dry: and, to improve and meliorate theſe, we have ſome Dung hot and light, as ſheep's, horſes, pigeons, &c. and other fat and cooling, as that of oxen, dogs, &c.

There are two remarkable qualities in Dung; the one is to produce a certain ſenſible heat capable of bringing about great effects. The other is to fatten the ſoil, and render it the more fertile. The firſt of theſe is ſeldom found in any other Dung, but that of horſes and mules, while newly made and a little moiſt. The great effects of this are ſeen in the kitchen garden, where it invigorates and gives a new life to every thing, ſupplying the place of the ſun; and to this we owe, in a manner, all the vegetable delicacies of the ſpring.

Beſide this, horſe-Dung is the richeſt of all improvements that can be had in any quantity for poor hungry lands; yet, when either too new, or when uſed alone, it is very prejudicial to ſome lands; and, if ſpread too thin on dry lands in ſummer, it becomes of very little ſervice, the ſun ſoon exhaling all its richneſs, and leaving it little more than a heap of ſtubble or dry thatch. And, though too much of it can hardly be uſed in the kitchen garden among colliflowers, cabbages, and the like, yet it is eaſy to over-dung land intended for corn, and gives riſe by that means to a very fatal quantity of weeds.

Horſe-Dung is always beſt for cold lands, and cow-Dung for hot ones; but, being mixed together, they make a very good manure for moſt ſorts of ſoils, and for ſome they are very properly mixed with mud.

Sheep's-Dung and Deer's-Dung differ very little in their quality, and are eſteemed by ſome the beſt of all Dung for cold clays; for this purpoſe ſome recommend the beating them to powder and ſpreading them thin over the autumn or ſpring crops, at about four or five loads to an acre, after the ſame manner as aſhes, malt duſt, &c. are ſtrewed. And, in Flanders and ſome other places, they houſe their ſheep at nights in places ſpread with clean ſand, laid about five or ſix inches thick, which, being laid on freſh every night, is cleaned out once a week, and, with the Dung and urine of the ſheep, is a very rich manure, and ſells at a very conſiderable price. It is principally uſed for ſtubborn lands; but Mr. Quintiney is of opinion, that it is the beſt of all manure for lands in general.

Hog's-Dung is by many recommended as the fatteſt and richeſt of all Dung, and is found, on experience, to be better than any other kind, for fruit-trees, apples, pears, and the like; it is alſo a very rich Dung for graſs, and is ſaid to do as much good in one load, as any other Dung whatever in two.

The Dungs of pigeons, hens, and geeſe are great improvers of meadow and corn land. That of pigeons is unqueſtionably the richeſt that can be laid on corn land; but, before it is uſed, it ought to be expoſed for ſome time out of the dove-houſe to the open air, to take off its fiery heat. It is in general very proper for cold clay lands, but then it always ſhould be well dried before it is laid on, becauſe it is apt to clod in the wet. It is beſt alſo to mix it with ſome dry earth to break its parts, that it may be ſpread the more regularly; and it is in itſelf ſo very rich and hot, as to bear ſuch an admixture, without greatly impoveriſhing it. This Dung is alſo by ſome recommended as better than any other for aſparagus and ſtrawberries, and for the propagation and culture of the tender garden flowers. The Dung of pigeons is alſo particularly recommended by Mr. Gentil for thoſe trees, whoſe leaves are apt to turn yellow, if they grow in cold ſoils; but for this uſe it ſhould firſt lie three years in a dunghil, and then be applied ſparingly in autumn, laying about an inch thickneſs of it at the root of the tree, and ſuffering it to remain there till the March following.

The Dung of poultry, being hot and full of ſalts, tends much to facilitate vegetation, and is abundantly quicker in its operation than the Dung of animals, which feed on the leaves of plants. It is an obſervation of Sir Hugh Plat, that one load of grains will enrich ground, more than ten loads of common Dung; and it is eaſy to infer from hence, that the ſame grain muſt needs be of greatly more virtue, when it has paſſed through an animal body. Human Dung is alſo a great improver of all cold and ſour lands, but ſucceeds beſt, when mixt with other Dungs or earths to give it a fermentation.

But, for all ſtubborn clayey ſoils, there is no manure ſo good as the cleanſing of London ſtreets; the parts of tough land will be more expeditiouſly ſeparated by this, than by any other compoſt, and, where it is to be had, it is of the greateſt value both for field and garden land. *Miller's Gard. Dict.*

Gooſe DUNG. This is a very valuable manure, and as uſeful to the farmer as pigeon's Dung, or that of any other fowl. The antients thought otherwiſe, and condemned it as prejudicial both to corn and graſs, and many are of the ſame opinion ſtill, but without any foundation in fact. Indeed

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where corn is high, and when grafs is ready to mow, thefe birds, if they got among it, will do great damage by treading it down with their feet; but their Dung, inftead of being hurtful to the land, does it a great fervice. Near Sutton in Nottinghamfhire, there is a barren piece of land given by the town, for a goofe pafture; the geefe have been kept in it many years, and their Dung has fo enriched it, that it is one of the fruitfulleft pieces of ground, in the whole country. There has been an opinion alfo, that cattle feeding on grafs, where thefe creatures had much dunged the ground, would fuffer by it; but it appears from trial, that cattle are moft fond of all of thofe parts of paftures, where the geefe have dunged moft; and that they fuffer no alteration by it, except the growing fat upon it. The Dung of fowls in general is very enriching to land. Fig-trees, afparagus beds, and ftrawberries, and many curious flowers fucceed better in earth manured with pigeon's Dung, than in any other; and Fowley ifland in Lancafhire, a place fo called from the abundance of wild fowl continually found on it, is fo enriched with their Dung, that it fattens fheep in a furprizing manner. *Mortimer's Hufbandry.*

DU'RION, in natural hiftory, the name of a fruit common in China and the Eaft-Indies, and efteemed by the Indians the fineft of all fruits; but the Europeans do not allow this, becaufe of its difagreeable fmell. The tree which bears it is large and much branched, and its wood is like that of the hazel. The leaves are of a very fingular figure, being about fix inches long, and fixteen or eighteen inches broad: they terminate in a long and flender point. The upper fide of the leaves is of a dufky green, the under fide is whitifh with fome yellow fpecks. The leaves grow on fhort pedicles, which are joined to the ftalks by a protuberance or oblong knot. The fruit grows to the large branches, adhering to their middles by a ftrong woody ftalk. It is of the fize of an ordinary melon, and of a conic fhape, pointed at the extremity, and is all over befet with prickles refembling thofe of a hedge-hog: they are green, and very large and thick. When thoroughly ripe, the fruit opens at the extremity into five parts, and, the cracks or openings running by degrees to the top, the inner fubftance or pulp is difcovered. This is of a whitifh colour, and of a very agreeable flavour, which may not unaptly be compared to that of cream and fugar; but it is of a more firm confiftence. This fruit contains in every compartment five large feeds perfectly refembling the common chefnut, but that they have no other covering than their own fkins.

The courfe of vegetation is elegantly feen in diffecting the pedicle which fupports this fruit; for in this are feen the three different juices which ferve to the nourifhment of three different parts of the fruit. In cutting this pedicle tranfverfly, we firft find, between the bark and the woody fibres, a yellowifh, thick, and glutinous juice: this ferves for the nutriment of the thorns. A fecond juice difcovers itfelf between the firft woody fibres, which is white and more folid, and lefs glutinous. This gives nourifhment to a thick fkin of a filver white, which lines the pulpy part of the fruit. And, finally, in the center of the pedicle there runs a third, much whiter and fofter than the former, which ferves to the nourifhment of the pulp, or foft and fweet-tafted part of the fruit.

The fruit itfelf, were its fmell as agreeable as its tafte, would vie with any fruit in the world; but its very difagreeable fcent requires time and cuftom to enable any one to bear it; but ufe makes the natives wholly difregard it. The fmell is very like that of onions, that have lain in heaps till they are very rotten. The fruit is not only agreeable to the tafte, but of a very cordial virtue; but it will intoxicate and get into the head, if eaten in a large quantity, efpecially fuch of the fruits as are of a yellowifh colour. The natives make debauches with it, as our poorer people do with fpirituous liquors. But it is not fo eafily come at as thofe, and therefore is very fatal to many families among them, who will fell their liberties for a time to purchafe enough of it for a debauch.

The Durion tree flowers in January. The flowers are of a dufky colour, and of the fize of a nut. As foon as thefe fall, the fruit begins to appear. It afterwards increafes flowly in fize till the month of June, in which it begins to ripen. Others continually fucceed thefe early ones during the whole fummer, fo that there is a fucceffion of them during that feafon, and they do not begin to grow fcarce till about the middle of October. *Mem. Acad. Scienc. Par.* 1699.

DU'TY (*Dict.*)—Duties, in regard to trade, are thofe impofts or taxes, which are laid on merchandizes at importation or exportation, which are commonly called the Duties of cuftoms; the taxes of excife, alfo, are frequently diftinguifhed by the Duties of excife.

The principles on which all Duties and cuftoms fhould be laid on foreign merchandizes, which are imported into thefe kingdoms, are fuch as tend to cement a mutual friendfhip and traffick between one nation and another; and, therefore, due care fhould be taken in the laying of them, that they may anfwer fo good an end, and be reciprocal in both countries: they fhould be fo laid as to make the exports of this nation, at leaft, equal to our imports from thofe nations wherewith we trade; fo that a balance in money fhould not be iffued out of Great Britain to pay for the goods and merchandizes of other countries; in order that no greater numbers of our land-holders and manufacturers fhould be deprived of their revenues arifing from the product of the lands, and the labour of the people, by foreign importations, than by exportations to fuch countries.

Thefe are the national principles, upon which all our treaties of commerce with other countries are to be grounded: and, as all ftates and empires are daily making their utmoft efforts for the advancement of commerce, and to prevent the importation of our manufactures into their kingdoms: as fuch-like meafures are the moft effectual reftraints and prohibitions upon our commerce, there feems no other way to redrefs the grievance, than by retaliating upon them, and fupplying ourfelves, at leaft, with their commodities in a degree of proportion diminifhed equal to what they have leffened in ours. For, if this policy is neglected, and traders are left to act at random, according to their own will, nothing is more certain than that they are taking fteps gradually to ruin the nation, notwithftanding the Duties of cuftoms fhould be daily increafed by thefe augmented impofts. So that the additional increafe of the cuftom-houfe revenue is not the criterion of an increafe of national commerce and treafure, but the infallible touch-ftone of the reverfe.

But one fundamental branch of the fupport of the royal revenue depending on the good plight and augmentation of the Duties arifing on cuftoms, it is no wonder that, ever fince thofe Duties have exifted, every meafure has been taken to improve and increafe them. But let every judicious man confider upon what principle of policy can this part of the public revenue poffibly be increafed. Does not this increafe of revenue arife from the increafe of foreign imports? And, as the importation and confumption of thefe imports diminifh, will not the cuftom-houfe revenue decline?

Now, fince the increafe of the confumption of foreign productions and manufactures, among us, has an inevitable tendency to impoverifh our own nation, and enrich others, the greater care that is taken to increafe and improve the cuftom-houfe branch of the revenue, can it have any other effect than to haften the ruin, rather than promote the opulence of the kingdom? Unlefs our exports in value keep pace with our imports. As our exports, however, do not, according to the conftitution of the public revenue, afford an increafe of the Duties of cuftoms any way proportionate to our imports, men in power have not thofe inducements to roufe and ftimulate them fo much in regard to the one, as they have in regard to the other.

Wherefore, fince an increafe of the public revenue, nay, the increafe of the king's own royal revenue of the civil lift, depends, in a great meafure, upon the increafe of our foreign imports, rather than our native exports; does it not appear, that the very fundamental conftitution of the revenue, both generally public, and perfonally royal, depends on our purchafing more of foreign commodities than in felling of our own; or, to fpeak in the modern phrafe, now familiarly ufed in France, Spain, and Italy, more on a paffive than on an active kind of commerce; that is, in buying more foreign commodities than we fell of our own native ones?

In regard, likewife, to our Duties of excife, let it be candidly confidered, how far they may affect the general commerce, and wealth, and power of the nation. Are they not laid even upon thofe neceffaries of life which affect the labour of the hufbandman and the farmer; and, confequently, the country gentleman, as well as the artfman, mechanics, and manufacturers of every clafs, throughout the whole kingdom? The public, as well as the perfonal royal revenue of our fovereign himfelf, doth alfo greatly depend on the keeping up, if not increafing, the product of the excife funds; and the very being and exiftence of thefe funds depend upon clogging and incumbering our native productions and manufactures: as this is the cafe, no one will prefume to fay that the conftitution of this, any more than the cuftom-houfe branch of the revenue, is fo laid, as neceffarily to advance that commerce and navigation, which alone can uphold and fupport the ftate. It is true there are drawbacks allowed of the excife Duties upon the exportation of fome commodities to foreign countries; fuch as on beer, ale, &c. yet the Duties on foap and candles, and other neceffaries of life, that are confumed in our mechanic and manufactural arts, are not drawn back, but render the workmanfhip of thofe artifts dearer, in proportion to the weight of thefe taxes; which muft unavoidably prove detrimental to our traffic, as it occafions other nations to under fell us.

As our intent is only to fet things in that fingle point of view which relates to trade, I fhall confider excifes in no other light than as taxes on commodities, but attempt to fhew the augmentative faculty of all fuch taxes, and the great prejudices they do to trade; for whatever raifes the neceffaries of life, raifes labour, and, of courfe, the price of every thing that is produced by labour. How our excifes do really encumber our traffic will eafily appear, they trebbling themfelves almoft to the people for what they raife to the government; and it is to be greatly feared it would appear much more, if we could go to the bottom of the incumbrance; for it is to be confidered that tradefmen in a country, by their

PLATE XIX. *Engraved for the Supplement.* *Facing* Dye-house

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their mutual dependence on each other, are like wheels in a machine, in which, if one is touched, the others are affected.

Amidst so many trading movers, to what degree the oppression is increased, is not easy to say; nor can we be startled at the largeness of such computations; for, circulated chiefly among ourselves, and going out by dribblets, we hardly perceive them, but yet are surprized to find wages and necessaries grow dearer and dearer, because few use themselves to consider the immensity of such collected advances in such sums; if, however, we compare the difference of the prices of necessaries between England and France, we shall find that difference obviously accounting for the prodigious amount of the consequences of our taxes; nor can it be a trifle that makes such a fruitful country, as England is, so dear, and its trade declining: for our working people, being forced to purchase the necessaries of life dear, must work dear to live, until their willing working hands are tied up by foreigners, who live less taxed, and, of course, work cheaper; so that they must, and do, undersell us at all markets for manufactured goods, where they come in competition with us, and, in time, must and will stop all such exports.

And we may appeal to the judgment of every honest man conversant in trade, whether he does not experience our trade to decline year after year, more especially our woollen trade, which has been estimated to be as necessary to us as bread is to the life of man; for our dearer goods must lie unsold, or be sold with loss, which must stop, or break our merchants; they, our clothiers, and weavers, &c. they, their journeymen who must either starve, turn beggars, thieves, or fly to our enemies, and help them to ruin us the faster; which has certainly happened too much of late years.

DWARF-*Trees* (*Dict.*)—These were formerly in much greater request than they are at present; for, though they may have many advantages to recommend them, yet, the disadvantages attending them greatly over-balance; and, since the introducing of espaliers into the English gardens, Dwarf-trees have been destroyed in most good gardens, for the following reasons.

1. The figure of a Dwarf-tree is very often so much studied, that in order to render the shape beautiful, little care is taken to procure fruit, which is the principal design in planting these trees.

2. The branches, being spread horizontally near the surface of the ground, render it very difficult to dig, or clean the ground, between them.

3. Their taking up too much room in a garden, especially when they are grown to a considerable size; for nothing can be sown or planted between them.

4. These trees, spreading their branches near the ground, continually shade the surface of the earth, so that neither the sun nor air can pass freely round their roots and stems, to dissipate noxious vapours; whereby the circumambient air will be continually replete with crude rancid vapours, which, being drawn in by the fruit and leaves, will render its juices crude and unwholesome, as well as ill-tasted.

These evils being intirely remedied by training the trees to an espalier, hath justly gained them the preference; however, if any one has a mind to have Dwarf-trees, notwithstanding what has been said, I shall lay down a few rules for their management.

If you design to have Dwarf pear-trees, you should bud or graft them on quince-stocks; but as many sorts of pears will not take, if they are immediately budded, or grafted on quince-stocks, some of those sorts which will take freely, should be first budded on the quince-stocks; and, when these have shot, the sorts you intend to cultivate, should be budded into these: for free stocks are apt to make them shoot so vigorously, as not to be kept within bounds. These grafts or buds should be put in about four or six inches above the surface of the ground, that the heads of the trees may not be advanced too high; and, when the bud or graft has shot out four eyes, you should stop the shoot, to force out lateral branches.

Two years after budding, these trees will be fit to transplant where they are to remain; for, though many people chuse to plant trees of a greater age, yet they seldom succeed so well as young ones. The distance these trees should be planted is twenty-five feet square; for less will not do, if the trees thrive well. The ground between them may be cultivated for kitchen-garden herbs, while the trees are young; but you should not sow or plant too near their roots.

In order to train your trees regularly, you should drive stakes into the ground round the tree, to which the branches should be nailed down with list in an horizontal position; for, if they are suffered to take a perpendicular figure, while young, they cannot be afterwards reduced, without great violence, to any tolerable figure. The necessary directions to be afterwards followed are, not to suffer any branches to cross each other; and always in shortening any shoots be sure to leave the uppermost eye outwards, whereby the hollowness in the middle of the tree will be better preserved; and be careful to rub off all perpendicular shoots in the middle of the trees, as soon as they are produced. The other necessary rules you will find under the article of PRUNING.

The sorts of pears which do best in Dwarfs, are all summer and autumn fruits: for winter pears are not worth planting in Dwarfs, they seldom bearing well, nor are ever well tasted, and commonly are very stony; because they are commonly grafted on quince-stocks.

Apples are also planted in Dwarfs, most of which are new budded or grafted on paradise-stocks; but, as these are for the most part of a short duration, they are not profitable, and are fit only for small gardens, as a matter of curiosity; producing fruit sooner, and in greater plenty, than when they are upon crab or apple-stocks.

The distance these trees should be planted, if on paradise-stocks, should be six or eight feet: but, if on crab-stocks, sixteen or twenty feet asunder each way. The management of this being the same with pears, I need not repeat it.

Some persons also plant apricots and plums for Dwarfs; but these seldom succeed well, as being of a tender constitution; and those which will produce fruit on Dwarfs, are much more likely to do so, when trained on an espalier, where they can be much better managed; and, therefore, I judge it much the better method, as being more certain, and the trees will make a better figure.

DYE-HOUSE, a place where cloth, linen, &c. are dyed.

Explanation of *Plate XIX*, representing part of the inside of a Dye-house.

1. A copper containing the dye, which is kept boiling during the operation.

2. A winch by which the cloth, or linen, is turned in the copper; for the linen, one part of which is placed on the winch, is, by turning it round, made to come out and fall again into the dye in the copper without any fold in it, which would have been the consequence, had the whole piece been put at once into the copper: but by this contrivance every part of the stuff is equally exposed to the action of the dye.

3. The linen on the winch.

4. A man turning the winch, which causes every part of the linen to be equally affected with the action of the dye. The man keeps turning the winch all the time the linen is continued in the dye, but not constantly the same way; for, when he comes to the end of the piece, he turns the winch the other way, by which means the linen is again moved in the dye.

5. A pipe to supply the coppers with water.

6, 6. Cocks to the pipe.

7. Another copper covered with its lid, 8.

9. Lid of another copper, which could not be expressed in the view, it being behind that marked 7.

10. A winch for washing the linen, after it is dyed, in cold water.

11. The linen on the winch.

12. A tub containing cold water, in which the linen is washed.

13. A man turning the winch, in order to wash the linen in the water.

14. A pipe for supplying the tub with water.

15. A man wringing the linen after it has been washed; after which it is hung up to dry, and then calendared.

16. The linen on a pin, or hook.

17. A tub that receives the water, which is wrung out of the linen.

18, 18. Two pails.

19. A common chimney to all the coppers.

20, 20. Tubs which contain the dye.

21. A back for washing the linen. Its use is the same with that of the tub before described; but, being generally much larger, several men can work at it, at one time; whereas only one can work at a tub.

DYING (*Dict.*)— The art of Dying is of great antiquity, as appears from the traces of it in the oldest sacred as well as prophane writers. The honour of the invention is attributed to the Tyrians, though, what lessens the merit of it is, that it is said to have owed its rise to chance. The juices of certain fruits, leaves, &c. accidentally crushed, are supposed to have furnished the first hint; and that coloured earths, and minerals washed and soaked with rain, gave the next Dying materials. But purple, an animal juice, found in a shell-fish, called murex, seems to have been prior to them all. The discovery of its tinging quality is said to have been taken from a dog, which, having caught one of the purple fishes among the rocks, and eaten it up, stained his mouth and beard with the beautiful liquor, which struck so strongly the fancy of a Tyrian nymph, that she refused her lover Hercules any favours, till he had procured her a mantle of the same colour.

Till the time of Alexander we find no other sort of dye in use but purple and scarlet.— It was under the successors of that monarch, that the Greeks applied themselves to the other colours; and invented, or at least perfected, blue, yellow, green, &c.—For the ancient purple, it has been long lost, but the perfection to which the moderns have carried the

 other

other colours abundantly indemnifies them of the loss. In this the French, under the auspices of that excellent minister M. Colbert, seem to have outstripped most of their neighbours.

Among the Romans, dye-houses, baphia, were all under the direction of the comes sacrarum largitionum; though they had each their peculiar præpositus, as at Alexandria, Tyre, &c.— The dyers of London make the 13th company of the city, incorporated under Henry VI. consisting of a master, warden, and livery.— At Paris, and in most of the great cities in France, the dyers are divided into three companies; viz. those of the great dye, du grand & bon teint, who are only to use the best ingredients, and such as strike the surest and most lasting colours.— Dyers of the lesser dye, du petit teint, who are allowed to use the inferior sorts of drugs, which only yield false and fading colours.— And silk, wool, and thread dyers.— All the higher-prized cloths and stuffs are reserved to the dyers of the first sort: those of less value, particularly such as are not rated at above 40 sols the ell in white, are committed to the masters of the petit teint. Blue, red, and yellow, are reserved more peculiarly to those of the grand teint; browns, fallows, and blacks are common to both sorts. As to black, it is begun by the dyers of the grand teint, and finished by those of the lesser.— It seems there is a tradition among dyers, that Jesus Christ was of their profession; which we also find delivered in the gospel of the infancy of Jesus, though on what grounded we know not. But it is hence, the Persian dyers, notwithstanding all their Mahometanism, have chosen Jesus for the patron of their art; insomuch that, among them, a dye-house is called Christ's shop.

DYING *ingredients*, or the materia tinctoria, are best reduced under two heads:—colorata, or those which properly give the colour.— And non-colorata, used to prepare the stuffs for better taking the dye, and to heighten the lustre of the colours.

The colouring ingredients are of three sorts, blue, yellow, and red.— To the first sort belong indigo, woad, weld, wood-wax, and log-wood; to the second, fustic; to the third, madder, brazil, cochineal, kermes, safflower, and sanders.— To which may be added annotto, and young fustic, for orange-colours: lastly, wood soot.

The art of Dying is indebted, for many of its valuable colours, to the vegetable kingdom; and may be much more so, if the world will be at the pains of enquiring into the properties of the plants that grow about the fields. Mr. Jussieu observed, in the drying plants between sheets of paper, in order to the making a hortus siccus in the common way, that some plants tinged the papers with colours the same with those they naturally possess, and others with different ones; and that many plants in drying assumed a colour which was not natural to them. Alkanet, woad, the several sorts of gallium, and some of the species anonis, tinge the papers between which they are dried to a yellowish or reddish colour, because their stalks, or some other parts of them, are of that colour. The common ros solis, or sun-dew, whose leaves are red, tinges the paper red also; and the ros solis of Portugal diffuses this tinge through three or four sheets of paper. The Alpine veronica, though green in itself, leaves its mark in red upon the paper; and many of the common leguminous plants always become black in the drying. The common mercury, which is green, while growing, becomes blue in the drying; and turnsole has the same change, though it is white in its natural state.

One great reason of these changes of colour is, that all paper is impregnated with alum; and this salt may very easily extract, or even alter the colours of plants, whose juices it receives; and in such cases, where the alum is not in sufficient quantity to do this, it is no wonder that it should however so far affect the leaves as to turn them black.

On this principle, Mr. Jussieu attempted, by means of alum, to separate colours from several plants, not known or used at present among the dyers, which might prove serviceable to them. The first experiment made on this occasion proved, that there were many plants not used at present, which afford colours not at all inferior to those in common use. The experiments the same gentleman tried on the drugs used for Dying in the Indies, proved very plainly that they were no way superior in many cases to vegetables of our own growth; and that, in order to have the most lively colours from such substances, it is always necessary to have recourse to some salt.

Among the other drugs used abroad in Dying, there were sent over to France, on this occasion, certain yellow flowers of the radiated kind, which afforded on trial a very beautiful yellow dye; and Mr. Jussieu found, on trying parallel experiments, that there were also yellow flowers in Europe of a like radiated kind, which were capable of affording a like beautiful yellow dye.

The flower which Mr. Jussieu tried these experiments upon, was the common yellow corn marygold, the chrysanthemum segetum of Lobel. This plant flowers in the middle of July, and Mr. Jussieu, drying its flowers between papers at that time of the year, found that they did not lose their colour, as most others do in the operation, but became of a deeper yellow than before. Hence it was easy to judge, that this flower contained a matter proper for colouring; and, decoctions being made of it of different strength, cloths of different kinds dipped into them became tinged to a light pale yellow, and keep this colour after being boiled in fair water. A little alum was after this added to the decoctions, and cloths dipped in these became much more finely dyed, the colour being greatly stronger and more lively. They also imbibed the colour much more speedily from the decoctions; and, on boiling afterwards in water, they lost no part of it, but remained as strongly and as lively tinged as before. This experiment was afterwards tried by a dyer, under whose hands it succeeded much better than before with Jussieu, who was unacquainted with the regular methods of the trade. The decoctions of the flowers gave a sort of sulphur colour; but linen, woollen, and silken things, which had been the day before steeped in alum water, received from this decoction a very beautiful and sufficiently strong yellow. Another decoction of the flowers, made stronger than the first, tinged a woollen cloth to a greenish lemon-colour; and the same decoction gave a bright gold-yellow to silk: and a piece of woollen cloth, before dyed blue with indigo, on dipping it in this decoction, became of a beautiful deep-green. A small quantity of chimney soot added to the decoction made it tinge cloth of a yellowish-brown, and a small quantity of roucou added to the simple decoction produced an olive-yellow.

The mixture of several other drugs, used to be added to the decoctions of the common luteola or dyer's weed to vary its tinge, produced the same changes with the decoction of this flower, and abundantly testified its value and use in the Dying trade. *Mem. Acad. Par.* 1724.

There is therefore great reason to believe, that the art of Dying might be carried to much greater perfection than it is at present, if the attempts to improve it were in proper hands, and the persons employed in it could be enabled to set out with all the knowledge there is at present in regard to its several materials, and their manner of use, as a fund of real facts on which to ground future discoveries. This however seems too difficult to be brought about, for the people who exercise the art generally are acquainted only with a certain set of rules, which though they know not they follow, yet they will not depart from them, and esteem every thing loss of time that can be proposed to them as improvements. They keep their knowledge also a close secret from those who might be expected to improve upon it; and usually, one man trades only in some one part of it, without any knowledge of the rest. Hence the difficulties attending the acquiring a knowledge of the first principles of the art are very discouraging, but they are not unsurmountable. The idea which presents itself most naturally to us, as to the manner in which stuffs are dyed, is, that the colouring particles which swim in the liquor, immediately attach themselves to the surface of the body that is plunged into it, and there adhere in so firm a manner, that there is no removing many of them without wholly taking off the surface of the body. The barely plunging a white substance into a coloured liquor is not however sufficient for the Dying of it in many cases. Indeed, there are only a few colours which will strike with this ease and facility; and the others require that the matter to be dyed should have first received the particles of another fluid, which is in most cases a solution of alum and tartar in common water. And, according to the nature of the colour that is to be given the stuff afterwards, the alum is put in large quantities, or the stuff boiled in the liquor a longer or a shorter time. After boiling in this liquor, a stuff is in the proper condition to receive the greater part of the common colours; but, for blue, stuffs require no preparation at all; and, for scarlet, the liquor in which they are first boiled is made without alum.

The matter of the stuff to be dyed makes it necessary also to change the liquor in which it is boiled, or to vary the ingredients; and the greatest naturalists, without a mechanical knowledge of Dying, would be amazed to see, that if a skain of white wool, and another of white cotton, be plunged together into the scarlet dye, and this even after they have both received the same previous boiling and preparation, the skain of cotton would come out of the liquor as white as it was put in, while the wool comes out tinged of a beautiful fire-colour. The dyer however sees this every day without an admiration of the cause, and never troubling his thoughts about how it is done. He uses it daily, to dye any thing woollen to a scarlet-colour, leaving a part white: in order to which, he knows, there requires no more than that the part, to be left white, should be of cotton.

Mr. du Fay, supposing this to be owing to the cotton's imbibing, much more slowly than the wool, the liquor in which they are both previously boiled to make them receive the colour, as cotton is well known not to take wet so soon as wool, ordered a sort of cloth to be wove, the warp of which was wool, and the woof cotton; and, sending this to the fuller's, the two substances were so well blended together, that it became impossible for the one to receive the impregnation of any liquor without the other. With all these precautions however, the whole came out of the scarlet dye in the same

ſame condition as if nothing had been done, the cotton remaining wholly white, and the wool being marked with fire-colour and white; ſo that it may be eſteemed a certain fact, that the colour of cochineal cannot be given to cotton by the means of acids; the ſame alſo holds good of kermes and gum-lac, both which are uſed inſtead of cochineal to dye in ſcarlet; but neither of theſe, any more than the cochineal, will dye cotton. It is not to be concluded from hence however, that cotton cannot be dyed ſcarlet by thin ſubſtances; the truth is, that it requires a different treatment; and, as wool, to take the ſcarlet dye, requires only to be firſt impregnated with tartar, cotton requires to be firſt impregnated with alum, as wool does, for the generality of other colours. The acid of ſea-ſalt, of vitriol, vinegar, and verjuice, all ſerve to dye wool to a ſcarlet with cochineal, but none of theſe will make it give any tinge to cotton, though alum alone can ſerve.

The ſame dye will give very different colours to the different parts of a cloth, which have been differently prepared. And this gentleman ſhewed before the Academy a piece of cloth, which he had carefully prepared in a different manner in the different parts, which being all plunged together into the dye, when taken out and dried, was found to be of a dirty red in that part where it had not been impregnated with any thing; and in the other parts, where it had been differently impregnated, was found of all the degrees of red, from a pale damaſk roſe-colour to the deepeſt ſcarlet, and this, while it had in every part been dipped an equal time in the ſame dye. This equally holds good of the other colours. And, in theſe experiments, the dirty colours given to ſuch parts of the cloth as have received no previous impregnation, will be waſhed away, and quite carried off, while the others remain in all their perfection.

Another circumſtance very worthy attention in the Dying of ſcarlet is this, that the dye is evidently compoſed of a clear or common water, in which the colouring particles are ſuſpended, and from which it is eaſy to ſuppoſe that they are ſeparated and applied to the ſtuff in Dying. As this is naturally ſuppoſed to be the caſe in regard to all colours, ſo it appears very evidently to be a fact in this, ſince the colouring particles adhere in ſuch quantities to the matter, and ſeparate themſelves ſo readily and perfectly from the water, that after an hour and half's boiling of the dye with the proper quantity of the ſtuff in it, the whole coloured matter ſhall be attached to the ſtuff, and the remaining liquor be only clear water; and what might appear wonderful is, that all the boiling in the world will never diſlodge any of the colour from the ſtuff, or occaſion its being received into the water again.

It might be ſuppoſed that this was wholly owing to the particles of ſalts, which had been imbibed into the ſtuff in its prior preparation; that theſe attracting the particles of the colour to the ſtuff, while the water of the dye had none of them to cauſe ſuch an attraction in it, they did not remain in it. But this appears not to be the caſe, but that the ſtuff will attract the colour, whether it be previouſly prepared, or the preparation and the Dying be all one act; ſince the dyers ſometimes dye ſcarlet at once in this manner, only plunging the ſtuff into a dye made of cochineal, a ſolution of tin mixed in a large quantity of water, with a ſmall quantity of ſal armoniac and cream of tartar. All theſe ingredients are mixed together before the ſtuff is put in, yet, after it has boiled about an hour and half, all the colour is in the ſtuff, and the liquor is become colourleſs as water. The event is the ſame in the dyes made of woad and of indigo for the Dying blue, and indeed in the greater part of other colours; but as the ingredients of theſe are not ſo pure as the cochineal, and there are uſually many heterogeneous particles among them, the liquor does not become ſo wholly colourleſs in theſe, as in the caſe of the ſcarlet. But the dyers, who well know, that ſo long as there is any colour left in the liquor, ſo long the ſtuff will be profited by remaining in it, always take ſmall quantities out of it, and, examining it by pouring it gently down againſt the light, they know when it is that the ſtuff has received all the tincture it can, by there being no more colouring matter ſuſpended in the dye.

Experience ſhews, that all colours do not attach themſelves with equal readineſs to the ſtuff, or remain equally firmly united to it. Woad, indigo, cochineal, kermes, and many other colours, never reach farther than the ſurface of the ſtuff. The liquor of the dye penetrates indeed perfectly through the body of it, but the colouring particles ſtopping at the ſurface become entangled there, and never penetrate, at leaſt, not in any great quantity, to the central part, which remains either quite white, or only very ſlightly tinged. This however only happens to ſuch ſtuffs as are thick, and of a very cloſe texture: others are coloured throughout. And this is only the caſe in regard to ſome dyes, not to all ſorts, ſince moſt of the wood-colours penetrate wholly through the ſtuff, be it ever ſo thick, and colour it equally every-where. Whence it ſeems probable, that the colouring particles of the woods are either more minute and fine, or much more intimately blended with the water, than thoſe of cochineal, indigo, and ſuch others as do not penetrate beyond the ſurface.

It might ſeem ſtrange, that the ſtuffs which are thus readily coloured on the ſurface, ſhould not afterwards, by the continued boiling of the water, have the colouring particles carried farther down into the body, as the water continually penetrates the whole from each ſurface to the center, and might naturally be expected to carry a part of the colouring particles in along with it. But, if we conſider the whole proceſs from the beginning, we find that the colouring particles are ſtrongly attracted by the ſtuff, and ſcarce at all by the water. Whence they almoſt immediately leave the water, and attach themſelves to the firſt part of the ſtuff they come in contact with, which is its ſurface; and, when once fixed there, it is no wonder that the particles of water, ever ſo long paſſing by them, do not attract or take them away from this ſurface, as they muſt do in order to carry them in; ſince we have before had proof, that their attraction to the water is greatly weaker than that to the ſtuff. And the difference between the wool and the cotton, the one receiving, and the other not receiving at all the coloured particles in its natural ſtate, or with the ſame impregnation by means of which the other does, ſeems reſolvable into the ſame principle, that though the attraction in wool be much greater in regard to the coloured particles than that of the water, and therefore it robs the water of them; yet the attraction in cotton being leſs than in water, the colouring particles remain in the water without any tendency to attach themſelves to the cotton.

In Dying, the ingredients uſed for the colours are well known to be of very different kinds. Some of them are ſuch as communicate a colour, which will a long time reſiſt the injuries of the air, and theſe are therefore called the good or ſtanding colours; and there are others which the bare expoſition to the air will deſtroy or deface in a very little time; theſe are therefore called the falſe or fading colours. In what manner is the action of the air upon theſe laſt to be explained? Does it take away, or carry off from the ſtuff, the very particles of the colours; or does it only break and deſtroy that beautiful and regular texture of each particle on which the colour depends? The dyers very often have recourſe to ſeveral ingredients, in order to produce one colour; and reaſon ſeems to urge, that one of theſe falſe or fading colours might be rendered laſting by mixing it with a permanent one: the dyers are alſo of this opinion. But it is nevertheleſs an erroneous one; for repeated experiments have proved, that one of theſe falſe colours fades as ſoon, when it is mixed with a ſtanding or laſting colour, as when it is uſed alone. There are but few colours on which this experiment can be tried, ſo as to come to a regular deciſion. One of the principal is the mixing a blue and a yellow, for the producing a green. In this experiment, if the blue and the yellow be both ſtanding or permanent colours, the ſtuff will perfectly hold its colours, and ſucceed alike, whether it be dyed firſt blue, and afterwards yellow; or firſt yellow, and afterwards blue. But, if one of the two colours be a falſe or fading colour, it is found that the green produced by the mixture will not ſtand, though the other be ever ſo good or permanent a colour.

There is a ſhorter way of trying the permanence of many colours of this kind, than that of expoſing them to the air, ſince in boiling only five minutes in a pint of water, in which there has been diſſolved half an ounce of alum, they will loſe as much colour as they would have done by being expoſed two days to the air in ſummer. Some colours require different methods of trial, but this ſerves for almoſt all. The ſhades of blue, yellow, red and green, purple and green, are the fineſt colours to experiment theſe things upon, as the ſame previous preparation or impregnation of the ſtuff ſerves for both, and both depend upon blue for their baſis, the purple being made of blue and red, and the green of blue and yellow.

It ſhould not ſeem ſurpriſing, if the ſtuff be firſt dipped into a dye of a ſtanding blue, and afterwards into a fading red or yellow, to turn it green or purple, that the action of the air, or boiling in alum water, ſhould carry off thoſe falſe colours, which had only been applied to the ſtuff, after it was before ſaturated with a ſtanding colour. But it might be expected, that when the ſtuff was firſt impregnated with them, and afterwards had the blue added upon them, that either the blue muſt be the colour that went off, or that they muſt all remain: but, in effect, nothing of this difference is found, but the blue remains, while the fading colours go off, however, or in whatever manner or order, they are applied. *Mem. Acad. Scienc. Par.* 1737.

The non-colouring ingredients are,— Certain reſtringent or binding materials, as galls, ſumac, alder bark, pomegranate peel, walnut rinds, and roots, ſapling bark, and crab-tree bark.— Certain ſalts, as alum, argol, ſalt-petre, ſal armoniac, pot-aſhes, lime, and urine.— Liquors, as well-water, river-water, aqua-vitæ, vinegar, lemon-juice, aqua-fortis, honey, and melaſſes.—Gums, as tragacanth, arabic, maſtic, and ſanguis draconis.— Smectics, or abſterſives, as ſoap, fullers-earth, linſeed-oil, ox-gall, &c.— Metals, as ſteel-filings, ſlippe, and pewter, to which add copperas, verdigreaſe, antimony, litharge, and arſenic.— Laſtly, bran, wheat-flower, yolks of eggs, leaven, cumin-ſeed, fenugreek-ſeed, argaric, and ſenna.

Of moſt of theſe ingredients ſome account may be found under their reſpective articles in the courſe of this book; but, with regard to their uſe and effect in Dying, it will be neceſſary to conſider them more particularly, and to bring together in one view.

Among the non-colouring drugs, then, from the mineral kingdom come, 1. Copperas, ſteel-filings, and ſlippe, the ſtuff found in the troughs of old grind-ſtones whereon edge-tools have been ground, which are uſed for all true or Spaniſh blacks, though not for the Flanders blacks.— 2. Pewter diſſolved in aqua-fortis, uſed for the new ſcarlet or Bow-dye.— 3. Litharge, though not owned or allowed, is uſed to add weight to the dyed ſilks. 4. Antimony uſed chiefly for the ſame purpoſe, though it alſo contains a tingent ſulphur, which by precipitation, &c. affords a great variety of colours.— 5. Arſenic uſed in Dying crimſon, on pretence of giving a luſtre.— 6. Verdigreaſe, uſed by linen-dyers, in their yellow and green colours.— 7. Alum.— 8. Bran and bran-water, whoſe flower, entering the pores of the ſtuff, levigates its ſurface, and thus renders the colour laid on it more beautiful; much as woods, to be gilded, are firſt ſmoothed over with white colours.— 9. Saltpetre, uſed chiefly in aqua-fortis, in the Bow-dye, to brighten colours by back boiling; for which purpoſe, 10. Argol is more commonly uſed.— 11. Lime or calk, uſed in the working of blue-fats.

Non-colouring ingredients of the animal kind, are,— 1. Honey.— 2. Yolks of eggs.— 3. Ox-gall: though this, and the two laſt, are only uſed by a few particular dyers to ſcowr, promote fermentation, and increaſe weight.— 4. Stale urine; uſed as a lixivium to ſcowr, alſo to help the fermenting, and heating of woad; though it is alſo uſed in the blue-fats inſtead of lime: in reality, as it diſcharges the yellow, wherewith blue and moſt greens are compounded, it is uſed to ſpend weld withal: yet it is known, that the urine or old mud of piſſing-places will dye a well ſcowred piece of ſilver of a golden colour; it being with this (not Bath water, as imagined) that the Bath ſixpences, &c. are prepared.

To the claſs of non-colouring ingredients, may alſo be added water, by dyers called white-liquor, which is of two ſorts.— 1. Well-water uſed in reds, and in other colours wanting reſtringency, as well as in Dying ſtuffs of a looſe contexture, as calico, fuſtian, and the ſeveral ſpecies of cottons: but naught for blues, and making yellows and greens look ruſty.— 2. River-water, ſofter and ſweeter than the former, and diſſolving ſoap better, uſed in moſt caſes by the dyers, for waſhing, rinſing, &c. their cloths after Dying.— 3. Liquor abſolutely ſo called, which is bran-liquor, made of one part bran, and fine river-water, boiled an hour, and put in a leaden ciſtern to ſettle: four or five days in ſummer will turn it too ſour, and unfit for uſe: its office is to contribute to the holding of the colour: it is known, that ſtarch, which is only the flower of bran, makes a clinging paſte, which will conglutinate paper, though not wood or metals. Accordingly, bran-liquors are uſed to mealy Dying ſtuffs, as to madder, which is rendered clammy and glutinous by being boiled in bran-water, and thus made to ſtick better to the villi of the ſtuff dyed.— 4. Gums, tragacanth, arabic, maſtic, and ſanguis draconis, are uſed in Dying ſilk, chiefly to give it a gloſſineſs, which may make it ſeem finer, as well as ſtiffer, and to increaſe its weight.

For the colouring ingredients, colorantia colorata, we have,— 1. Iron and ſteel, or what is made from them, which, we have obſerved, are uſed in Dying blacks; though how they contribute thereto is not ſo obvious: we know that green oaken boards become black by the friction of a ſaw; a green ſour apple, cut with a knife, turns of the ſame colour; the white greaſe wherewith the wheels of coaches are anointed, becomes likewiſe black, by means of the iron boxes wherewith the nave is lined, and the friction between the nave and the axle-tree; and that an oaken ſtick becomes black by a violent friction againſt other wood in a turning lath; and the black colour on earthen-ware is given with ſcalings of iron vitrified. From all which it ſeems to follow, that the buſineſs of blacking lies in the iron, and particularly in its uſtulation or friction. Be this as it will, copperas, the moſt uſeful ingredient for Dying black, is the ſalt of the pyrites wherewith old iron is incorporated. And, wherever this is uſed, ſome of the aſtringents are to accompany it.— 2. Red-wood chopped, and ground in a mill, is uſed for Dying cloth, rugs, &c. of the coarſer ſort. Its tincture, which is a ſort of brick-colour, is got out by long boiling it with galls, and the cloth along with it. It ſtands better than brazil.— 3. Brazil, chopped alſo, and ground, dyes a pink-colour, or carnation neareſt approaching cochineal: it it uſed with alum; with pot-aſhes it alſo ſerves for purples. It eaſily ſtains.— 4. Madder gives a colour near approaching the Bow-dye, or new ſcarlet: thoſe called baſtard-ſcarlets are dyed with it. It endures much boiling, and is uſed both with alum and argol, and holds well: the brighteſt dyes with madder are made by over-dying the ſtuff, and then diſcharging part of it by back-boiling in argol. It is uſed with bran-water inſtead of white liquor.— 5. Cochineal, uſed with bran-liquor in a pewter furnace, with aqua-fortis, gives the dye called among us, though improperly, ſcarlet in grain. Any acid takes off the intenſe redneſs of this colour, and turns it towards an orange, or flame-colour. With this colour the Spaniſh leather and wool, uſed by ladies, are dyed.— 6. Annotto gives an orange-colour, eſpecially to ſilks, linens, and cottons; for it does not penetrate cloth: it is uſed with pot-aſhes.— 7. Weld, by the help of pot-aſhes, yields a deep lemon-colour, though it is uſed to give all ſorts of yellows.— 8. Wood-wax, or green-wood, called alſo geniſta tinctoria, and the dyers-weed, has the like effect as weld, though its uſe is chiefly confined to coarſe cloths. It is ſet with pot-aſhes, or urine.— 9. Fuſtic is of two ſorts, young and old.— The former, chopped and ground, yields a kind of reddiſh orange-colour: the latter, a hair-colour, diſtant ſeveral degrees of yellow from the former. It ſpends with or without ſalts, works either hot or cold, and holds firm.— 10. Wood-ſoot, containing not only a colour, but a ſalt, needs nothing to extract its dye, or make it ſtrike on the ſtuff. The natural colour it yields is that of honey, but it is the foundation of many other colours on wool, and cloth only.— 11. Woad ground, or chopped with a mill for the purpoſe, is made up into balls, which being broken, and ſtrewed on lime or urine, is uſed with pot-aſhes, or ſea-weed, and gives a laſting blue. The lime, or calk, accelerates the fermentation of the woad, which in three or four days will work like a guile of beer, and be covered with a greeniſh froth or flower. An intenſe woad colour is almoſt black, that is, is of a damſon-colour. It is the foundation of ſo many colours, in its different degrees or ſhades, that the dyers have a ſcale whereby to compute the lightneſs and depth of this colour.— 12. Indigo is of the like nature, and uſed for the ſame purpoſe as woad, only that it is ſtronger.— 13. Logwood, chopped and ground, yields a purpliſh-blue: it may be uſed with alum: formerly it was of ill repute, as a moſt falſe and fading colour: but, ſince it has been uſed with galls, it is leſs complained of. The Dying materials are generally applied in decoctions made in water, more or leſs ſtrong, according to the occaſion; ſometimes by only dipping the ſtuff in the vat of dye; ſometimes by boiling it therein; and ſometimes by leaving it a day or more to ſteep.— For the alum, in Dying ſilks, it is always applied cold, in which ſtate alone it contributes to the brightneſs of the dye.

The art of Dying may be divided into as many branches as there are different colours to be communicated, and ſorts of different ſtuffs to be ſubjects of it.

Dying *of cloths, ſerges, druggets, and other woollen manufactures.*— For black, in cloths and ſtuffs of price, it is begun with a ſtrong decoction of woad and indigo, which give a deep blue; after which, the ſtuffs, being boiled with alum and tartar, or pot-aſhes, are to be maddered with common madder; then dyed black with Aleppo galls, copperas, and ſumac; and finiſhed by back-boiling in weld.— Scarlet is dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic.— Crimſon ſcarlet is given with cochineal-meſtich, aqua-fortis, ſal armoniac, ſublimate, and ſpirit of wine.— Violet-ſcarlet, purple, amaranth, and panſy-ſcarlet, are given with woad, cochineal, indigo, braziletto, brazil, and orchal.— For common reds, pure madder is uſed, without other ingredients.—Crimſon-reds, carnations, flame and peach-colours, are dyed, according to their ſeveral hues, with cochineal-meſtich, without madder, or the like.—Crimſon-red is prepared with Roman alum, and finiſhed with cochineal.— Peach colour muſt be back-boiled a little with galls and copperas, or the like.— Orange-aurora or golden-yellow, brick-colour, and onion-peel-colour, are given with woad and madder, tempered according to their reſpective ſhades. For blues, the dark are given with a ſtrong tincture of woad: the brighter, with the ſame liquor, as it weakens in working.—Dark-browns, minims, and tan-colours, are given with woad, weaker in decoction than for black, with alum and pot-aſhes; after which, they are maddered higher than black: for tan-colours, a little cochineal is added.—Pearl-colours are given with galls and copperas; ſome are begun with walnut-tree roots, and finiſhed with the former; though, to make them more ſerviceable, they did them in a weak tincture of cochineal.— Greens are begun with woad, and finiſhed with weld.— Pale yellows, lemon-colour, and ſulphur-colour, are given with weld only.— Olive-colours of all degrees are firſt put in green, and taken down again with ſoot, more or leſs, according to the ſhade required.— Feuille-mort, hair-colour, muſk, and cinnamon-colour, are given with weld and madder.— Nacarat, or bright orange-red, is given with weld and goats hair, boiled with pot-aſhes. Fuſtic here is forbid, as a falſe colour.

Dying *of wools for tapeſtry*, is performed after the ſame manner as cloths, excepting blacks, which are only to be woaded, and then put in black, as above.

Black wools for cloths and ſerges may be begun with walnut-tree root, and walnut rinds, and finiſhed by dipping in a vat of black.

Dying *of ſilks*, is begun by boiling them with ſoap, &c. then ſcowring and waſhing them out in the river, and ſteeping them in alum-water cold.— For crimſon they ſcowr them a ſecond time before putting them in the cochineal vat.

Red-crimſon is dyed with pure cochineal-meſtich, adding galls,

galls, turmeric, arsenic, and tartar, all put together in a copper of fair water almost boiling: with these the silk is to be boiled an hour and a half; after which, it is suffered to stand in the liquor till next day.—Violet-crimson is also given with pure cochineal, arsenic, tartar, and galls; but the galls in less proportion than in the former. When taken out, it is to be well washed, and put in a vat of indigo.— Cinnamon-crimson is begun like the violet, but finished by back-boiling, if too bright, with copperas; if dark, with a dip in indigo.— Light-blues are given in a back of indigo.— Sky-blues are begun with orchal, and finished with indigo. For citron-colours, the silk is first alumed, then welded, with a little indigo.—Pale-yellows, after aluming, are dyed in weld alone.— Pale and brown aurora's, after aluming, are welded strongly, then taken down with rocou dissolved with pot-ashes.— Flame-colour is begun with rocou, then alumed, and dipped in a vat or two of brazil.— Carnation, and rose-colours, are first alumed, then dipped in brazil.— Cinnamon-colour, after aluming, is dipped in brazil and braziletto.— Lead-colour is given with fustic, or with weld, braziletto, galls, and copperas. But the galls, on these and other occasions, are not to be used, which increases the weight to the damage of the purchaser; for which reason, it is punished in France as a fraud: in reality, few but black silks need galls.

Black silks, of the coarser sort, are begun by scowring them with soap, as for other colours: which done, they are washed out, wrung, and boiled an hour in old galls, where they are left to stand a day or two; after which they are washed again with fair water, wrung, and put in another vat of new and fine galls; then washed and wrung again, and finished in a vat of black.— Fine black silks are only put once into galls, viz. the new and fine sort, which has only boiled an hour; then they are washed, and wrung out, and dipped thrice in black, to be afterwards brought down by back-boiling with soap.

DYING *of thread*, is begun with scowring it in lye of good ashes; after which it is wrung, rinsed out in river-water, and wrung again.— For a bright-blue, it is given with braziletto and indigo.— Bright-green is first dyed blue, then back-boiled with braziletto and verdeter, and lastly woaded.—For a dark-green it is given like the former, only darkening more before woading.—Lemon, or pale yellow, is given with weld, mixed with rocou.— Orange and isabella, with fustic, weld, and rocou.— Red, both bright and dark, with flame-colour, &c. are given with brazil, either alone, or with a mixture of rocou.— Violet, dry rose, and amaranth, are given with brazil, taken down with indigo.— Feulemort, and olive-colour, are given with galls and copperas, taken down with weld, rocou, or fustic.— Black is given with galls and copperas, taken down and finished with braziletto wood.

DYING *of hats*, is done with braziletto, galls, copperas, verdigrease, dissolved and boiled in a copper capable of receiving, besides the liquor, twelve dozen of hats on their blocks, or moulds. Here the hats are suffered to boil some time; after which, they are taken out, and suffered to stand and cool; then dipped again; and thus alternately, oftener or seldomer, as the stuff is of a nature to take the dye with more or less difficulty.

Proof of DYES.— There are divers ways of proving the truth of Dyes, or examining the justness and legitimacy of their composition.— To discover whether a cloth have been duly treated by the dyer, and the proper foundation laid, a white spot, by the French called rosette, of the bigness of a shilling, ought to be left; besides a white stripe between the cloth and the list.

Farther proof is had by boiling the dyed stuff in water, with other ingredients different according to the quality of the Dye to be proved. If the colour sustain the test, i. e. do not discharge at all, or very little, so that the water is not tinctured by it, the Dye is pronounced good: otherwise, false.

Proof of the DYES *of Silks.*— For red-crimson the proof is made by boiling the silk with an an equal weight of alum.— For scarlet-crimson, it is boiled with soap almost of the weight of the silk.— For violet-crimson, with alum of equal weight with the silk, or with citron-juice, about a pint to a pound of silk.— These ingredients are to be mixed, and put in fair water, when it begins to boil; after which, the silks are also to be put in, and after boiling the whole for half a quarter of an hour, if the Dye be false, the liquor or the red-crimson will be violet, in case it had been dyed with orchal, or very red, if with brazil.— That of crimson-scarlet, if rocou have been used, will become of an aurora colour, or, if brazil have been used, red.— And that of violet-crimson, if brazil or orchal have been used, will be of a colour bordering on red.— On the contrary, if the three sorts of crimson be truly dyed, their liquors will discover very little alteration.

A still surer way to discover whether crimson silks have been rightly dyed, is by boiling a piece of standard dyed crimson silk, kept for that purpose at Dyers-hall, after the same manner, and then comparing the tinctures of the two liquors.

To discover whether other colours have been dyed with galls, the silk is put in fair boiling water, with pot-ashes, or soap, nearly of the weight of the silk; after some time, it is taken out; upon which, if it have been dyed with galls, the colour will be all vanished, and nothing but that of the galls left, which is a sort of feulemort, or wood colour.

The dying of silk with galls may also be detected by putting it in boiling water, with a gallon of citron juice; being taken out, and washed in cold water, and then dipped in a black dye, if galls have been used, it will turn black; if not, it will be of a brown-bread colour.

To discover whether black silk have been overdosed with galls, steel filings, or slippe, it is boiled in fair water, with twice its weight of soap: if it be loaden with galls, it will turn reddish, otherwise it will keep its colour.

To discover whether black cloth have been first woaded, and maddered; a sample of it, and, at the same time, a sample of standard black, kept for that purpose by the dyers company, is to be taken; and then as much Roman alum as is equal in weight to both, together with a like weight of pot-ashes, is to be put over the fire in a pan of bran water: when it begins to boil, the two samples to be put in, and after half an hour to be taken out and compared. — The piece which has only been woaded will be found bluish, with somewhat of a dull green; if it have both woaded and maddered, it will be of a tan or minim colour; and, if it have been neither woaded, nor maddered, its colour will be dunnish, between yellow and fallow.

For cloths dyed of a minim colour, the proof is to be made after the same manner as that of blacks.

To know whether scarlet or crimson cloth have been dyed with pure cochineal, they are to be boiled with an ounce of alum to a pound of cloth.

For cloths of other colours, the proof is to be made in the same manner as that of blacks and minims.

Theory of DYING. — We cannot better close this article, than with some general deductions, which may throw a little necessary light on the theory of Dying. As,

1. That all the materials, which of themselves give colour, are either red, yellow, or blue; so that out of them, and the primitive fundamental colour, white, all that great variety, which we see in dyed stuffs, arises. — 2. That few of the colouring materials (as cochineal, soot, wood-wax, or woad) are, in their outward and first appearance, of the same colour, which, by the slightest solutions in the weakest menstrua, they dye upon cloth, silk, &c. 3. That many of the colouring materials will not yield their colours without much grinding, steeping, boiling, fermenting, or corrosion by powerful menstrua; as red-wood, weld, woad, annotto, &c.— 4. That many of the said colouring materials will of themselves give no colouring at all, as copperas, or galls, or with much disadvantage, unless the cloth, or other stuff to be dyed, be first covered or incrustated, as it were, with some other matter, though colourless, aforehand; as madder, weld, and brazil, with alum. — 5. That some of the colouring materials, by the help of other colourless ones, strike different colours from what they would alone, and of themselves; as cochineal and brazil. — 6. That some colours, as madder, indigo, and woad, by reiterated tinctures, will at last become black. — 7. That, though green be the most frequent and common of natural colours, yet there is no simple ingredient, which is now used alone, to dye green with upon any material; sap-green, the condensed juice of the rhamnus berry, being the nearest; and this only used by country people. —8. There is no black thing in use which dyes black; though both the coal and soot of most things burnt, or scorched, be of that colour; and the blacker, by how much the matter, before it was burnt, was whiter, as in the famous instance of ivory black. —9. The tincture of some dying stuffs will fade even with lying, or with the air, or will stain even with water; but very much with wine, vinegar, urine, &c.— 10. Some of the dyers materials are used to bind and strengthen a colour; some to brighten it; some to give lustre to the stuff; some to discharge and take off the colour, either in whole, or in part; and some, out of fraud, to make the material dyed, if costly, to be heavier. — 11. Some Dying ingredients, or drugs, by the coarseness of their bodies, make the thread of the dyed stuff seem coarser; and some, by shrinking them, smaller; and some, by levigating their asperities, finer.— 12. Many of the same colours are dyed upon different stuffs with different materials; as red-wood used in cloth, not in silks; annotto in silks, not in cloth; so that they may be dyed at several prices. — 13. Scowring, and washing of stuffs to be dyed, is to be done with appropriate materials; as sometimes with ox-galls, sometimes with fullers earth, sometimes with soap: this latter being pernicious in some cases, where pot-ashes will stain or alter the colour. — 14. Where great quantities of stuffs are to be dyed together, or where they are to be done with great speed, and where the pieces are very long, broad, thick, &c. they are to be differently handled, both in respect to the vessels and ingredients. — 15. In some colours and stuffs the tingent liquor must be boiling; in other cases bloodwarm, in some it may be cold. — 16. Some tingent liquors are fitted for use by long keeping; and in some the virtue wears away by the same.— 17. Some colours, or stuffs, are best dyed by reiterated dippings

pings ever into the fame liquor at feveral intervals of time; and fome by continuing longer, and others leffer whiles therein.— 18. In fome cafes, the matter of the veffel wherein the liquors are heated, and the tinctures prepared, muft be regarded; as that the kettles be pewter for Bow-dye.— 19. Little regard is had how much liquor is ufed in proportion to the dying drugs; the liquor being rather adjufted to the bulk of the ftuff, as the veffels are to the breadth of the fame; the quantity of Dying drugs being proportioned to the colour higher or lower, and to the ftuffs both; as likewife the falts are to the Dying drugs. Concerning the weight which colours give to filks, for in them it is moft taken notice of, as being fold by weight, and being a commodity of great price; it is obferved, that one pound of raw filk lofes four ounces by wafhing out the gums and natural fordes. — That the fame fcowred filk may be raifed to above thirty ounces from the remaining twelve, if it be dyed black, with certain materials. That the reafon why black colour may be dyed the heavieft is, that all ponderous drugs may be dyed black, being all of colours lighter than it; whereas, there feem to be few or no materials wherewith to increafe the weight of filk, which will confift with fair light colours; and perhaps white arfenic to carnations, is the only inftance. Of things ufeful in Dying, efpecially black, nothing increafes weight fo much as galls; by means whereof black filks recover the weight which they loft by wafhing out their gum: Nor is it counted extraordinary, that blacks fhould gain about four or fix ounces in the Dying upon each pound. — Next to galls, old fuftic increafes the weight about one half in twelve. —Madder about an ounce.—Weld half an ounce.—The blue fat, in deep blues of the fifth ftall, adds no confiderable weight. —Neither do logwood, cochineal, or annotto; nor even copperas of itfelf, where galls are not.—Slippe adds much to the weight, and gives a deeper black than copperas, which affords a good excufe for the dyers that ufe it.

Dying *of leather, fkins*, &c.—Blue is given by fteeping the fubject a day in urine and indigo, then boiling it with alum: or it may be given by tempering the indigo with red-wine, and wafhing the fkins therewith. Red is given by wafhing the fkins, and laying them two hours in galls; then wringing them out; dipping them in a liquor made with liguftrum, alum, and verdigreafe in water; and laftly, in a dye made of brazil-wood boiled with lye.—Purple is given by wetting the fkins with a folution of roche alum in warm water, and, when dry again, rubbing them with the hand with a decoction of log-wood in cold water. — Green is given by fmeering the skin with fap-green and alum-water boiled: to darken the colour, a little more indigo may be added. — Dark-green is alfo given with fteel filings and fal armoniac fteeped in urine till foft, then fmeered over the skin; which is to be dried in the fhade.— Sky-colour is given with indigo fteeped in boiling water, and the next morning warmed and fmeered over the skin. — Yellow, by fmeering the skin over with aloes and linfeed oil diffolved and ftrained: or by infufing it in weld. — Orange-colour is given by fmeering with fuftic berries boiled in alum-water: or, for a deep orange, with turmeric.

Dying, *or ftaining of wood, for inlaying, vaneering*, &c.— Red is done by boiling the wood in water and alum; then taking it out, adding brazil to the liquor, and giving the wood another boil in it.—Black, by brufhing it over with log-wood boiled in vinegar, hot; then wafhing it over with a decoction of galls and copperas, till it be of the hue required.— Any other colour may be given by fqueefing out the moifture of horfe-dung thro' a fieve, mixing it with diffolved roche alum and gum arabic; and to the whole adding green, blue, or any other colour defigned: after ftanding two or three days, pear-tree, or other wood, cut to the thicknefs of half a crown, is put into the liquor boiling hot, and fuffered to remain till it be fufficiently coloured.

Dying *of bone, horn, or ivory*. — Black is performed by fteeping brafs in aqua-fortis till it be turned green: with this the bone, &c. is to be wafhed once, or twice; then put in a decoction of log-wood and water, warm.—Green is begun by boiling the bone, &c. in alum-water; then with verdigreafe, fal armoniac and white-wine vinegar; keeping it hot therein till fufficiently green.—Red is begun by boiling it in alum-water, and finifhed by decoction in a liquor compounded of quicklime fteeped in rain-water, ftrained, and to every pint an ounce of brazil-wood added: the bone, &c. to be boiled herein till fufficiently red.

E.

EAR *of fishes*.—All the cetaceous fishes have external meatus auditorii, or passages for hearing; but other fish have nothing of these external appearances, and seem neither to be intended by nature to make any sounds, or to hear any. Though, sound being a tremulation in the air, it may be felt by them as motion, though not distinguished as sound. It may easily be proved, that they do not hear our voices in speaking, by walking near the side of a pond or river well stored with fish about the edges; if the body and its shadow be kept out of their sight, they will never start at the voice.

Yet, how far fishes are deaf and dumb, seems a question not yet perfectly decided.

EAR, in gardening, a name given to seminal leaves of plants, or those two green and succulent leaves which first appear from the seed, and are varied different in all respects from those which follow:

EAR-*shell*, auris marina, in natural history, the name of a genus of shell-fish, the characters of which are these: it consists only of one shell, or valve, and is of a flatted shape, in some measure resembling that of the human Ear, and has an extremely wide mouth, or aperture, at its base, the widest of that of all shells, except only the patella or limpet, which is all mouth below. *Plate* XVII. *fig.* 14.

EARTH, in geography (*Dict.*)—In the terraqueous globe we distinguish three parts, or regions, viz. 1. The external part, or crust, which is that from which vegetables arise, and animals are nourished. 2. The middle, or intermediate part, which is possessed by fossils, extending further than human labour ever yet penetrated. 3. The internal, or central part, which is unknown to us, though by many authors supposed of a magnetic nature; by others, a mass, or sphere of fire; by others, an abyss, or collection of waters, surrounded by the strata of Earth; and, by others, a hollow empty space, inhabited by animals, who have their sun, moon, plants, and other conveniencies within the same. Others divide the body of the globe into two parts, viz. the external part, which they call the cortex, including the whole depth or mass of the strata of the Earth: and the internal, which they call the nucleus, being of a different nature from the former, and possessed by fire, water, or the like.

The external part of the globe either exhibits inequalities, as mountains and vallies; or it is plain and level; or dug in channels, fissures, beds, &c. for rivers, lakes, seas, &c.

These inequalities in the face of the Earth are by most naturalists supposed to have arose from a rupture, or subversion of the Earth, by the force either of the subterraneous fires or waters. The Earth, in its natural and original state, Des Cartes, and after him Burnet, Steno, Woodward, Whiston, and others, suppose to have been perfectly round, smooth, and equable; and account for its present rude and irregular form, principally from the great deluge.

In the external, or cortical part of the Earth, we meet with various strata, which are supposed to be the sediments of various floods, the waters whereof being replete with matters of divers kinds, as they are dried up, or oozed through, deposited these different matters, which in time hardened into strata of stone, sand, coal, clay, &c.

Dr. Woodward has considered the business of strata with great attention, viz. their order, number, situation with respect to the horizon, depth, intersections, fissures, colour, consistence, &c. and ascribes the origin and formation of them all to the great flood, or cataclysmus. At that terrible revolution, he supposes all the terrestrial bodies of every kind to have been dissolved and mixed with the waters, and sustained therein, so as only to constitute one common mass therewith. This mass of terrestrial particles, intermixed with water, he supposes to have been at length precipitated to the bottom, and that, according to the laws of gravity, the heaviest sinking first, and the lighter in their order. By such means were the strata formed, whereof the Earth consists, which, attaining their solidity and hardness by degrees, have continued so ever since. These sediments he further concludes to have been at first all parallel and concentrical, and the surface of the Earth, formed thereby, perfectly smooth and regular: but, in course of time, divers changes happening from earthquakes, volcano's, &c. the order and regularity of the strata was disturbed and broke, and the surface of the Earth, by such means, brought to the irregular form in which it now appears.

EARTHS, in natural history, are the various species and kinds of earthy matter found in digging, or lodged on the surface of the terraqueous globe. These are either simple, or composed of entirely similar particles; or compound, having a mixture of heterogeneous ones, as sand, or the like, among them.

Earths are defined to be friable, opake, insipid bodies; not inflammable; vitrifiable by extreme heat, diffusible in water, and separable from it by filtration.

The simple Earths are divided into two orders, and under those into five genera. Of the first order are those Earths which are naturally moist, of smooth surfaces, and of a firmer texture; and of the second are those which are naturally dry, of rough, dusty, surfaces, and of a looser texture. Of the first of these orders there are three genera, the boles, the clays, and the marles; and of the second there are two, the ochres and the tripelas. The several distinguishing characters of which are these.

Of the first order: 1. Boles are Earths moderately coherent, penderous, soft, not stiff, or viscid, but, in some degree, ductile, while moist, composed of fine particles, smooth to the touch, easily breaking between the fingers, readily diffusible in water, and freely and easily subsiding from it. See BOLE.

2. Clays are Earths firmly coherent, weighty, and compact, very stiff and viscid, ductile to a great degree while moist, smooth to the touch, not easily breaking between the fingers, nor easily diffusible in water, and, when mixed in it, not readily subsiding from it.

3. Marles are Earths, but slightly coherent, not ductile, stiff, or viscid, while most, most easily diffusible in, and disunited by water, and by it reduced to a soft, loose, incoherent mass.

Of the second order are, 1. Ochres. These are Earths slightly coherent, composed of fine, smooth, soft, argillaceous particles, rough to the touch, and readily diffusible in water.

2. Tripelas are Earths firmly coherent, composed of fine, but hard, particles, and not readily diffusible in water.

The compound Earths are two; the loams, composed of clay and sand; and the moulds, composed of earthy and putrified vegetable and animal matters.

Magnetism of the EARTH. The notion of the magnetism of the Earth was started by Gilbert; and Mr. Boyle supposes magnetic effluvia moving from one pole to the other. See Works abr. Vol. I.

Dr. Knight also thinks, the Earth may be considered as a great load-stone, whose magnetical parts are disposed in a very irregular manner; and that the south pole of the Earth is analogous to the north pole in magnets, that is, the pole by which the magnetical stream enters.

He observes, that all the phænomena attending the direction of the needle, in different parts of the Earth, in great measure correspond with what happens to a needle, when placed upon a large terella; if we make allowances for the different dispositions of the magnetical parts, with respect to each other, and consider the south pole of the Earth to be a north pole, with regard to magnetism. The Earth might become magnetical by the iron ores it contains, for all iron ores are capable of magnetism. It is true, the globe might notwithstanding have remained unmagnetical, unless some cause had existed capable of making that repellent matter producing magnetism move in a stream through the Earth.

Now the doctor thinks that such a cause does exist. For, if the Earth revolves round the sun in an ellipsis, and the south pole of the Earth is directed towards the sun, at the time of its descent towards it, a stream of repellent matter will thereby be made to enter at the south pole, and come out at the north. And he suggests, that the Earth's being in its perihelion in winter, may be one reason why magnetism is stronger in this season than in the summer.

The cause here assigned for the Earth's magnetism must continue, and perhaps improve it from year to year. Hence the doctor thinks it probable, that the Earth's magnetism has been improving ever since the creation, and that this may be one reason, why the use of the compass was not discovered sooner. See Dr. *Knight's attempt to demonstrate, that all the phænomena in nature may be explained by attraction and repulsion.*

EARTH *of dew*, an Earth much valued by many of the chymical experimenters, and prepared in the following manner: a large quantity of dew is to be collected, and set in a wooden vessel, in a cool shady place, covered with a canvas, to keep out

out duft and flies; there will in time come on a putrefaction in the liquor. It is fometimes three weeks, fometimes longer firft; during the time of this putrefaction, certain films are daily formed on the furface of the liquor, and thefe falling down to the bottom, one after the other, form, by degrees, a fediment of a fort of mud. This is to be thrown away, and the dew, when feparated from it, is to be filtred clear, and evaporated to a drynefs; the remainder is a greyifh Earth, which is the true Earth of dew; this is very light and friable, and is of a foliated ftructure in the mafs, looking like fo many leaves of brown paper, fpread very thin and even over one another. *Phil. Tranf.* N°. 3.

EARTH-*banks*, in hufbandry, &c. are a very common fence about London, and in feveral other parts of England. Where ftones are not to be had cheap, thefe are to be preferred to all other fences, both for foundnefs and lafting.

The beft manner of making them is this: dig up fome turf in a graffy place, a fpit deep, or nearly to the breadth of the fpade, and about four or five inches thick; lay thefe turfs, with the grafs outward, even by a line on one fide, and on the backfide of thefe lay another row of turf, having a foot fpace of folid ground on the outfide, to prevent the bank from flipping in, if it fhould be any ways faulty. On the outfide of this make a ditch, or elfe let the fides be lowered both ways with a flope two feet deep, and there will be no pafture loft by the fence, becaufe it will bear grafs on both fides.

The Earth that is dug out of the ditches, or from the flope, muft be thrown in between the two rows of turf, till the middle is made level with the reft. Then lay on two more rows of turf, in the fame manner; and with more of the earth fill up, and make level as before. Let this method be continued till the bank is raifed four feet high, or more if neceffary, only obferving, that, the higher it is to be carried, the wider the foundation muft be made. As the bank is carried up, the fides muft not be raifed perpendicular, but floping inward both ways, fo that at the top it may be about two feet and a half wide. This fort of fence, when made with lefs care, and faced with clay, is left naked, and ferves very well in fome places; but, when it is thus managed with the turf, the joinings of the feveral pieces are hid in a little time, by the growth of the graffy part of the turf on each fide, and it makes a beautiful fence, of as green and pleafant a colour as the reft of the field.

The great improvement upon this plan is the planting quickfets, or young white-thorn plants, in the middle of the top of the bank. The Earth on each fide of thefe may be raifed up with a fort of wall, and the rain that falls all preferved for the plants. This plenty of water, and depth of fine Earth, makes the young plants grow quicker and more vigoroufly than any other way; and the moft beautiful of all hedges is propagated this way. When this fort of hedges is young, there muft be placed on each fide of it a fhort dry hedge, of about a foot high, to keep the fheep from cropping thefe young plants, but this may be taken away after a little time.

There is one caution neceffary in regard to the making thefe banks, which is, that they muft never be made in a very dry feafon, becaufe, if much rain fhould follow, the Earth of the bank would fwell and burft out, or fpoil the fhape of the bank; but, if this fhould happen, it is eafily enough repaired. This beautiful fence may be made at a fmaller price than thofe unaccuftomed to thefe things may imagine. In good digging ground, where men work for fourteen pence a day, it may be made and planted with quick for two fhillings a pole. It may be made proper for the keeping in of deer, only by the fmall addition of planting, at every eight or ten feet diftance, a poft a little flanting, with a mortife in it; let this ftand about two feet above the bank, and into the mortifes, all along, put a rail made of a bough of any tree; no deer will ever go over this, nor can they creep under it, as they often do, when a pale tumbles down. The quick, on the top of this bank, may be kept clipped, and will grow very thick, and afford the beft fhelter for cattle of any fence in ufe with us. *Mortimer's Hufbandry.*

Compound EARTHS, in natural hiftory, are a clafs of foffil bodies, ufually confounded with the genuine and fimple Earth, as if fubftances of the fame kind, but being of a very different nature and origin. They are foffils compofed of argillaceous and marly particles, feparated and divided by adventitious matter, and never found free from thofe admixtures, or in the ftate of pure fimple marles or clays.

EA'RTHQUAKE. — Jamaica is remarkable for Earthquakes. The inhabitants, Sir Hans Sloane informs us, expect one every year. That author gives us the hiftory of one in 1687: another horrible one, in 1692, is defcribed by feveral anonymous authors. In two minutes time it fhook down and drowned nine tenths of the town of Port-Royal. The houfes funk outright, thirty or forty fathoms deep. The earth, opening, fwallowed up people, and they rofe in other ftreets; fome in the middle of the harbour, and yet were faved; though there were 2000 people loft, and 1000 acres of land funk. All the houfes were thrown down throughout the ifland. One Hopkins had his plantation removed half a mile from its place. Of all wells, from one fathom to fix or feven, the water flew out at the top with a vehement motion. While the houfes, on one fide of the ftreet were fwallowed up, on the other they were thrown on heaps; and the fand in the ftreet rofe like waves in the fea, lifting up every body that ftood on it, and immediately dropping down into pits; and, at the fame inftant, a flood of water, breaking in, rolled them over and over; fome catching hold of beams and rafters, &c. fhips and floops in the harbour were overfet and loft; the Swan frigate particularly, by the motion of the fea, and finking of the wharf, was driven over the tops of many houfes. It was attended with a hollow rumbling noife like that of thunder. In lefs than a minute, three quarters of the houfes, and the ground they ftood on, with the inhabitants, were all funk quite under water; and the little part, left behind, was no better than a heap of rubbifh. The fhake was fo violent, that it threw people down on their knees, or their faces, as they were running about for fhelter. The ground heaved and fwelled like a rolling fea; and feveral houfes, ftill ftanding, were fhuffled and moved fome yards out of their places. A whole ftreet is faid to be twice as broad now as before; and, in many places, the earth would crack, and open, and fhut, quick and faft. Of which openings, two or three hundred might be feen at a time; in fome whereof, the people were fwallowed up; others the clofing earth caught by the middle, and preffed to death; in others, the heads only appeared. The larger openings fwallowed up houfes; and out of fome would iffue whole rivers of waters, fpouted up a great height into the air, and threatening a deluge to that part the Earthquake fpared. The whole was attended with ftenches and offenfive fmells, the noife of falling mountains at a diftance, &c. and the fky, in a minute's time, was turned dull and reddifh, like a glowing oven. Yet, as great a fufferer as Port-Royal was, more houfes were left ftanding therein, than on the whole ifland befide. Scarce a planting-houfe, or fugar-work, was left ftanding in all Jamaica. A great part of them were fwallowed up, houfes, people, trees, and all, at one gape: in lieu of which afterwards, appeared great pools of water, which when dried up left nothing but fand, without any mark that ever tree, or plant, had been thereon. Above twelve miles from fea, the earth gaped and fpouted out, with a prodigious force, vaft quantities of water into the air: yet the greateft violences were among the mountains and rocks; and it is a general opinion, that, the nearer the mountains, the greater the fhake; and that the caufe thereof lay there. Moft of the rivers were ftopped up for twenty-four hours, by the falling of the mountains; till, fwelling up, they made themfelves new tracks and channels, tearing up in their paffage trees, &c. After the great fhake, thofe people who efcaped, got on board fhips in the harbour, where many continued above two months; the fhakes all that time being fo violent, and coming fo thick, fometimes two or three in an hour, accompanied with frightful noifes like a ruffling wind, or a hollow rumbling thunder, with brimftone blafts, that they durft not come afhore. The confequence of the Earthquake was a general ficknefs, from the noifome vapours belched forth, which fwept away above three-thoufand perfons.

EA'RWIGS.—Thefe are very troublefome vermin in a garden, efpecially where carnations are preferved; for they are fo fond of thefe flowers, that, if care is not taken to prevent them, they will entirely deftroy them, by eating off the fweet part at the bottom of the leaves. To prevent which, moft people have ftands erected, which have a bafon of earth or lead round each fupporter, which is conftantly kept filled with water. See the article CARNATION.

Others hang the hollow claws of crabs and lobfters upon fticks in divers parts of the garden, into which thefe vermin get; and, by often fearching them, you will deftroy them without much trouble; which will be of great fervice to your wall-fruit; for thefe are great deftroyers thereof. *Miller's Gard. Dict.*

E'BONY (*Dict.*) — Authors and travellers give very different accounts of the tree that yields the black Ebony: by fome of their defcriptions it fhould be a fort of palm-tree, by others a cytifus, &c. The moft authentic of them is that of M. Flacourt, who refided many years in Madagafcar as governor thereof. He affures us that it grows very high and big; its bark black, and its leaves refembling thofe of our myrtle, of a deep, dusky, green colour.

Tavernier affures us, that the iflanders take care to bury their trees, when cut down, to make them the blacker. F. Plumier mentions another black Ebony tree, difcovered by him at St. Domingo, which he calls *fpartium portulacæ foliis aculeatum ebeni materiæ*. Candia alfo bears a little fhrub, known to the botanifts, under the name of ebenus Cretica.

Pliny and Diofcorides fay, the beft Ebony comes from Ethiopia, and the worft from India; but Theophraftus prefers that of India. Black Ebony is much preferred to the other colours. The beft is a jet black, free of veins and rind, very maffive, aftringent, and of a fharp pungent tafte.

Its rind, infufed in water, is faid to purge pituita, and cure venereal diforders; whence Matthiolus took guaiacum for a fort of Ebony. It yields an agreeable perfume, when laid on the coals: when green, it readily takes fire, from the abundance of its fat. If rubbed againft a ftone, it becomes brown. The Indians make ftatues of their gods, and fcepters for their princes, of this wood. It was firft brought to Rome by Pompey, after his

his fubduing Mithridates. It is now much lefs ufed among us, than anciently, fince the difcovery of fo many ways of giving other hard woods a black colour.

As to green Ebony, befides Madagafcar and St. Maurice, it likewife grows in the Antilles, and efpecially in the ifle of Tobago. The tree that yields it is very bufhy, its leaves fmooth, and of a fine green colour. Beneath its bark is a white rind about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, though, fometimes, ftreaked with yellow veins. Its ufe is not confined to Mofaic work: it is likewife good in dying, as yielding a fine green tincture

As to red Ebony, called alfo grenadilla, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree, and other woods, pafs for Ebony, by ebonifing, or giving it the black colour thereof. This fome do, by a few wafhes of a hot decoction of galls, and, when dry, adding writing ink thereon, and polifhing it with a ftiff brufh, and a little hot wax. Others heat, or burn their wood black.

ECHINI'TES, or ECHINITÆ, in natural hiftory, the name given by authors to the foffil fhells of the feveral fpecies of echini marini, and to the ftones formed in them. Of thefe there is almoft an endlefs variety in the foffil world. Many of thofe which we find daily in our chalk-pits are the fame with thofe now known to us in their recent ftate, or living in the fea; but we have numbers of others, of which our imperfect knowledge of the animal world gives us no certain account, in their recent ftate.

ECHINOPHO'RA, in botany, the name of a genus of plants the characters of which are thefe: the flower is of the rofaceous kind, being compofed of feveral petals, arranged in a circular form; and thefe are collected into an umbellated head, and contained in the circuit of one common cup, which finally becomes an unicapfular fruit, containing an oblong feed.

ECHINO'PUS, *globe thiftle*, in botany, the name of a genus of plants, the characters of which are thefe: the flower is of a globofe fhape, and of the flofculous kind, being compofed of a number of flofcules divided into feveral equal fegments at the ends, and placed on the embryo feeds, but each having its peculiar fquamofe cup, which is fixed to the thalamus of the flower; and contains the embryo, when it has ripened into a feed.

E'CHO (*Dict.*)—Echo's are diftinguifhed into divers kinds, viz.

1. Single, which return the voice but once; whereof fome are tonical, which only return a voice when modulated into fome particular mufical tone. Others polyfyllabical, which return many fyllables, words and fentences.

Of this kind is that fine Echo in Woodftock Park, which, Dr. Plott affures us, in the day-time, will return very diftinctly feventeen fyllables, and in the night twenty. See *Nat. Hift. Oxford*.

2. Multiple, or tautological, which return fyllables and words the fame oftentimes repeated.

In Echo's, the place where the fpeaker ftands, is called the centrum phonicum; and the object, or place, that returns the voice, the centrum phonocampticum.

At the fepulchre of Metella, wife of Craffus, was an Echo, which repeated what a man faid, five times. Authors mention a tower at Cyzicus, where the Echo repeated feven times. One of the fineft Echo's we read of is that mentioned by Barthius, in his notes on Statius's Thebais, l. VI. v. 30. which repeated the words a man uttered feventeen times: it was on the banks of the Naha, between Coblents and Bingen. Barthius affures us, he had proved what he writes, and had told feventeen repetitions. And whereas, in common Echo's, the repetition is not heard till fome time after hearing the word fpoke, or the notes fung; in this, the perfon who fpeaks, or fings, is fcarce heard at all; but the repetition moft clearly, and always in furprizing varieties; the Echo feeming fometimes to approach nearer, and fometimes to be further off. Sometimes the voice is heard very diftinctly, and fometimes fcarce at all: one hears only one voice, and another feveral: one hears the Echo on the right, and the other on the left, &c.

Addifon, and other travellers into Italy, mention an Echo in that country, ftill more extraordinary, which will return the found of a piftol fifty-fix times, even though the air be very foggy.

ECLI'PSE (*Dict.*)—The learned M. Segner, profeffor of mathematics at Gottingen, has contrived the following method of reprefenting folar Eclipfes by means of a terreftrial globe.

In order to exhibit any Eclipfe of the fun, a projection in plano of the imaginary arches and circles defcribed on the illuminated hemifphere of the earth is of great ufe: and, if in fuch a projection the fituation of the cities, iflands, &c. on the furface of the earth be inferted, and a circle defcribing the pofition and magnitude of the lunar penumbra, and fome leffer concentric circles be added, thofe parts of the fun which at that time are obferved by the interpofition of the moon, are fhewn at one view, and to what part of the world the Eclipfe is vifible.

But fuch a projection is imperfect, becaufe it cannot exhibit the other phænomena which depend partly on the rotation of the earth, and partly on the motion of the moon; fo that whoever would exhibit all the appearances of an Eclipfe by this method muft draw feveral projections, which will be a work of much labour, and never worth the pains taken about it.

The rotation of the earth, indeed, makes no difference in the parallels or circles of latitude, and their projection is therefore always the fame; but the meridians or circles of longitude are continually changed by the earth's rotation, and confequently the projection of thefe circles and the fituation of places on the globe muft alfo be changed, as far as they depend on them; thefe confiderations induced me to devife a clearer and more concife method of demonftrating the doctrine of Eclipfes.

An artificial globe eafily reprefents an hemifphere illuminated. For, the pole being elevated above the horizon or depreffed beneath it, fo as to render that elevation or depreffion equal to the declination of the fun at the given time, or, which amounts to the fame thing, let the fun's place in the ecliptic be the zenith of the globe, the artificial horizon becomes the terminator of light and fhade, or that which diftinguifhes the opake from the illuminated hemifphere of the earth: and nothing remains to exhibit the illuminated hemifphere, but to turn the globe on its own axis till it obtains that fituation, which the time of day requires.

And thus the globe more eafily and naturally performs what is very difficult to exhibit by projection. From this obfervation, I imagined that all the phænomena of Eclipfes of the fun might be exhibited on a globe, that the lunar penumbra might be projected upon it, and a machine be contrived, by which its pofition might be reprefented for any time, and might be referred to places of the earth drawn on the globe. Invited by the eafe and perfpicuity I apprehended in fuch a demonftration of the nature of Eclipfes, I fet about the following machine defcribed, *plate* XVII. *fig.* 15. which reprefents a common terreftrial globe with the meridian and horary circle rectified. Two wooden brackets A B, *a b*, are fixed to the horizon, the length of each of thefe brackets fomewhat exceeds a femidiameter of the globe. Both the extremities of thefe brackets A C D, *a c*, are fo made that they may take in the horizon, and be fixed at any point of it by fcrews, one of which appears at D.

On the oppofite extremes of the brackets B, *b*, are fixed two wooden columns perpendicular to the horizon B E, *b e*, of an equal height with the femidiameter of the globe and breadth of the brazen meridian, fo that a right line drawn through the fummits of the columns may not touch the meridian.

The columns are covered with circular plates of brafs, perforated with iron axes, firmly connected to the plates of brafs. The lower parts of thefe axes are inferted firmly in the columns, the circular plates are likewife fixed immoveable in a pofition parallel to the horizon of the globe.

The tops of the axes are fmooth and polifhed as well as the plates which receive the brazen wheels E F G, *e f g*, placed on the plates, in fuch a manner, that, however they are moved round the axes, they continually keep parallel to the horizon. The diameters of thefe wheels are about three inches, and their peripheries have each a cavity to receive a thread. The wheel *e f g* is a little lefs than the other E F G, but the machine receives no detriment by this difparity, for nothing particular is marked on *e f g*; it is therefore fimply faftened at *h*, to prevent it from falling off from the axis.

But the other wheel E F G has a circle infcribed on it, divided into degrees, and the index H is fixed on to fhew the number of their parts; which is fixed to the axis in fuch a manner, as to move round it with fome difficulty, but fo that the motion of the wheel may not interrupt the motion of the index, nor the motion of the index interrupt that of the wheel. Therefore, a fmall immoveable round plate is fixed between the index and the wheel; and the index is fo faftened to the axis, that it is preffed on every fide towards that immoveable round plate.

Three brazen radii, *i k*, *i l*, *i m*, are connected at *i*, containing the equal angles *k i l*, *l i m*, *m i k*; at *i* is a very fmall perforation. The radii are elaftic, and as thin as the ftrength required will admit; their length is as near as poffible equal to a fourth part of the diameter of the globe, and this part is applied to the other as a fkeleton to produce the penumbra. Now, the radii have little holes at *l* and *m*, through which a thread is drawn and put round the wheels, as may be feen by *m*; E F G, *g f e l*, the extremes between *l* and *m*, are tied faft: wherefore, the fkeleton, alfo is rendered immoveable at that part of the thread which is included between *e l m* E; the third radius *i k* lies loofe on the part of the thread between *g* G, fo that the wheel E F G, or *e f g*, being turned round the fkeleton, may be moved backward or forward in a right line. By this conftruction of the machine it may be difcovered how many parts of the divifion of the wheel E F G are equal to a diameter of the globe.

The brackets A B, *a b*, are fo difpofed, that, the fkeleton being put in motion, its center *i* would pafs over the diameter of the globe: to this end, the horizon of the globe being placed in a fituation parallel with the horizon of the earth, the plumbline *i n* is let down from the center, to fhew the points of the horizon over which this center would impend. Therefore, the center being brought forward the whole length of the diameter of the globe, the number of the parts of the wheel E F G may be noted, which paffed in the mean time by the index H: and this muft be carefully obferved, becaufe the ufe

of

of it recurs in exhibiting all Eclipses. The following circumstances must be changed according to every particular Eclipse. First, the disk of the penumbra, which I endeavoured to effect in this manner: having found by the tables the semidiameter of the lunar penumbra on the disk of the earth, and the horizontal parallax of the moon, for the Eclipse I designed to exhibit, I reasoned in this manner; as the parallax of the horizontal moon was to the radius of the disk of the penumbra, so the semidiameter of the terrestrial globe, I made use of, must be to a fourth term which expressed the radius of such a penumbra as the size of the globe required.

That radius being divided into six parts (for the smallness of the machine prevented me from dividing it into twelve with convenience) I described concentric circles on thick cap paper, and, according to them, cut the paper into armillæ. I pasted the biggest of these on the skeleton *k l m*, so that the center of the armilla might be congruous to the center of the skeleton; the second armilla I rejected, and pasted the third on the skeleton in the same manner as the first; the fourth I rejected, pasted on the fifth as before, omitting the inner circle, which produced the figure described between *k l m*, the use of which is to shew (every part of the machine being put into the disposition herein after mentioned) the beginning and end of an Eclipse, and the places marked on the globe which are perpendicularly under the exterior margin of the biggest armilla; those parts which are placed under the interior margin of the same armilla exhibit an Eclipse of two digits; those parts which are under the exterior margin of the second armilla, represent an Eclipse four digits, and so on; those parts of the globe which are under the center suffer a total Eclipse; for I thought it sufficient to represent the shade by the center itself, on account of its minuteness.

The machine must be put in this disposition to exhibit every moment or progression of the given Eclipse. Having found by calculation the points of the terminator of light and shade, at which the center of the moon first enters into the earth's disk, and departs out of it again, they are marked on the horizon of the globe, and the brackets A B, *a b*, *fig.* 15. are placed in such a manner that, the wheel E F G being turned round, *i*, the center of the disk of the penumbra *k l m*, may pass over it, which the pendulum *i* shews whether it can or not. Then I find at what time the center of the penumbra is in any remarkable place, to shew where it first enters the disk of the earth, and place the globe in such a manner, with the help of the horary circle, that the part which appears above the horizon may represent the hemisphere of earth at that time enlightened by the sun. Then I turn round the wheel E F G, till the center of the penumbra *i*, at that remarkable place as in our example, becomes perpendicular to the terminator of light and shade; this I call its first position, and set H, the index of the wheel, to the beginning of the division. Thus every part is properly adapted to the time, and will exhibit the phænomena of the Eclipse proposed.

Now, the horary motion of the moon from the sun being taken out of the tables, I infer that, as the parallax of the horizontal moon is to this horary motion of the moon, so the number of the parts of the wheel E F G, which is equal to the semidiameter of the globe, is to a fourth term which shews how many parts are to be drawn through the place of the index to obtain the situation of the disk of the penumbra an hour after or before the time which corresponds to its primary position; the disk being placed in this position, and the globe being turned round upon its axis, the phænomena of the time given will be exhibited.

The positions for any other times are easily obtained, for, the number of the parts of the wheel being divided into half-hours, quarters, and months, a table may be formed only by addition and subtraction, by which it may be shewn how the disk of the penumbra ought to be moved backward or forward to agree with the time. This being completed, the globe need only be turned round according to the time; but the wheel in such a manner, that the index may shew the number ascribed to the time. The first operation is performed more expeditiously by the use of an horary circle which is expressed in the figure, if the hours are marked in retrograde order, accommodated to the motion of the earth round its axis.

We have before observed that the parts of the globe placed perpendicularly under the disk of the penumbra in any position might be discovered by the plumb-line. But these may be seen, at one view, by the solar rays reflected from a plane speculum so disposed that the rays may fall perpendicular to the horizon of the globe, which will project shades on the globe from the disk of the penumbra resembling those penumbræ which the moon projects on the earth, and exhibit the phases of any Eclipse.

ECTRO'PIUM (*Dict.*)—Sometimes this is a simple and original disorder, and sometimes it is only a symptom of some other, as of an inflammation, sarcoma, tumour, or the like. This sometimes owes its original to the contraction of the skin of the eye-lids, by the scar of a wound, ulcer, burn, &c. or to the induration and contraction of the skin, after an inflammation; and sometimes it in a great measure proceeds from the injudicious use of astringent collyriums, or eye-waters.

When the disorder is become inveterate, it is not easily cured; while recent, it is to be attempted by relaxing and elongating the skin of the eye-lid, by the application of emollients, such as the vapours of hot milk, or water, oil of almonds, mucilage of quince seed, and ointment of marsh-mallows. These must be repeated every day, the skin of the eye-lid drawn frequently towards its right position, and, when the patient goes to bed, the eye-lids should be brought together, and restrained in their proper posture by a plaister compress and bandage. But, if all this fail, and the case yet appear not incurable, manual operation must take place.

The operation is performed in the following manner: first, a semilunar incision is to be made in the external skin of the eye-lid, next its tarsus, or cartilaginous margin, making the angles of the incision, downward in the upper lid, and upward in the under, that by this means the skin may be elongated. If it does not appear sufficiently let out by one incision, two or three more may be made, running parallel with the first, and at the distance of a small packthread. When the eye-lid is thus sufficiently elongated, the incision must be dressed first with dry lint stuffed into them, and afterwards with lint, armed with some vulnerary unguent, which will prevent the skin from growing together again, and will occasion new flesh to be formed in the place, which will elongate the skin. Lastly, to forward the extension and cure, a piece of sticking plaister should be fastened to the eye-lid, to keep it extended, and this must be continued till the eye will shut close. When this case has continued from the patient's birth, the cure is very difficult, and it is a yet more hopeless case, when it happens to old people, from a weakness of the orbicular muscle. *Heister's Surgery.*

EDGINGS, in gardening, the series of small, but durable, plants, set round the edges or borders of flower beds, &c. The best and most durable of all plants for this use is box, which, if well planted, and rightly managed, will continue in strength and beauty for many years. The seasons for planting this are the autumn, and very early in the spring. And the best species for this purpose is the dwarf Dutch box. The Edgings of box are now only planted on the sides of orders, next walls, and not, as was some time since the fashion, all round borders or fruit beds, in the middle of gardens, unless they have a gravel walk between them, in which case it serves to keep the borders from washing down on the walks in hard rains, and fouling the gravel.

In the last age, it was also a very common practice to plant borders, or Edgings, of aromatic herbs, as thyme, savory, hyssop, lavender, and the like. But these are all apt to grow woody, and to be in part, or wholly, destroyed in hard winters. Daisies, thrift, or sea july flower, and chamomile, are also used by some for this purpose; but they require yearly transplanting, and a great deal of trouble, else they grow out of form; and these are also subject to perish in very hard seasons. *Miller's Gard. Dict.*

EEL, in ichthyology, the name of a well-known fish.

Though the learned world at this time generally allows, that Eels are produced, like other animals, by parents of their own kind, yet there remain many doubts, about the manner in which this is performed; some allowing the Eels to be like the generality of other animals of different sexes, in the different individuals; and others affirming that they are all hermaphrodites, each having the parts of generation of both sexes. Rondeletius affirms they are of different sexes: and Mr. Allen, who has given a very curious paper concerning them, in our Philosophical Transactions, is of the same opinion; and both say, that the parts of the sexes may be discovered, on a careful inspection, and some found to be males, and others females; but these parts are, in both sexes, they say, buried in a large quantity of fat, and they are of opinion, that hence proceeded the mistake of Aristotle and his followers, who, not being able to find these parts, concluded that they did not exist at all.

Among those who allow the Eels to be produced, like other animals, from animal parents, which have the sexes, some are of opinion that they are viviparous, and others, that they are oviparous; but a gentleman of our nation, Mr. Chartwynd, seems to have determined this great controversy, by observing, that, if the aperture under the belly of the Eel, which looks red in the month of May, be cut at that time, the young Eels will be seen to come forth alive, after the operation. Mr. Allen also affirms them to be viviparous; but his observation, concerning the place of their conception, does not appear analogous to that care and industry of nature, in providing convenient receptacles for the fœtus; neither is it consonant to reason, that, when nature has provided an uterus in all animals, not only the viviparous, but the oviparous, and even in insects, that the Eel and the sword-fish should be without this part, as Bartholine supposes; much less that the guts, which are appointed by nature for the secretion of nourishment, and expulsion of the fæces, and which are in continual motion to answer these purposes, should be destined in one single animal to the reception of a fœtus. This gentleman mentions a slender gland lying near the bowels, and, in all probability, this was the uterus. For Mr. Lewenhoeck, who took much pains in examining this fish, says, that he found an uterus, not only in some,

ſome, but in every Eel he examined, and he therefore concludes Eels to be hermaphrodites; nay, he goes ſo far as to ſuppoſe, that there are no male parts of generation, of the common form of thoſe in other animals; but that the office of theſe is performed by a liquor analogous to the male ſeed of animals, which is contained in certain glands, ſituated on the inſide of the uterus itſelf.

Nature having, in all animals hitherto diſſected, been found to have provided in the females not only an uterus, but alſo two tubes, which, from Fallopius, the perſon who firſt diſcovered them, are called Fallopian tubes, and which ſerve to convey the ovum from the ovary into the uterus, the ſyſtem of Mr. Allen, and thoſe others who ſuppoſe the bowels the ſeat of generation in Eels, is rendered highly improbable, by the want of ſuch parts as theſe. This gentleman obſerves, that he had ſeen the embryo's within the parent Eel, both in the egg and animal ſtate; that the eggs were always found to lie on the outſide of the inteſtines, and the young Eels within them. Now, as we have no idea how theſe embryo's ſhould get within the gut, from an egg on the outſide, any more than how an egg ſhould come in that place, the whole ſyſtem of this gentleman, though favoured by many people, ſeems built on ſo bad a foundation, as not to merit any longer the countenance of the world. It is probable, that all his obſervations were founded upon errors, for it is a very common caſe to find Eels ſubject to worms in their guts, ſuch as we have, and all the kinds that we are ſubject to; ſome of theſe might be eaſily miſtaken by the author of this ſyſtem for embryo Eels; and poſſibly the eggs he deſcribes on the outſides of the bowels, might be no other than ſmall lumps of fat.

The fine ſilver Eel may be catched with many ſorts of bait, and with great eaſe to the fiſher. Powdered beef is the very beſt bait for many places; next after this are lob-worms, minnows, or other ſmall fiſh, and, in the place of theſe, chickens guts, and even fiſh garbage will do. The Eel, for the ſix winter months, remains conſtantly buried in mud, and even in warmer weather this fiſh ſeldom appears above the bottom by day light, ſo that night is the beſt time for fiſhing for it. The hooks may be baited, and thrown into the water at night, and the ends of the lines faſtened to the ſhore; and one general line may have a great many other ſhorter ones, with each its hook tied to it, depending on it. When theſe are laid in over night, they may be left to themſelves afterwards; and, when they are taken up in the morning, the Eels will be found hung. A very good method for large Eels is this: take five or ſix lines, each of them about ſixteen yards long, and at every two yards ſpace make a nooſe, and at every one of theſe nooſes hang on a hook, faſtened to a ſhort line of ſtrong ſilk; ſome uſe wire, but ſilk will anſwer the purpoſe, and give the fiſh leſs ſuſpicion; bait the hooks with miller's thumbs, loaches, minnows, and ſmall gudgeons; let the long line be drawn quite acroſs the deepeſt part of the brook or river, and the two ends faſtened down, with a peg driven into the ground on each ſide: theſe are to be laid in at night, and the ſportſman muſt either ſit up and watch them, or elſe be up very early to take them up, for otherwiſe many of the Eels, which were hung, will be got away again; and what is moſt provoking is, that thoſe are the largeſt which thus eſcape.

With proper management and attendance there will ſeldom fail being three or four Eels on each line. When there are very large Eels in any place, the beſt bait is a moderate-ſized roach: this muſt be faſtened to a ſtrong ſingle night line, and the hook muſt be hid in the mouth of the bait.

Eels have been obſerved to move directly upwards, and ſo to get over perpendicular obſtacles ſeveral feet above the ſurface of the water. They ſlide thus upwards with as great eaſe, ſeemingly, as if they had been going along the level ground. *See Phil. Tranſ.* Numb. 482.

EEL *Pout*, in ichthyology, the Engliſh name of the muſtela fluviatilis, a fiſh of the gadus kind, according to Artedi, and diſtinguiſhed from the others by the name of the bearded gadus, with two fins on the back, and with both jaws of the ſame length.

This fiſh is caught in the Trent, and many other of our rivers, and in ſome places called a barbot.

EFFLU'VIA (*Dict.*)—Some bodies are found to emit Effluvia for a great number of years, without any conſiderable loſs, either as to bulk or weight; as magnets, electrical bodies, ambers, and divers odorous bodies, the tenuity of whoſe emanant corpuſcles is incredible: not but that the loſs they ſuſtain by the continual emiſſion of Effluvia, may be made up to them by the reception of other ſimilar Effluvia of the ſame kinds of bodies, diffuſed through the air.

It is added, that theſe Effluvia are emitted in manner of radii, rays, in orbem, and that the circumference or bound of the activity of the radiation exhibits the ſame figure as is that of the radiant. This the aſtronomers ſufficiently prove, from the ratio of the refraction of the atmoſphere.

That Effluvia may conſiderably operate upon, and have great effects on bodies within the ſphere of their activity, is proved by Mr. Boyle, in an expreſs treatiſe on the ſubtility of Effluvia; where he ſhews, 1. That the number of corpuſcles, emitted by way of Effluvia, is immenſely great. 2. That they are of a very penetrating nature. 3. That they move with vaſt celerity, and in all manner of directions. 4. That there is frequently a very wonderful congruity, or incongruity, in the bulk and ſhape of theſe Effluvia, with the pores of the bodies they penetrate into and act upon. 5. That in animal and organical bodies, particularly, theſe Effluvia may excite great motions of one part of the frame upon another, and thereby produce very conſiderable changes in the œconomy. Laſtly, that they have ſometimes a power of procuring aſſiſtance in their operations from the more catholic agents of the univerſe, ſuch as gravity, light, magnetiſm, the preſſure of the atmoſphere, &c.

That Effluvia are emitted to very great diſtances, we have a notable proof in this: that our wines grow turbid in the hogſhead, preciſely at the ſame time when the grapes are at their maturity in other remote countries, whence the wine was imported. Beſide, that odoriferous Effluvia are, in many caſes, perceived at the diſtance of many leagues. Again, that the generality of Effluvia retain the proper colour, ſmell, taſte, and other properties, and effects of the bodies whence they proceed, and this even after they have paſſed through the pores of other ſolid bodies, we have abundant proof. Thus, magnetical Effluvia penetrate all, even the moſt ſolid bodies, without any change of their nature, or loſs of force. And the ſame we ſee confirmed in ſympathetic inks, and powders, the ſagacity of blood-hounds, &c.

The wonderful extenſion of Effluvia, and the ſmall diminution of the body they iſſue from, is one of the ſtrangeſt problems in phyſics. Mr. Boyle refers the doctrine of Effluvia to ſeveral heads, as to the ſtrange extenſibility of ſome bodies, while their parts yet remain tangible; the multitude of viſible corpuſcles that may be afforded by a ſmall quantity of matter; the ſmallneſs of the pores at which the Effluvia of ſome bodies will get in; and finally the great quantity of ſpace that may be filled as to ſenſe by a ſmall quantity of matter, where rarified or diſperſed. The efficacy of ſeveral Effluvia, and their acting on one another, is a ſecond thing as obſervable in regard to them. This is done by either the great quantity of corpuſcles emitted, or their penetrating or pervading nature, or elſe by their celerity, or other modification of their motion, or by the congruity or incongruity of their bulk and ſhape to the pores of the bodies they are to act upon; or by the motions of one part upon another, which they excite or occaſion in the body they work upon, according to its ſtructure; and finally by the fitneſs and powers which they have to make themſelves be acted upon by the more catholic agents of the univerſe, which then aſſiſt them in their working.

The determinate natures of Effluvia, according to the principal inſtances we have of them, are reducible to theſe three heads: 1. That, theſe Effluvia being, by condenſation, or otherwiſe, re-united, they appear to be of the ſame nature with the body that emitted them. 2. Their determinate nature may be ſometimes diſcovered by the difference that may be obſerved in their ſenſible qualities, foraſmuch as thoſe Effluvia which are endowed with them proceed from the ſame ſort of bodies, and yet, thoſe afforded by one kind of bodies being in many caſes manifeſtly different from thoſe which fly off from another, this evident diſparity in their exhalation argues, that they retain diſtinct natures, according to the nature of each body from which they proceed. 3. We may diſcover this different nature of Effluvia from their effects upon other bodies than the organs of our ſenſes, conſidering that the effects, which certain bodies produce in others by their Effluvia, being conſtant and determinate, and always different from thoſe which other agents produce by their emiſſions on the ſame or other ſubjects, the diſtinct nature of the corpuſcles, emitted on this occaſion, may be ſufficiently judged of, were it only from this. *Boyle on Effluvia.*

EFT, or EFF, in zoology, the name of a creature very common in all parts of England, and called alſo the newt, and the ſwift, and by others the common lizard, lacertus vulgaris. The beak of this creature is oval and obtuſe, its back of a ruſty iron colour; its feet have each five toes, and are armed with very ſharp though ſmall claws. That toe which is in the place of the fore finger with us is the longeſt of all, and that which anſwers to our thumb is placed lower. *Ray's Syn. Quad.*

EGGS *of flies.* After the congreſs with the male, the female fly is ſeldom ſo much as twenty-four hours before ſhe begins to depoſit her Eggs on ſome ſubſtance proper to give nouriſhment to the worms that are to be produced from them.

Theſe Eggs in general are white and oblong, but there are ſome of them which are ſingular, and vary from this form. The deſcription of one ſpecies of theſe may give an idea of the reſt, and it may not be improper to take, for this purpoſe, thoſe of the Eggs of the fly found on hog dung, and on other ſuch matters. This fly is of the claſs of the great blue fleſh fly, but differs from it in many particulars. Its body is more round, and a little hollowed on the belly ſide, eſpecially that of the male. The hinder end of the male is bent alſo into a ſort of hook. The wings croſs one another on the body, and exceed it in length. The male is yellow, often of a very beautiful, and ſomewhat reddiſh yellow. This colour is principally owing to a multitude of hairs with which the body is covered. The corcelet is of a paler yellow than the body,

body, and has some slight tinge of brown with it. Is has only a number of black hairs on it, fewer, and placed more distant than those of the body. The female has much fewer hairs, and is browner than the male.

The Eggs are but a little time in hatching, and the growth, and all the changes of the animal, take up but a little time. The creature is found to make its way out of the upper part of the Egg, and it is not more than three weeks from the laying the Egg that is taken up, before the creature is seen in form of a perfect fly, if a female, and ready to deposit her's.

On the stalks of the common meadow grasses, there are also frequently found the Eggs of flies deposited in great numbers. These, examined by the microscope, have all the form of small snow white boats, or rather of small ships, with the decks standing up above their sides. The places where they are lodged, shew evidently the care of the creature which laid them; the fly is not known, but they always produce a small white worm, with a variable head, and two hooks.

On other stalks of grass, one may often see also yellow spots and blotches, which may naturally pass with an incurious observer for maladies of the plants; but, when examined with the microscope, all these appear to be, in reality, clusters of Eggs of the same boat-fashioned form, and amassed in different numbers; sometimes also they are formed perfect and whole, and sometimes with their ends eaten. These last are such Eggs from which the worms have made their way. These worms are white, and have a variable head, armed with two hooks, but their changes are not known. *Reaumur, Hist. Insect.*

EGGS *of gnats*. There are few creatures in the winged kingdom more prolific than the gnat. Its whole series of changes, from the Egg to the perfect animal, is usually accomplished in three weeks, or a month, and there are commonly seven generations of them in a year, in each of which every female is the parent of two or three hundred young ones, if all the Eggs come to good. These Eggs are arranged by the animal in the form of a small boat, and each separate Egg is of the shape of a nine-pin; the thicker ends of these are placed downwards, they are all firmly joined to one another by their middles, and their narrower, or pointed parts, stand upward, and make the upper surface of the boat of the Eggs, as it were, rough or prickly.

When these Eggs are examined singly by the microscope, they appear not exactly of the nine-pin shape; the larger end is rounded, and terminated by a short neck, the end of which is bordered with a ridge which makes a kind of mouth. The neck of each of these is sunk within the water on which the boat swims, for it is necessary that it should keep on the surface, since, if wholly submerged, the worms could never be hatched.

The arrangement of these Eggs, in such nice and exact order, is a thing very worthy our admiration, and which cannot have been effected, but by the utmost care and caution in the creature, while in the act of laying them. It is only in the morning hours that the gnats are to be found laying their Eggs, and then they will be frequently found about the surfaces of waters, as are in a proper condition to give support to their young. The female gnat here places herself on a small stick, the fragment of a leaf, or any other such matter usually near the water's edge, and places her body in such a manner, that the last ring but one touches the surface of the water; the last ring of all, where there is the passage for the Eggs, is turned upward, and every Egg is thrust out vertically, and the creature, when it is almost disengaged, applies it against the sides of the already formed cluster, to which it readily adheres, by means of a mucilaginous sticking matter with which it is naturally covered, like the Eggs of many other insects.

The greatest difficulty to the creature is the placing the first laid Eggs in a proper position to receive the rest, and sustain themselves and them in a proper direction; these she, with great precautions, places exactly by means of her hinder legs, and, when a sufficient number of them are thus arranged together, the rest is easy, they serving as a support to all the following. *Reaumur's Hist. Insect.*

EGRA *Salt*, Egranum sal, a name given by Hoffman, and other writers, to a purging salt, extracted from the waters of Egra by evaporation. The waters of this place are in great esteem for many diseases, and are, by Hoffman himself, in some repects, preferred to the Pyrmont, as containing less ochre and calcarious earth. The salt is wholly of the nature of Glauber's salt, as is also that of many other springs thereabouts, and even in our own country; the nitrum calcarium of Dr. Lister being plainly the same with this, or Glauber's salt, produced in the bowels of the earth by a mixture of a vitriolic acid with that alkaline earth, which is the basis of sea salt. This salt, or one analogous to it, is found also concreted into a solid form in the earth in many places. There are accounts of it in the Memoirs of the Paris Academy, in Spain, in France, and in some parts of the East; and, in England, we have earth which contains it. *Hoffman.*

ELATE'RIUM, in botany, *the wild cucumber*. — This plant has several rough stalks, which creep upon the ground, whose leaves are set on long hairy foot-stalks; they are pretty large, greenish above, and hoary underneath, somewhat triangular, and indented about the hedges, rough and hairy. The flowers grow on the rudiment of the fruit, being much smaller than the flowers of the garden cucumbers, of one single pale yellow leaf, cut into five parts. The fruit is as big as a large olive, covered, all over, with harmless prickles, and full of a pulpy juice, containing several brown oval seeds, which, when ripe, upon handling, or gently pressing, will squirt forth at the end with great violence. It is sown in gardens, flowers in July, and the fruit is ripe in September.

It may be propagated by sowing the seeds in the spring of the year in an open warm border; and, when the plants are come up, they may be transplanted into an open bed or borders, about six or eight feet distance from each other; for the vines will spread very far, especially if the ground is good, in which they are planted; these produce their fruit in autumn, which if you suffer to fall off, and emit their seeds, will afford a plentiful supply of plants, without any farther care. The roots of these plants will abide some years. *Miller's Gard. Dict.*

In order to render the preparations of this plant more mild and gentle, Mr. Boulduc has been at incredible pains, and, in the course of his experiments, found that this plant has scarcely any sulphureous principles; because brandy and spirit of wine hardly act upon it at all, and because the principles they draw from it are only salts, dissolved and carried off, not by the sulphur of these menstruums, but by the phlegm they always retain. The wild cucumber, then, contains only saline parts, in which its virtues consist: and, as it is a strong purgative, we may, from this circumstance, conclude, that salts are as properly purgatives as sulphurs, though this quality is not so generally ascribed to the former as to the latter.

Mr. Boulduc was convinced, that juices obtained by expression have less virtue than decoctions and infusions. In the former of these processes, we leave, as useless, a mass, which is not, in reality, so; and which contains principles of the plant, the union of which with the others would be necessary, either to correct or augment their qualities. By the latter of these processes, that is, decoction or infusion, every principle is equally drawn out; and, even though the compound substance should be peccant with respect to strength and acrimony, the principles united and mixed, drawn from it, are such as were most easily disengaged, and, at the same time, most mild and gentle.

After trying an incredible number of experiments, sometimes on all, and sometimes only on some of the parts of this plant, Mr. Boulduc, at last, fell upon a method of preparing, from the dry root, a simple decoction, or extract, preferable to what can be obtained from all the other parts, and which he has found, from experience, to be a very mild, and, at the same time, a very powerful hydragogue. The dose is from twenty-four to thirty grains, in conjunction with a few grains of mechoacan or rhubarb, and salt of wormwood, incorporated with extract of juniper.

As the cucumbers, produced by this plant, do not ripen all at once, they must be gathered immediately before the precise moment of their perfect maturity, because soon after they would fall, and spread their seeds, which would render them useless. Mr. Boulduc thinks, that the method of preparing the Elaterium used among the antients was highly difficult; and positively affirms, that it was lost a long time ago. This art he has attempted to recover, and, by preserving every thing that was essential and important in it, has found the means of preparing an Elaterium, not only as good, but apparently better than that of the antients; since six grains of it purge very well, and without violence. It must be exhibited in conjunction with some powder of rhubarb, and some alcaline salt.

But the most simple elaterium is that which he made, when he imagined, that most of the good vegetable remedies come, as it were, prepared from the hands of nature. Accordingly he dried the wild cucumber very well, and reduced it, together with its seeds, to a powder, which he found a very good hydragogue. *Hist. de la Acad. Royale, An.* 1719.

ELEA'TICS, a sect of philosophers of Elea, founded by Xenophanes, a Colophonian. He held all things to be incomprehensible, but withal maintained many dogmatical assertions. He held that God is one, incorporeal, eternal, all sight, and all hearing, no way resembling man: that this God is all things; that whatsoever is, is eternal; that there are infinite worlds, and those immutable and eternal; that there are four elements; that the stars are certain clouds, set on fire when they rise, and extinguished when they set; that all comets, falling stars, and the like, are clouds, kindled by motion; that the sun is a fiery cloud, extinguished in its eclipses; that the moon is a close, compact, and habitable cloud; that there are many suns and moons in the several climates of the earth; that the sun promotes generation, but the moon contributes nothing to it; that the sun goes forward in infinitum, but to us seems to move circularly by reason of the great distance; that the clouds are a vapour drawn up by the sun; that the earth was first founded and rooted, as it were, in an infinite depth; that the soul is a spirit; and that all divination is false, &c.

ELECTRI'CITY (*Dict.*)—The effects of lightning and those of of Electricity appear very similar. Lightning has been known to strike people blind, the electrical shock has had the same effect on animals. Animals have been killed by both. The mariner's compass has sometimes lost its virtue by lightning; and by Mr. Franklin's experiments it appears, that polarity may be given and reversed by Electricity. The late Mr. Stephen Gray observed several years ago, that the electrical seemed to be of the same nature with that of thunder and lightning. Others have since been of the same opinion. And indeed it appears, from various experiments, that the flame of Electricity has been justly called by Mr. Franklin, a mimic lightning, since it blinds and kills animals, and melts metals, &c. like natural lightning.

This analogy is now farther confirmed by the discovery made in France, in consequence of Mr. Franklin's hypothesis, of being able, by a proper apparatus, to collect the Electricity from the atmosphere during a thunder storm. For a pointed bar of iron, 40 feet high, having been placed upon an electrical body, and a stormy cloud having passed over the place where the bar stood, those that were appointed to observe it drew near, and attracted from it sparks of fire, perceiving the same kind of commotions as in the common electrical experiments. The like effect followed, when a bar of iron 99 feet high was placed upon a cake of resin, two feet square and two inches thick. For a stormy cloud having passed over the bar, where it remained half an hour, sparks were drawn from the bar. These were the first experiments made in France, and they have been sufficiently varied and verified since; so that it seems now certain, 1. That a bar of iron, pointed or not, is electrifed during a storm. 2. That a vertical or horizontal situation is equally fitting for these experiments. 3. That even wood is electrifed. 4. That by these means a man may be sufficiently electrifed to set fire to spirit of wine with his finger, and repeat almost all the usual experiments of artificial Electricity; for such may that which is excited by friction be denominated.

It is, however, to be remarked, that these phænomena are attended with irregularities, and do not always succeed perfectly. Sometimes simple clouds, without thunder or lightning, produce more Electricity, than when there is loud thunder. Sometimes the Electricity does not shew itself but where there is lightning: in other cases, the Electricity which seemed dissipated during the rain, began again as soon as the rain ceased, although the thunder was very distant.

Mr. Franklin has contrived a very ingenious and easy way of trying experiments of this kind by means of an electrical kite, made of a large thin silk handkerchief, extended and fastened at the four corners to two slight strips of cedar, of sufficient length for this purpose. This kite, being accommodated with a tail, loop, and string, will rise in the air like those of paper. To the top of the upright stick of the cross is to be fixed a very sharp-pointed wire, rising a foot or more above the wood. To the end of the twine, next the hand, is to be tied a silk ribband; and where the twine and silk join, a key may be fastened. The kite, is to be raised when a thunder gust appears to be coming on, and as soon as the thunder-clouds come over the kite, the pointed wire will draw the electric fire from them, and the kite with all the twine will be electrified; and the loose filaments of the twine will stand out every way, and be attracted by an approaching finger. When the rain has wet the kite and twine, so that it can conduct the electric fire freely, it will stream out plentifully from the key, on the approach of a man's knuckle. At this key the phial may be charged; and from electric fire thus obtained spirits may be kindled, and all the other electrical experiments be performed, which are usually done by the help of a rubbed glass globe or tube, and the sameness of the electric matter with that of lightning may thereby be completely demonstrated.

The electrical virtue having, in some cases, accelerated and facilitated the motion of liquids through capillary tubes, the Abbé Nollet was led to suppose, that the electrical effluvia might also contribute to accelerate the growth of vegetables, and to increase the perspiration of animals, and the experiments made by that gentleman seem to support his opinion; though objections have arisen, as to what he has advanced with respect to the acceleration of the motion of fluids through capillary tubes or syphons: for Mr. Ellicott seems to have proved, that this acceleration is not barely owing to the fluids being electrified, but that other circumstances are necessary, in order to produce this effect. Mr. Ellicott observes, that if a vessel of water is hung to the prime conductor, having a syphon in it of so small a bore that the water will be discharged from it only in drops, on the water's becoming electrical by means of the machine, it will immediately run in a stream, and continue to do so, till the water is all discharged, provided the sphere is continued in motion. And the true reason of the water's running in a stream in this case seems to be, that so long as the machine is in motion, there is a constant succession of the electric effluvia excited, which visibly run off from the end of the prime conductor in a stream; and as they are in like manner carried off from all bodies hung to it, those effluvia which run off from the end of the syphon, being strongly attracted by the water, carry so much of it along with them, as to make it run in a constant stream.

Mr. Watson has given us a particular account of several curious phænomena of Electricity in vacuo in the Philosophical Transactions, Vol. XLVII. p. 362, seq. The electrical effluvia, in their passage through an exhausted glass tube, of almost three inches in diameter, afford a most agreeable spectacle in a darkened room. We may observe, not as in the open air, brushes or pencils of rays an inch or two in length, but coruscations extending the whole length of the tube, that is, in his experiment, thirty-two inches, and of a bright silver hue. These did not immediately diverge, as in the open air, but frequently, from a base apparently flat, divided themselves into less and less ramifications, and resembled very much the most lively coruscation of the aurora borealis. At other times, when the tube has been exhausted in the most perfect manner, the Electricity has been seen to pass between two brass plates, contrived so, that they might be placed at different distances from each other in one continued stream, of the same dimensions throughout its whole length.

If the exhausted tube be made part of the circuit before mentioned in Muschenbroek's experiment, at the instant of explosion, a mass of very bright embodied fire may be seen jumping from one of the brass plates in the tube to the other. But this is observed not to take place, when one of the plates is farther distant from the other than ten inches. If the distance be greater, the fire begins to diverge, and lose part of its force; and this force diminishes in proportion to its divergency, which is nearly as the distance of the two plates.

But, though the vacuum here employed greatly exceeded that which is usually made by common air-pumps, yet it was far from being perfect. These experiments were therefore tried with a Torricellian vacuum, very ingeniously contrived by Lord Charles Cavendish. The apparatus consisted of a cylindrical glass tube of about three-tenths of an inch in diameter, and of seven feet and an half in length, bent in such a manner, that thirty inches of each of its extremities were nearly straight, and parallel to each other, from which an arch sprung, which was likewise of thirty inches. This tube was carefully filled with mercury; and each of its extremities being put into its bason of mercury, so much of the mercury ran out, until, as in the common barometrical tubes, it was in equilibrio with the atmosphere. Each of the basons containing the mercury was of wood, and was supported by a cylindrical glass of about four inches in diameter, and six inches in length; and these glasses were fastened to the bottom of a square wooden frame, so contrived, as that to its top was suspended, by silk lines, the tube filled with mercury before mentioned; so that the whole of this apparatus, without inconvenience, might be moved together. The Torricellian vacuum then occupied a space of about thirty inches. In making the experiment, when the room was darkened, a wire from the prime conductor of the common electrical machine communicated with one of the basons of mercury, and, any non-electric touching the other bason, while the machine was in motion, the Electricity pervaded the vacuum in a continued arch of lambent flame, and as far as the eye could follow it, without the least divergency.

It is to be observed, that upon admitting a very small quantity of air into the exhausted tube, the phænomena disappear; not so much from the small quantity of air admitted, as from the vapours which insinuated themselves therewith. For these phænomena have been visible, though in a less perfect degree, when a much larger quantity of air was left in the receiver, by omitting to exhaust it as much as possible.

If the electrifying machine, and the man who turns the wheel thereof, are supported by electrics per se; and if a piece of wire be connected with the brass cap covering the upper extremity of the exhausted tube, or to the end of the long brass rod, by the sliding of which through a box of oiled leather, the upper brass plate may be moved in the tube; and if the other end of the wire be fastened to any part of the frame of the electrifying machine; when this is put in motion, the electrical coruscations may be seen to pass, as before, from one of the brass plates contained in the tube to the other, and to continue, unless the air insinuates itself, as long as the machine is in motion. If, under these circumstances, the hand of a person standing on the floor is brought near the sides of the glass, the coruscations will direct themselves that way in a great variety of curious forms.

This experiment, in which the Electricity is seen pushing itself on through the vacuum by its own elasticity, is considered by Mr. Watson as an experimentum crucis of the truth of his doctrine hereafter mentioned.

It may be observed in all these experiments, that a vacuum does not conduct Electricity so perfectly as metals or water. For, in the last experiment, a person standing upon the floor,

floor, and applying his finger to the upper brass cap of the tube, receives a smart stroke; and, in the former, snaps of fire may be drawn from the prime conductor. These are arguments of some degree of accumulation, while the Electricity is passing through the vacuum; since nothing of this kind happens when metals, standing upon the ground, touch the prime conductor.

Laws, &c. of ELECTRICITY.—Mr. Ellicott, from carefully observing the various phænomena of Electricity, thinks that the following conclusions, or general laws, may be justly deduced from the phænomena.

1. That these remarkable phænomena are produced by means of effluvia; which, in exciting the electrical body, are put into motion, and separated from it.

2. That the particles composing these effluvia strongly repel each other.

3. That there is a mutual attraction between these particles and all other bodies whatsoever.

That there are effluvia emitted from the tube when rubbed, and which surround it as an atmosphere, is evident from that offensive smell arising from them, from that sensation on the hands or face, when the tube is brought near either of them, and from those sparks of light, on a still nearer approach of the finger to it.

That the particles of these effluvia repel each other, is proved by the cork balls, and the fibres of the feather repelling each other, when impregnated with them; and by the leaf-gold being repelled by the tube, and not returning to it again, until by coming near, or touching some non-electric body, the effluvia are drawn off from it. From this property it is, that these effluvia expand themselves with so great a velocity, whenever they are separated from the electric body; and, as they are likewise capable of being greatly condensed, may we not from hence justly conclude they are elastic?

That there is a mutual attraction between these effluvia and most other bodies, appears from their collecting from the tube such quantities thereof, as to endue them with the same properties with the tube itself, as is proved from several of the experiments above-mentioned.

These principles being admitted, it will follow, that, the greater difference there is in the quantity of electrical effluvia in any two bodies, the stronger will be their attraction. For, if the effluvia in each are equal, instead of attracting, they will repel each other; and in proportion as the quantity of electric matter is drawn from one of the bodies, will the attraction between them increase, and consequently be strongest, when any one of them has all the electrical matter drawn from it.

The particles of these effluvia are so exceeding small, as easily to pervade the pores of glass, as is evident, in that a feather, or any light bodies inclosed in a glass ball hermetically sealed, will be put in motion on the excited tube's being brought near the outside of it: and it has been generally thought that they pass through the pores of the densest bodies, and several experiments render this supposition not improbable, though none of them are quite conclusive.

Mr. Ellicott then proceeds to shew, in a very ingenious manner, how, from these principles, the phænomena of some of the more remarkable experiments of Electricity may be accounted for. But as what he says cannot, with justice to his reasonings, be abridged, we must refer the curious to his essays before quoted; only adding, that we have seen a manuscript of his, where he endeavours to account for the experiment of Muschenbroek on these principles, in a manner that makes us wish to see the rest of his experiments, observations, and reasonings on this subject published.

Mr. Watson has endeavoured to prove, that Electricity is not furnished from the glasses employed in the experiments, nor from the circumambient air. He thinks that Electricity is the effect of a very subtile and elastic fluid, occupying all bodies in contact with the terraqueous globe, and that everywhere in its natural state it is of the same degree of density; and that glass, and other bodies, which are called electrics per se, have the power of taking this fluid from one body, and conveying it to another, in a quantity sufficient to be obvious to all our senses; and that under certain circumstances, it is possible to render the Electricity in some bodies more rare than it naturally is, and, by communicating this to other bodies, to give them an additional quantity, and make their Electricity more dense; and that these bodies will thus continue until their natural quantity is restored to each; that is, by those which have lost part of theirs, acquiring what they have lost, and by those, to which more has been communicated, parting with their additional quantity. Both one and the other of these is, from the elasticity of the electric matter, attempted to be done from the nearest non-electric; and when the air is moist, this is soon accomplished by the circumambient vapours, which here may be considered as preventing, in a very great degree, our attempts to insulate non-electric bodies.

Mr. Watson's system naturally leads him to ask, by what denomination shall we call this extraordinary power? From its effects in these operations shall we call it Electricity? From its being a principle neither generated nor destroyed; from its being every-where and always present, and in readiness to shew itself in its effects, though latent and unobserved, till by some process it is produced into action, and rendered visible; from its penetrating the densest and hardest bodies, and its uniting itself to them; and from its immense velocity; shall we, with Theophrastus, Boerhaave, Niewentiit, s'Gravesande, and other philosophers, call it elementary fire? Or shall we, from its containing the substance of light and fire, and from the extreme smallness of its parts, as passing through most bodies we are acquainted with, denominate it, with Homberg and the chemists, the chemical sulphureous principle, which, according to the doctrines of these gentlemen, is universally disseminated? Whatever we call it, it seems certain, that this power has many surprising properties, and cannot but be of great moment in the system of the universe.

ELECTRO'METER, an instrument contrived to measure the force of electricity.

M. d'Arcy, in the Memoirs of the Royal Academy of Sciences at Paris, has given us the following curious Electrometer.

Plate XX. *fig.* 5. is a large vessel A B containing a glass bottle C D called the philosophical egg: at the extremity of the neck of this bottle is fitted on the rod V, perfectly cylindrical, one line in diameter and twelve inches long. The vessel A B is covered again at the top with a plate of brass H which fits close upon it; this plate has a large perforation at its center, and so has the vessel, that the rod may pass through at liberty. At the upper extremity of the rod is the small circular plate of brass L, fourteen lines one sixth diameter. The vessel A B being full of water, the egg is immersed to a certain depth, which ought to be such, that the instrument being at rest, that is, not electrified, the lower extremity of the egg may be as near as possible to the bottom of the vessel without touching it. That the egg and rod may always be in a vertical situation, the egg is ballasted with mercury, by which means, the center of gravity being very low, the whole keeps itself perpendicular to the horizon, and proves by the least possible motion of the egg, from its balance, that if it were not confined, it would go towards the sides of the vessels, and swim sometimes on one side and sometimes on the other; wherefore it was necessary to determine it to a center in the following manner. On the plate H are fixed fine silver wires in the form of a cross, like those in micrometers; this cross is formed by double wires, which leave a small square space in the center of the plate, which being larger than the diameter of the rod, permits it to ascend and descend between the wires without any sensible friction, and yet restrain it from erring from its center: and this singular phænomenon arises, when the whole machine is strongly electrified, the rod keeps in the middle of the wires almost without touching them, because, being electrified as well as they are, it avoids them continually.

After this description of the instrument, it is easy to conceive its use, especially if we attend to this known principle in hydrostatics, that a body immersed in water swims on the surface or sinks in it, in proportion as a volume of water, equal to that it possesses, is lighter or heavier than the body itself; from this principle it follows, that a volume of water equal to that of the egg, and that part of the rod immersed in the water when the whole is at rest, was equal to the egg, the little plate, and all the rod: consequently, if the whole be elevated one inch, the power which will sustain it at this height, will sustain a weight equal to a volume of water of the thickness of the rod, and an inch above; because the volume of water which the egg and rod then possess, is lessened by this quantity. If, therefore, different powers suspend it at 1, 2, 3, and 4 inches, &c. in height above the point of rest, these powers will be, with regard to each other, as these numbers, double, triple, quadruple, &c. You will see in a moment that electricity produces the same effect upon the Electrometer, that is, it performs the function of a power which would suspend it at 1, 2, 3, and 4 inches, &c. above its point of rest; and, consequently, that by means of this instrument we may estimate all its different degrees of force. Let us suppose, for example, the whole machine composed of the vessel A B, the egg, &c. placed like that in *fig.* 6, on a recipient of glass or any other electric per se. Electrify the vessel A B, the rod V and plate L will become electrified also. Now it is admitted that all electrical bodies repel each other; thus the little plate L and the rod V, being repelled by the great plate H, will necessarily rise more or less in proportion to the strength or weakness of the electricity. Electricity, therefore, will, as I have said before, perform the function of a power, that will suspend the instrument to a certain elevation; but as these powers are proportional to the elevations of the instrument above its equilibrium, or point of rest, these elevations also will be in proportion to the different degrees of the force of electricity: this is therefore a true Electrometer. But this instrument is of much more extensive use than barely this; for it may be employed in a great number of electrical experiments, to determine the laws of attraction,

traction, repulsion, transmission, &c. in electrical bodies: discoveries equally important with that of mensurating the electrical force.

Method of using the ELECTROMETER.—As electrical bodies have this inconvenience, that they cannot be approached, without destroying their electricity, it is evident, that, if we come so near the Electrometer as to judge of its motions with exactness, we should destroy its electricity. This reason determined us, after a number of attempts, to make our observations in the following manner: we place a great lanthorn with a large wax candle, in a part of the room which projects its light through a hole on the Electrometers I, K (we have not drawn the lanthorn in the plate, for fear it might have caused some confusion, and have therefore only exhibited the stream of light) behind these Electrometers is a very solid frame Q, all the part X is wood, but it may be of any opaque matter. In this frame are cut two rectangles or windows filled with glasses, on which are marked very exact divisions with strong Indian ink.

This frame is so disposed that the projection of the Electrometers may fall upon the glasses, and the extremity of the rod D, being made in the form of a cone, projects a very nice shadow. Now, as these glasses are transparent, the observator, placed behind in F, sees, in the most distinct manner, all the different elevations of the Electrometer, and can therefore judge of all its variations with the utmost exactness: for, the plane of the square being perpendicular to the horizon, and Electrometer rising and falling in a parallel plane, the elevations and depressions of the shadows are always correspondent to those of the Electrometers. The chains M serve to conduct the electricity from the bar of iron or any other electrified body to the Electrometers: the square Q, instead of two windows, may have but one, that being sufficient for the Electrometer: but we must at the same time make our observations on the instrument with which we made the experiments, and the Electrometer too, to be assured that the electricity is always equal, which cannot be done without comparing their shadows very accurately. The construction of the Electrometer shews, it has all the essentials to an instrument of this kind.

1. As the electrical force is very weak, the instrument must be very nice and sensible of the least impression: therefore the weight of eight grains laid on the little plate makes it sink above four inches.

2. As the electrical force is very subject to alterations, the instrument must be so contrived as to exhibit all its variations; a thousand experiments have convinced us that the least alteration, in the force of electricity, immediately affects this Electrometer. It is in short universal, for the true Electrometer is the cylindrical rod V, which determines the quantity of electrical power by the number of its parts raised above the point of rest: now it is not difficult to procure a cylindrical rod of a line diameter. It is true the diameter of the little plate L and its distance to H, the point of rest, may cause some differences in the repulsion; but it is easy to observe all these proportions, so that any one may construct an Electrometer, which will be operated upon, like ours, by the same power of electricity: this property seems to me one of the most remarkable in our instrument, like that of M. Reaumur's thermometer, which all Europe has admired. As I have said our Electrometer might be used as an instrument, it may be proper to give some account of the experiments we have made. In order to discover whether electricity is in proportion to the bulk or surface of bodies, we applied ourselves in the manner following: the instrument E served for an Electrometer, the other I was designed to make the experiment on, above this last was suspended perpendicularly, at the distance of ten inches, a cap or portion of the sphere PS; this cap was of hammered iron, very thin, and of a very regular figure; it received its electricity from the electrical bar by a brass wire, and, being suspended on silk, preserved it. The chain in *fig.* 6. extends to both instruments, but in this experiment it only communicated with the Electrometer, so that the instrument was not electrified. One person made his observation on the square of the height of the Electrometer caused by the electricity, another observed the elevation of the instrument; and several repeated experiments confirmed us in the opinion that the elevation of the instrument was in proportion to the force of the electricity, and this we found to answer exactly, after having repeated the experiment above fifty times. We afterwards poured mercury into this cap till it increased the weight sixty times, and found no sensible alteration in the experiment: this seems to shew that the attraction of electrical bodies is in proportion to their surfaces; but this is a mattter of doubt, for the fire and sparks drawn from an electrical body may observe some other law. Certain it is that a piece of any metal must be of a certain thickness to extract shining sparks from, otherwise you only procure such a kind of fire as is extracted from electrified wood of any thickness; yet the sparks we extract from the middle of a plate of iron are very strong; and those extracted from the cap, either with or without mercury, seemed to have no difference. We have, in short, found by a multitude of experiments, that the gravity or levity of a body neither increase nor diminish its electricity.

I shall add another experiment we made to try whether an electrical body always transmitted the same quantity of electricity, of whatever volume it was. Every thing being disposed as in *fig.* 6, except that the instrument with which we made our experiment, instead of communicating with the iron bar by a chain, had a communication with it by a very fine iron wire; we electrified the bar of iron, and made our observations on the Electrometer and the instrument: we afterwards substituted a much thicker wire in the room of the fine one, repeated the experiment, but did not find the least difference in the result, though it was performed several times with wires of all the different sizes, that could be procured.

The objections to our Electrometer are of three kinds, its certainty, universality, and the method of making use of it. It may be asked in the first place, whether the egg immersed in water be not more or less repelled by the bottom of the vessel, which would affect the Electrometer, without any alteration in the electricity? I answer that a body totally immersed in a fluid receives no motion from electricity, and this is a fact confirmed by experiments. 2. It may be asked whether the bodies which transmit the electricity to the Electrometer, may not act differently on the Electrometer? The experiment I have produced of wires of different magnitudes transmitting the same quantity of electricity sufficiently proves electricity to have the property of fluids, which always endeavour to preserve a plain surface, whatever are the canals of their communication. Besides, it follows from this property, that the least change of electricity, in a body composing the mass of those which are electrical, equally influences the whole mass; which solves another objection that might be made against the vessels of glass on which we support our Electrometer: it may be said, that, being more or less dry, they might lose their electricity, and the Electrometer sink, though there was no alteration in the electrical bodies themselves: but the last property I have mentioned proves, that electricity, like a fluid, endeavours to preserve an even surface, and is therefore acted upon equally; and this is supported by a number of experiments.

It may in the last place be objected, that the instrument, notwithstanding all I have said about it, is too coarse to be affected so nicely, and that we are therefore apt to draw false consequences from it; but the following experiment will shew this objection intirely groundless.

The iron bar which receives the electricity of the globe was placed at the distance of above twenty inches from it; a communication was made afterwards between this bar and the Electrometer: and, the chamber being made very dark, we began to electrify. The electricity which the bar received by this method was so weak that we could scarce be sensible whether it was electrified or not, by trying to draw sparks from it; and what were drawn, were so weak, they scarce deserved the name, notwithstanding which, our Electrometer which had a communication with the iron bar rose above a degree. This sufficiently demonstrates the nicety of the instrument and how easily it is acted upon; this too might, if there was occasion, be still increased by lessening the diameter of the rod.

The strongest objection against the universality of our instrument is the different density of water in different climates: but I answer, if a rod be made which will descend four inches with the weight of eight grains, the Electrometer will be as correct as ours. It may be objected, that in a hot country such a rod might be more repelled, because it would be bigger than ours; but, as the rod is only repelled in proportion to its circumference, the difference can scarce be perceivable.

It may be imagined that different positions of the Electrometer, with regard to the frame and lanthorn, may change the apparent ascent or descent, but a very simple experiment will bring these to a certainty. Your Electrometer, &c. being placed as before directed, load the little plate with eight grains, and see how many degrees that will make the Electrometer descend upon the frame; the sum of these degrees, compared with the sum of the degrees which the same weight would have made another Electrometer, on which the same experiment had been made, pass through, will give their exact proportion. *Mem. de la Acad. Royale*, 1749.

ELEOSA'CCHARUM (*Dict.*)—After the chemists had shewn physicians, that the spirit residing in essential oils contained, in a small volume, all the particular virtues of the plants; physicians prudently reflected, that they had hence an excellent instrument in their art; but the unctuous tenacity of the oil still prevented its being used with safety, because these oils, being extremely sharp, and, by their tenacity, remaining fixed to one part, occasioned inflammations. Hence they began to think of a method of rendering these oils miscible with water, and uniformly conveying their intire virtues to the places intended; and this they found might be affected by the means of sugar.

Grind, therefore, an ounce of dry loaf sugar to an impalpable

ble powder, in a glass mortar, with a glass pestle; and, by degrees, add thereto a drachm of any essential oil, or half a drachm, if the oil be very tenacious; and continue rubbing them together, till all the oil is perfectly mixed, and drank into the sugar. The oil, in this operation, usually diffuses a fragrancy to a great distance; the operation, therefore, should be performed quick, and the mortar be covered with a cloth, surrounding the pestle. If a little fresh white of an egg be added in the grinding, and mixed in with the sugar and oil, the oil thus becomes more easily miscible; but the mixture will not thus keep so long, without turning rancid. And thus sugar, which is a very pure soap, or a true essential oily salt, divides the glutinous tenacity of the oil, interposes itself betwixt the principles thereof, unites them closely with itself, and makes an extemporaneous soap; which may thus be commodiously diluted with water, for medicinal uses: for though this mixture is not so perfect as in an actual soap, or true essential salt, yet it suffices for use; nor is there reason to apprehend any inconvenience from the sugar, in this preparation; for sugar is unjustly said to be unwholesome, as there are no proofs extant thereof. On the contrary, it is a wonderful salt, that perfectly mixes with water, and ferments therewith into wine: and yet, what is exceedingly suprising, it appears oleaginous, and perfectly inflammable in the fire; whence it is known to consist of oil and salt.

If these Eleosacchara be well prepared, dried, and put into clean glasses, exactly closed with glass stoppers, they may long be preserved perfect; and, in this manner, very effectual medicines might be commodiously carried from place to place, and, upon occasion, be directly used on a journey, by adding a little of the Eleosaccharum to a glass of wine. An Eleosaccharum might, also, be made, by grinding an essential oil with a fixed alcaline salt; by which means, also, a kind of soap is obtained: but alcalies thus destroy the grateful properties of the essential oils, and change their natural tastes and odours. Such Eleosacchara, also, would presently resolve in the air, and thence be easily spoiled. By the former method, therefore, physicians may prepare an excellent medicine, rich in virtues: for, if the Eleosaccharum of mint be dissolved in distilled mint-water, then strengthened with the addition of the spirit of mint, and the mixture sweetened with the syrup of the same plant, the whole virtues of mint may thus be obtained.

Remarks.

Hence appears the saponaceous property of sugar, which fits it for breaking and dividing the bodies of oils, as if they were in a manner fermented with sugar; and, at the same time, it does not diminish, but rather improves, the particular virtue of these oils: whence the ancients, who were unacquainted with sugar, mixed oils with honey, for the like purpose. And hence we learn the virtue of sugar in the body; where, being diluted with the natural juices, it affords a saponaceous lixivium, which, by the force of circulation, dissolves unctuous and viscous substances: whence it does not generate, but dissolves phlegm; nor does it increase the bile, nor turn into it, but opens, thins, and divides it; though, by dissolving the oils too much, it may occasion leanness; as, by attenuating too much, it produces a weakness and relaxation of the parts, and is, therefore, often found prejudicial in the rickets and the scurvy. In the mean time, this production of nature and art is, as we above observed, very singular and extraordinary; for it intirely dissolves in water, melts in fire, shoots like a perfect salt into perfect crystals, is manifestly fixed, and, if distilled in close vessels, affords an acid penetrating spirit: in an open fire it becomes wholly inflammable; it is fermentable, and thus convertible into strong wine, which will afford alcohol; and, lastly, it may be converted into sharp vinegar. If it be called a salt, we may ask how it comes to be inflammable in the fire: if an oil, how it comes to crystallize? If an essential salt, how it comes to ferment? So that, perhaps, in all nature there is no other body found, in which all these properties conspire. *Boerhaave's Chemistry.*

ELEPHANT (*Dict.*)—The Elephant is said to have four venters, and lungs four times as big as an ox. His genital member is like that of a horse, but less; and the testicles lie inward about the reins. The fore legs are much longer than the hind legs, of short joints, and of equal bigness, both above and beneath the knees; the ancle-bones are very low; he bends his hind legs as a man when he sits, but not both together, and so, leaning on one side, sleeps most commonly against a tree. Their feet are round like horses, and as broad as a bushel, having five distinct toes upon each foot, which are very little cloven, but without nails. They are for the most part of a mouse colour, or darkish brown. See *Plate* XXII. *fig.* 6.

Taming of ELEPHANTS. The method of taking and taming this creature, in the island of Ceylon, is as follows: the natives pitch upon a proper place for a warren, or park, which is broad at the entrance, and grows narrow farther in, till, at the end, it is so narrow, that an elephant cannot turn himself, and it runs on of this narrowness so far, that twenty elephants may stand in it one behind another. When the inclosure of this warren is finished, all the people of the neighbouring places assemble, and make a circumference round the woods, where they know there are elephants, which takes in, perhaps, sixty miles. The men now stand at twenty-five yards distance, and kindle fires between them, and make all the noise they can, by shouting, blowing horns, beating drums, and the like, and, by degrees, approach nearer and nearer the warren. The elephants run from the fires and noise, and consequently can go no where but towards the warren; the men, who every way surround them, except on the warren side, follow upon them in this manner, till they come together, and make a ring, and the Elephants are driven into the inclosure. When these creatures perceive that they are thus taken, they make resistance, and often turn upon the men; but there are always near the warren fences of poles, lying flat upon the ground, which the hunters need only raise up, and they keep in the prey, so that they can neither escape, nor injure them; they then pursue the Elephants with fire-brands, and drive them into the narrow part where they cannot turn.

They are, from this place, taken one by one, and led to the stable, each between two tame Elephants bred for that purpose, the points of whose long teeth are cut; and these, if the wild Elephant be troublesome, will lay hold of his trunk with theirs, and beat him with their teeth. A man, sitting upon each of the tame Elephants, directs them by a staff with a hook at the end, with which he occasionally touches their heads, and orders them, as he pleases, without bridle, or any other furniture. When they are brought into the stable, they are led between two posts, with stakes put athwart before their breasts, and under their bellies, and are so tied that they cannot stir, nor lie down upon the ground; for, if permitted to lie down, they would become sorrowful, refuse to eat, and in some time die. They are here fed with the trunks of plantains, a food they much delight in; and, when they have been kept thus about six weeks, they become tame enough for sale. If not sold at that time, they feed them about six weeks longer with cocoa leaves, and they are, at the end of that time, perfectly tame as a spaniel, and will eat grass with the oxen in the fields. *Philos. Trans.* N°. 277.

The Elephants of Ceylon have been so long hunted, that they now know man for their mortal enemy, and seldom fail to seize upon and kill him, whenever they meet him; but if a man lie upon the ground, and pretend to be dead, they never meddle with him. Several people have, in this island, lain asleep while Elephants passed by them, and some have only pretended sleep, and a perfect stillness has always been found to preserve them, even though the creature came up to examine them.

ELIXIR (*Dict.*)—ELIXIR *of aloes*, a name given, in the late London Dispensatory, to the medicine commonly known by the name of Elixir proprietatis, which is there also ordered to be made in the following manner: take tincture of myrrh, a quart; powder of aloes, and fine saffron, of each three ounces; digest them a due time, and then press off the tincture, and filtre it for use. *Pemberton's London Dispensatory.*

ELIXIR *paregoricum*, a name given, in the late London Dispensatory, to the Elixir asthmaticum of Quincey; which is there ordered to be made thus:

Take flower of benjamin, and strained opium, of each a drachm; camphire, two scruples; essential oil of aniseeds, half a drachm; rectified spirit of wine, a quart; digest all together a proper time, and then strain off the spirit. *Pemberton's London Dispensatory.*

ELLIPSIS *in grammar* (*Dict.*)—F. Bossu considers the Ellipsis, as a way of disguising sentences, by suppressing the word which should make the particular application, and leaving the whole in a kind of ingenious ambiguity.

Thus, the Trojans, in Virgil, being reduced by Turnus to the last extremity, and ready to be destroyed, spy Æneas coming to assist them: upon which the poet says, Spes addita suscitat iras. Which expression signifies either, in particular, that the hope they conceive retrieves and augments their courage: or in general, that the hope of assistance at hand naturally raises courage, and gives new strength.

If the poet had added a word, and said, Ollis spes addita suscitat iras, the passage had been expresly restrained to the first sense; and had ceased to be a sentence, and commenced only the application of a sentence. The suppression of that word makes it a sentence in form.

This that excellent critic looks on as one of the finesses of the Latin tongue; wherein it had vastly the advantage of the modern tongues. *Trait. du Poeme de Epique.*

ELM-TREE, *ulmus*, in botany, a genus of trees whose characters are;

The flower consists of one leaf, which is shaped like a bell, having many stamina, or threads, in the center: from the bottom arises the pointal, which afterwards becomes a membranaceous or leafy fruit, almost heart-shaped; in the middle of which is placed a pear-shaped seed vessel, containing one seed, for the most part of the same shape.

These trees are very proper to plant in hedge-rows, upon the borders of fields, where they will thrive much better than, when planted in a wood, or close plantation; and their shade will not be very injurious to whatever grows under them; but, when

when these trees are transplanted out upon banks after this manner, the banks should be well wrought and cleared from all other roots, otherwise the plants, being taken from a better soil, will not make much progress in these places. About Michaelmas will be a good time for this work, for the reasons before assigned; but when they are planted, there should be some stakes fixed in by them, to which they should be fastened, to prevent their being displaced by the winds; and part of their heads should be taken off, before they are planted, which will also be of use in preventing their being easily overturned by winds; but by no means should their leading shoot be stopped; nor their branches too closely cut off; for, if there are not some shoots left on to draw and attract the sap, they will be in danger of miscarrying.

These trees are also proper to plant at a distance from a garden or building, to break the violence of winds; for which purpose there is not any tree more useful; for they may be trained up in form of an hedge, keeping them cut every year; which will cause them to grow very close and handsome, to the height of forty or fifty feet, and be a great protection against the fury of winds: but they should not be planted too near a garden, where fruit trees, or other plants, are placed; because the roots of the Elm run superficially near the top of the ground to a great distance, and will intermix with the roots of the other trees, and deprive them of nourishment. Nor should they be planted near gravel or grass walks, which are designed to be well kept; because the roots will run into them, and send forth suckers in great plenty; which will deface the walks, and render them unsightly.

But, for large gardens, where shade is required, there is scarce any tree so proper for that purpose, being easy to remove, when grown to a considerable size; so that a person who is willing to have his plantations for shade in a short time, may procure trees of one foot circumference in their trunk, which will be in no danger of succeeding, provided they are removed with care. And these will take root, and grow again, almost as well as young plants, which is what few other sorts of trees will do; but then they should be such trees as have been thus regularly trained up in a nursery, and have good roots, and not such as are taken out of hedge-rows, as is by some practised, which seldom rise with any tolerable roots, and consequently often miscarry; and this has been the occasion of so many plantations of these trees failing; for although some of them may live a few years, yet few of them are of long duration, and they rarely increase much in their stems, but frequently grow hollow, their heart decaying first; so that they are supported only by their bark or shell, for a few years, and the first severe winter, or very dry summer, they are generally destroyed.

In planting of these trees, great care should be taken not to bury their roots too deep; which is very injurious to them, especially if they are planted on a moist loam or clay; in which case, if the clay is near the surface, it will be the best way to raise the ground in an hill, where each tree is to be planted, which will advance their roots above the surface of the ground, so that they will not be in danger of rotting in winter with moisture.

When these trees are propagated by suckers taken from the foot of old trees, they are commonly laid into the ground very close in beds, where, in dry weather, they may be frequently watered, to encourage their putting out roots. In these beds they are left two years; by which time, those that live, will be well rooted, though a great many of them generally die; then they should be transplanted into the nursery.

There are some who raise the witch Elm from seeds, which it generally produces in great plenty, and are ripe in April. These should be sown upon a bed of fresh loamy earth, and gently covered; in dry weather they should be watered, and if the bed is shaded from the violent heat of the sun, it will be of great service to the seeds, for I always observe the plants to come up better in the shade, than when exposed to the sun. When the plants come up, they should be carefully cleared from weeds; and after they have stood two years in the seed bed, they will be fit to plant out into the nursery.

Sometimes the common English Elm will produce seed; but it is not so constantly fruitful as the witch Elm, which seldom fails to produce great quantities, when they have arrived to due maturity; which seeds will fall to the ground, and when they light upon a spot which is not disturbed, the plants will come up in great plenty.

The timber of the common English Elm is generally preferred to the rest; though that of the witch Elm is often as good, and is the largest tree, when planted on a kindly soil; but the Dutch Elm affords the worst timber, and never will grow to the stature of either of the other sorts; so that this should not be cultivated for the timber; therefore the best way to be sure of the kinds which a person would chuse to propagate, is to have a nursery of stools, in order to furnish layers; for when they are grubbed up from hedge-rows, there will often be many sorts intermixed, especially if the people who go about to gather them, furnish them; because they take them indifferently, wherever they can procure them; so that when they are planted out thus blended together, there will be a considerable difference in their growths, which will deface the plantation.

Mr. Dodart, in a discourse made before the Paris academy, on the great fecundity of vegetables, and their prodigious increase, chose this tree as an example of it. He observed an Elm of about six inches diameter in the body, and about twenty feet high to the branches; he ordered one of the branches to be cut off, and, without reckoning the seeds which had been shaken off by the blows of the weapon, or lost by the fall, he counted the rest only which remained on. This branch was about eight feet long, and on this there were 16450 seeds. Counting in a very moderate way, there must be reckoned, at least, ten such branches as this, on an Elm of that growth. The product of these ten branches will be then 164500 seeds.

All the branches which are shorter than eight feet, on the same tree, taken together, on a most moderate computation, must be allowed to make a surface more than double that of these ten branches. The product of this surface of the short branches, therefore, will be 329000.

An Elm may very reasonably be supposed to live a hundred years, and as the Elm, here mentioned, was but of twelve years growth, it cannot be supposed, in that state, to be yet arrived at its middle degree of fertility in seeds; therefore the smallest addition that can be made to the 329000, will bring it to at least 330000, for the mean yearly product of seeds of the tree; and to know what is the whole product of an Elm in seeds, according to this computation, this sum must be multiplied by a hundred, the number of years of the duration of the tree. Thus the smallest amount will be thirty-three millions of seeds, produced by an Elm originally raised from one single seed. *Hist. Acad. Par.* 1700.

This, however, is no more than the natural produce of the tree, in its wild state; we all know very well, that proper management will make trees yield abundantly more fruit than they naturally would. Thus, if this Elm, at a proper stage of its growth, had been lopped off at the head, it would have pushed out infinitely more numerous branches; and a set of these would have appeared in a circle round the trunk, at about half an inch from the place where it was cut off, and this would have been the case in whatever part, or at whatever height, it had been cut. All the trunk of the tree, from the ground up to the beginning of the natural eruption of the branches, being then full of these rudiments of branches, placed in circles, and separated by circular spaces of about half an inch deep, composes so many circles of branches, or rudiments of branches, as there are half inches in measure from the ground up to the first natural rudiments; all these rudiments are formed, therefore, all ready to appear in form of complete branches, and all contain, in miniature, their proportion of seeds, and any circle of them may be made to shoot out and appear, by only cutting off the trunk just above them; these are all, therefore, to be allowed really to exist, and all to be brought into the account of the providence of nature, in the fecundity of the tree, as all are formed and provided for it. There are therefore evidently contained, in the Elm, so many times thirty-three millions of seeds, as there are half inches in twenty feet, which was its measure from the ground to the first branches: that is to say, this tree contains actually in itself 15840000000 rudiments of seeds, or has so many bodies inclosed in itself, by each, or any one of which, it is capable of multiplying its species, and of producing so great and astonishing a number of trees. The imagination is startled at being conducted to so amazing a scene by reason.

What are we to think then of the immensity of the works of the great Creator of the universe, when we consider that every one of these seeds contains in itself a tree, loaded with an equal number of seeds, and each of those another tree, loaded in the same manner, and so on, beyond the utmost extent of our capacity; and that consequently here is a geometrical proportion, or progression of increase, the first term of which is 1, the second 15840000000, the third the square of that number, the fourth the cube, and so on to infinity. Reason and imagination are lost together in the immensity of such a calculation? *Mem. Acad. Par.* 1700.

E'LOHA, in scripture, the singular of Elohi, one of the names of God.

E'LOHI, Eloi, or Elohim, in scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse is what assists us in judging rightly concerning the true meaning of this word. It is the same as Eloha. One is the singular, the other the plural. Nevertheless Elohim is often construed in the singular number, particularly when the true God is spoken of; but when false gods are spoken of, it is construed rather in the plural. *Calmet. Diction. Bibl.*

E'LVERS, an English name for a small sort of eels, caught in some parts of the kingdom, particularly about Gloucester and Tewksbury. These are, in reality, young congers, or sea eels. They get up into rivers, while very small. They are taken in prodigious numbers in the rivers, in dark nights, and

and are esteemed a very delicate food. *Willughby's Hist. Pisc.*

E'LUL, one of the Hebrew months, answering pretty near to our August. There are but nine and twenty days in it. It is the twelfth month of the civil year, and the sixth of the ecclesiastical. Upon the seventh or ninth day of this month the Jews fast, in memory of what happened after the return of those who went to view the promised land.

ELUTRIA'TION, in metallurgy, is the separating the lighter matters from the mixed ores of metals, by means of great quantities of fair water. Solid bodies, not dissoluble in water, are by this operation separated from each other by water very well stirred, so that the lighter and the finer parts are carried away with the water, and the heavier and more solid remain at the bottom of the vessels.

ELYCRY'SUM, in botany, the name of a large genus of plants, the characters of which are these: the flower is of the flosculous kind, being composed of several small floscules, divided into segments, arranged in a stillated form at the ends; these stand on the embryo fruit, and are contained in a common scaly husk or cup, which is of a very glossy and splendid appearance, and of a gold or silver colour, or of some other gaudy tinge. The embryo's finally ripen into seeds, winged with down.

E'MERALD *Colour*, in the glass trade.—The way of giving this beautiful dye to glass is this: in the pots of melted metal, made of pulverine, and without manganese, when the matter is well purified, put a little crocus martis calcined with vinegar. About three ounces of this crocus is enough for a hundred weight of glass; let it stand till thoroughly mixed, then put in to every hundred weight of metal two pounds of calcined brass; this must be added at six different times, letting the metal stand two hours every time. When this is all in, make a proof of the metal, and, if it have any bluishness, add more crocus martis, a small quantity at a time. When the whole is of a fine leek green, let it stand twenty-four hours to mix thoroughly, and then work it. *Neri's Art of Glass.*

EME'RUS, *scorpion sena*, in botany, a genus of plants, whose characters are:

It hath leaves like those of the colutea: the flowers are papilionaceous: the pods are slender, and contain two or three cylindrical-shaped seeds in each.

These shrubs are easily propagated by sowing their seeds, which they commonly produce in great plenty, in March, upon a bed of light sandy earth, observing to keep the bed clear from weeds; and in very dry weather you must often refresh the bed with water, which should be given carefully, lest the seeds should be washed out of the ground by hasty watering. When the plants are come up, you must continue the same care; and the Michaelmas following, if your plants have thriven well, you may draw out the largest; which may be transplanted into a nursery, at three feet distance row from row, and one foot asunder in the rows. This will give room to those plants which are left to grow in the seed bed; in which place they may remain another year, when they will also be fit to transplant into a nursery; where they should be trained up in the manner you design them to grow, either in round heads, or in rude plants. In one or two years more they will be fit to plant out, where they are to remain for good: in doing of which you should be careful, in taking them up, not to break or wound their roots: nor should they remain too long in the nursery before they are transplanted: for they are subject to shoot downright roots, which, when cut off, oftentimes prove the death of the tree. In all other respects it must be treated like other flowering shrubs; amongst which, this is commonly sold at the nurseries. It delights in a dry soil, and may also be propagated by laying down the tender branches; which will take root in about a year's time, and may then be transplanted into a nursery, and managed in the same manner as the seedlings. *Miller's Gard. Dict.*

EMMENAGO'GA, (*Dict.*)—Under this term the great Hoffman also included those medicines which excite a flux of blood from the hæmorrhoidal veins; as the roots of birthwort, zedoary, and the five aperient roots; the herbs mugwort, calamint, feverfew, penyroyal, baum, savin, polium montanum, rue, marjoram, rosemary, wall-flowers, saffron, bay-berries, juniper-berries; the gums bdellium, myrrh, galbanum and amber: among purgative substances, aloes, rhubarb, and bryony; as also aromatics, and animal salts; castor, and chalybeated preparations, which excel all others of the mineral and chymical kind.

The more these excretions are subservient to life and health, the more it were to be wished, with Hippocrates, that we had certain and efficacious medicines for regulating them, and by that means preventing and curing several very terrible disorders. But as these excretions are principally the work of nature, and, in women, appear, return, and end, at certain periods; but are neither incident to all women, nor so periodical as the menses; and as a certain redundance of blood, together with a certain state of the vessels of the anus and uterus, disposed to a spontaneous evacuation, are requisite, in order to these discharges; and as these evacuations may be obstructed, or totally destroyed, by various causes; it must of course be a difficult task to fall upon effectual means of restoring these evacuations when stopped, or enlarging them when impaired; neither of which ends can ever be obtained without knowing the cause from which the misfortune proceeds.

But, supposing that there is a redundance of blood, the principal cause of this evacution; supposing, also, that the vessels of the uterus and anus are so disposed, that they may be distended by a large quantity of blood flowing to them, and be capable of discharging this blood; yet, if the excretions are not duly carried on, either on account of obstructions, or spasmodic constrictions of the small lateral vessels of the arteries, in consequence of which, the blood does not circulate naturally, or on account of a diminution of the spirituous principle of the blood, and the elastic contractile force of the heart and arteries; then the above enumerated medicines afford the desired relief: for the capillary vessels are excellently opened, and obstructions removed, by the five aperient roots, birthwort, rhubarb, bryony, and wall-flowers, especially if exhibited, by way of decoction, with some saline stimulus, such as borax. This intention is also excellently answered by the gums exhibited with aloes, and other purgatives, in the form of pills. The small and capillary ducts, when spasmodically constricted, or preternaturally contracted, are excellently relaxed and opened by mugwort, which is of a demulcent nature, as also by yarrow, saffron, and castor. In order to restore the spirituous principle of the blood, strengthen the solids, and confirm the tone of the fibres and vessels, such corroboratives are to be used, as operate by their fine volatile and oleous salt; among which we may reckon all aromatics, myrrh, the berries of the bay and juniper-trees, rosemary, penyroyal, baum, savory, savin, wall-flowers, calamint, amber, filings of steel, chaly beate tinctures, and volatile oleous salts.

When the evacuation is impaired, or rendered slow, by a redundance of blood which too powerfully resists the elasticity of the vessels, the emmenagogues already mentioned, especially those of the hotter kind, are by no means to be exhibited; for by these the blood is thrown into violent commotions, and a train of formidable symptoms are frequently brought on. In this case, therefore, venesection in the feet is to be recommended, since, by means of that alone, these salutary and critical evacuations are often happily restored.

Nor are the emmenagogues already enumerated proper, in cases where there is a deficiency of blood, and laudable juices, as in persons recovering from the shock of a disease, those whose primæ viæ are stuffed with viscid sordes, or those the villous coats of whose stomachs are lined with a viscid mucus, and by that means digestion and chylification unduly carried on. In cases of this nature, the principal intention of the physician ought to be, not only the regeneration of a good and laudable blood by nutritive gelatinous substances, and broths, easily convertible into blood and juices; but also, if necessary, the restitution of the digestion and elaboration of the chyle by emetics, gentle purgatives of a saline aperient nature, and bitter stomachics.

These evacuations are frequently stopped by obstructions and infarctions of the vascular substance of the anus in men, and the internal part of the uterus and vagina in women; in consequence of which, they admit no blood, however strongly propelled to them. In these cases forcing medicines are not only superfluous, but pernicious, unless the indurated and infarcted vessels are previously relaxed and softened by proper medicines. And this intention can neither be more speedily nor efficaciously answered, than by baths, or fomentations, or vapour baths, so contrived, that a vessel full of warm water, impregnated with mugwort, penyroyal, and chamomile flowers, may be placed under the abdomen in such a manner, that the steam may ascend and penetrate into the uterus and adjacent parts. This is to be done in a warm room, with the patient's body well covered; and, in order to keep the water warm, red-hot flints are now and then to be put into it. Frictions of the legs and thighs with warm cloths, especially after bathing with sweet water, also contribute very much to the production of this effect.

But, in those disorders arising from a suppression, a defect, or irregularity of the menses, or hæmorrhoidal discharge, nothing is more certain, safe, and effectual, than a prudent use of mineral waters, especially the mild Caroline springs for internal, and those of Toeplitz for external use, since by these all the intentions of cure are excellently answered; for, by drinking the former of these waters, the viscid humours are attenuated and evacuated, and the obstructions of the capillary vessels removed, whilst by bathing in the Toeplitz waters, which are highly light, and destitute of a constructing earthy principle, the structure of the parts is removed, and the vessels so enlarged, as readily to admit the blood, and again discharge it.

As in medicine it is a difficult task to keep the menstrual discharges in a due and natural order, so it is still more difficult to manage the hæmorrhoidal, when a large quantity of blood attempts its discharge by the veins of the anus, but does not find them disposed for its evacuation; but the discharges of this kind are, among all other substances, most

most powerfully promoted by pills prepared of aloes, which, by their highly subtile, resinous, and sulphureous particles, not only excite a violent orgasm in the whole mass of blood and humours, but also, by stimulating the coats of the colon and rectum, by their tenacious, viscid, and resinous particles, excite a greater afflux of blood to these parts: yet, when the blood, after it has arrived here, cannot make its way through the vessels, it partly protrudes them, like so many turbercles accompanied with pain; and partly, stagnating between the nervous coats of the intestines, and pressing them, produces violent inflations, spasms, and other terrible disorders of the abdomen. *Frederic Hoffman.*

E'MPIS, in natural history, the name given, by authors, to a large species of gnat, found about rivers and ponds; it is distinguished from all the other kinds, by a circle of white passing round the middle of its body.

EMPLA'STER (*Dict.*)—No part of the apparatus for dressing is of more importance than plaisters; the nature of which is so well known, that it would be ridiculous to attempt a definition of them. There are various and almost innumerable kinds of plaisters; the most considerable of which, together with their composition and preparation, are found in the several dispensatories; but especially in the Pharmacopœia Augustana, the London Dispensatory, that of Brandenburg, and Lemery's Pharmacopée Universelle. Most of these plaisters are spread upon linen cloth, leather, or silk, according to the different conditions of wounds, and the various states of patients. When plaisters are to be applied to hairy parts of the body, those parts are previously to be shaved, that the plaister may adhere more firmly, and be removed more easily and with less pain to the patient. But, that they may be still more commodiously applied, their form is to be adapted to that of the particular part, for whose relief they are intended.

The bulk, as well as the figure, of plaisters, is various; for their largeness ought always to correspond to the wound, or part affected. As for the use of plaisters, it is found to be very various and extensive; for they not only serve to retain balsams, ointments, lint, tents, and other applications, to wounds, but also contribute very effectually to generate pus, to digest and maturate tumors, to conglutinate and cure wounds, to unite fractured bones, to heal burns, to alleviate pains, and to corroborate such parts of the body as are weak and infirm.

It is to be remarked, that the best way of giving a plaister a good consistence is a prejudice to many intentions; and that is done with litharge, or minium, and oil; for, when these are boiled, so as to incorporate, they make a body very suitable for this form, but when they are opposite in virtues to the warmer gums, which are frequently mixed with them. The other way, therefore, of giving a consistence to this form, either with wax, resin, or pitch, may be preferable as to intention or efficacy; but these also have their inconveniencies in other respects; for those plaisters which take in much wax, are difficult to spread, because, when warm, they are not glutinous enough to stick well. Resin likewise is troublesome to spread, and, where it abounds, sticks too much; and pitch of any kind, especially when joined with turpentine, though made into a hard consistence, yet will not hold its form in rolls, but run flat, as is commonly observed in the emplastrum cephalicum and adhæsivum; for which reason they are frequently confined in bladders.

In the prescription of extemporaneous plaisters, the greatest regard is to be had to that particular consistence which the part can most conveniently bear, whereupon the application is to be made. Thus plaisters to the breast and stomach, especially in the intentions of emollient or discutients, should be yielding and soft, as the officinal emplastrum stomachicum magistrale; but to the loins, or any of the limbs, where warm discutients and strengtheners are to be applied, an higher and more adhesive consistence is to be sought for. The emollient plaisters likewise should be laid on thick, and frequently repeated, if the symptoms continue; because their better parts are soon spent. Discutients also, applied to hard tumors, require repetition; but the strengtheners, which are on purpose contrived of a strong adhesive consistence, are permitted to lie on, till they grow dry, and come off spontaneously. In some flatulent tumors, where a plaister alone does not prevail, they are at intervals taken off, and discutient fomentations or lotions made use of; such as are composed of bitters, carminatives, and take in lixivial salts, or alcaline spirits.

EMPLA'STRUM *attrahens*, the drawing plaister, a plaister ordered, in the late London Pharmacopœia, to supply the place of the melilot plaister, in the dressing of blisters. The college are satisfied that the herb is of no sort of use in the composition, and that very gross abuses are practised to give the green colour to the plaister; for which reason they have ordered the plaister to be now made in this manner: take yellow resin, and yellow wax, of each three pounds; tried mutton suet, one pound; melt all together, and strain, while it is hot. *Pemberton's Lond. Disp.*

EMPLASTRUM *commune*, a name given, in the new London Pharmacopœia, to what has been long called diachylon plaister. The apothecaries had been long used to make this by a shorter way than was prescribed them, and the college has now authorized that method, ordering it to be made of only a gallon of oil of olives, and five pounds of litharge, boiled together with about a quart of water, to keep them from burning till they are perfectly mixed, and have the consistence of a plaister. *Pemberton's Lond. Disp.*

EMPLASTRUM *ex ammoniaco cum mercurio*, a form of medicine, in the late London Dispensatory, ordered to be prepared in the following manner:

Take gum ammoniacum strained, a pound; quicksilver, three ounces; simple balsam of sulphur, a drachm. Rub the quicksilver with the balsam of sulphur, till it no longer appears; then add, by degrees, the gum ammoniac melted, and almost cooled again, and make the whole into a plaister. *Pemb. Lond. Disp.*

EMPLASTRUM *roborans*, the strengthening plaister, a form prescribed in the London Dispensatory, and ordered to be made thus: take of the common plaister two pounds, of frankincense half a pound, of dragon's blood three ounces; melt the plaister, and then add to it the other ingredients in powder. *Pemberton's Lond. Disp.*

EMPYE'MA (*Dict.*)—When matter or pus is collected in the cavity of the breast, betwixt the lungs and the pleura, the disorder is called an Empyema.

This is properly enough an Empyema; but the matter may happen, also, to be collected in the duplicatures of the mediastinum.

The disorder above-mentioned supposes a previous purulent abscess within the breast; which, breaking, discharges, its contents into the cavity of the thorax.

These abscesses are seated, first, in the lungs; and are caused either by inflammations, ruptures of the vessels, or considerable obstructions by substances not easily resolvable.

Secondly, in the pleura, arising either from an inflammation, a slight wound healed too precipitately externally, a contusion, or rupture of the membrane.

Thirdly, in the diaphragm, when an unresolved inflammation of this part suppurates, and breaks on that side next the breast.

Fourthly, in the mediastinum, when that part is, in like manner, inflamed.

Fifthly, in the pericardium, after an inflammation thereof.

An Empyema may be prognosticated from an inflammation of any of the parts above-mentioned, which has not been resolved by means of coction, revulsion, a crisis, or medicines; but which terminates with a shivering, a fever which increases in the evening, a wandering heat, a sense of weight on the part, a difficulty of breathing, loss of appetite, and thirst.

An Empyema is known to be formed, first, from a duration of such a disorder, as is mentioned above, for twenty days, without a due expurgation by expectoration.

Secondly, by the discontinuance of the signs of an abscess in any of the before-mentioned parts.

Thirdly, from a new pain, together with a difficulty of breathing, and discharge of saliva, which soon after cease.

Fourthly, from a dry cough, a weight on the diaphragm, an impossibility of lying on one of the sides, a noise made by the fluctuating pus or matter upon motion, a slow fever, redness of the cheeks, hollowness of the eyes, heat at the extremities of the fingers, incurvation of the nails, and tumor of the abdomen.

The consequences of the rupture of an abscess or vomica, so as to form an Empyema, are, first, a continual accumulation of pus or matter from the ulcer, not yet healed, nor deterged.

Secondly, a continual agitation, a degeneracy, fœtidness, putrefaction, and attenuation of the pus or matter, thus confined in a warm and moist place.

Thirdly, a difficult elevation of the diaphragm, and extension of the lungs: hence respiration is rendered short, difficult, and not easily performed, unless in an erect posture; danger of suffocation when the patient lies down, which, however, it is not possible for him to do on the unaffected side; a perpetual dry cough and anxiety.

Fourthly, a maceration, corrosion, and consequent tabid state of the lungs, pleura, diaphragm, mediastinum, pericardium, and of the heart itself; a hectic fever, attended with a small and quick pulse; redness of the cheeks; perpetual thirst; utter loss of appetite; extreme weakness and faintings.

Fifthly, hence an unfitness of all the fluids for nutrition, circulation, secretion, and excretion, whence a consumption and atrophy, a resolution of the fibres, a putrefaction of the liquids, and their discharge through the corroded lungs; or a sanious and fatal diarrhœa, with nocturnal sweats after sleep, pustules on the face, incurvation of the nails, a shining yellowness of the skin, and an Hippocratic countenance.

The operation for the Empyema generally implies an artificial opening made into the cavity of the thorax, by which we evacuate any fluid that lies there extravasated, and is become dangerous by its weight and quantity. The fluids described as necessary to be voided by this operation, are blood, matter, and water.

When

When blood is the fluid, ſuppoſed to require evacuation by this method, it is always extravaſated through ſome wound of the veſſels of the lungs or thorax, and, being diſcharged in great quantities on the diaphragm, is ſaid to oppreſs reſpiration till let out by ſome convenient perforation, made in the moſt depending part of that cavity, which is the only kind of perforation into the thorax, diſtinguiſhed by the name of the operation for the Empyema: but, though this opening is univerſally recommended in the caſe here ſtated, yet we meet with few or no examples, where it has been practiſed for a mere extravaſation of blood; and I ſhould think it can hardly ever be adviſeable on this account: for, if we perform it immediately after the accident, and during the hæmorrhage, the opening made at the bottom of the thorax might probably make way for a dangerous effuſion of blood, which perhaps would otherwiſe be choked up and ſtopped for want of a ready iſſue; and, if we wait till the hæmorrhage ceaſes, it becomes needleſs, becauſe the blood not only, for the moſt part, finds ſome vent for the external wound, if left open, but is conſtantly ſpit up by the trachea; ſo that, had we no farther proofs of this abſorbent power in the lungs, we might from hence be perſuaded of the probability of its being more ſafely carried off ſo, than by any artificial opening we can poſſibly contrive in the thorax.

Or if it be thought that the extravaſated blood, being coagulated in the thorax, cannot be taken up by the veſſels of the lungs, yet, even in that caſe, the operation uſually practiſed will not anſwer the purpoſe; for, beſides the poſſibility of the lungs adhering to the pleura in the place of inciſion, which would abſolutely prevent any advantage from it, the depth and narrowneſs of the orifice, and its height above the diaphragm, on which the congealed blood is ſuppoſed to lie, will make the ſucceſs at beſt very precarious.

To empty the thorax, in a rupture of any veſſels which open into it, bleeding is very neceſſary, which not only ſtops the hæmorrhage, by abating the force of the circulation; but likewiſe, by unloading the veſſels of their contents, makes them more fit to receive the extravaſated fluid by abſorption: gentle evacuations and pectorals are alſo very ſerviceable, and a low diet is abſolutely neceſſary.

The rules laid down in ſome books for diſtinguiſhing if a wound penetrates, have led practitioners into miſchievous methods, by adviſing them to examine theſe wounds with the probe, or, for more certainty, the finger; which if rudely uſed ſometimes even tear into the thorax, always force or preſs the parts too much, and often ſeparate the lungs from the pleura, when they happen to adhere; all which violences will produce abſceſſes there, eſpecially if the part be afterwards dreſſed with large tents, or filled with any active injection, both which were formerly applied with a view to deterge the cavity of the wound, but now ſeem to be exploded in favour of more ſuperficial dreſſings, the advantage of which method, in my opinion, cannot be too much inculcated.

But what I have here advanced concerning the excellence of ſuperficial applications, without dilating the wound, to make way for the iſſue of the blood or ſucceeding matter, muſt be conſidered with regard to punctures or inciſions by ſharp inſtruments, not followed with a great diſcharge: for, where the wound is made by fire arms, the method of practice muſt be ſometimes altered; becauſe not only ſloughs and great ſuppurations enſue, but very often pieces of the ſhirt or coat are carried in with the bullet, which will perhaps require an enlargement of the wound, in order to be freely diſcharged; though, even upon this account, there will be no occaſion to make an opening at the bottom of the thorax, ſince the mere dilatation of the wound will more readily give vent to the pus and extraneous bodies, than an orifice made lower; becauſe the lungs, being inflamed by the wound, will generally adhere to the pleura, and break off the communication between the abſceſs and the cavity below it. In dreſſing the dilated wound, care muſt be taken to apply the doſſils with ſuch preſſure only, as ſhall be ſufficient to keep open the external orifice; and not to croud them into the thorax, ſo as to lock up that matter, which the very deſign of dilatation is to give a diſcharge to.

The ſecond circumſtance in which this operation takes place, is a rupture of matter from the pleura, mediaſtinum, or lungs, into the cavity of the thorax, where accumulating it at length proves fatal for want of a diſcharge. It is true that the caſe occurs but very ſeldom, where the operation is neceſſary; becauſe, in moſt abſceſſes of the thorax, the matter is uſually ſpit up as faſt as it is generated, and in the diſſection of ſuch, who have died of this ſpecies of conſumption, we rarely find much extravaſated pus in the cavity, though a great portion of the lungs is deſtroyed: however, as I have intimated, there are a few examples which require the operation, and theſe may be diſtinguiſhed by the following ſymptoms. The patient is obliged to lie upon the diſeaſed ſide, or, in caſe there is matter in both cavities of the thorax, on his back; becauſe the mediaſtinum can ſeldom ſupport the weight of the incumbent fluid, without ſuffering great pain; but this rule is not certain, it ſometimes happening that the patient can lie with eaſe on that ſide, where there is no fluid. Another ſymptom of extravaſated matter, is an evident undulation of it, ſo that in certain motions it may be heard to quaſh. For the moſt part too, upon careful enquiry, an œdema, or at leaſt a thickening of ſome portion of the intercoſtal muſcles, will be diſcovered. And, laſtly, if there be much fluid, it will be attended with a preternatural expanſion of that ſide of the cheſt, where it lies. When therefore theſe ſigns appear after a previous pleuretic or pulmonary diſorder, and the caſe has been attended with the ſymptoms of a ſuppuration, it is moſt probably owing to a collection of matter; though the patient will alſo labour under a continual low fever, and a particular anxiety from the load of fluid.

I have here deſcribed the abſceſs as breaking into the cavity of the thorax; but, generally ſpeaking, in any inflammation of the pleura or lungs, an adheſion of both enſues; in conſequence of which, nature finds a diſcharge outwardly, it being moſt frequent for abſceſſes of the pleura and intercoſtal muſcles, and not uncommon even for abſceſſes of the lungs, to break externally. In caſe of an adheſion, no farther operation is required than opening the tumor, when ſuppurated, with a lancet; and, if the diſcharge is ſo great as to forbid the healing the external ulcer, it may be kept open with a hollow tent; by which manner of treatment many have lived a long time with a running fiſtula.

The laſt ſort of fluid, ſaid to require iſſue from this operation, is water, which however very ſeldom collects in ſuch manner as to become the proper ſubject of the operation; for, if the dropſy of the thorax is complicated with an anaſarca, or even aſcites, it is certainly improper; and indeed it can hardly ever take place, but where the diſtemper is ſingle, and takes its riſe from the ſame ſort of diſorder in the lymphatics of the pleura, as the hydrocele does from thoſe of the tunica vaginalis. The ſymptoms of this dropſy are, a ſmall cough without ſpitting, a little ſlow fever from the diſturbance of reſpiration; ſometimes too the water, by a ſudden jerk, may be heard to ſquaſh, and, generally ſpeaking, its weight upon the diaphragm and mediaſtinum are ſo troubleſome as to oblige the patient to ſtoop forward when in an erect poſture, and to turn upon the affected ſide when he lies down; for the ſame reaſon, when there is water in both cavities of the thorax, he is forced to lie on his back.

The manner of operating, whether it be for the diſcharge of matter or water, is to pitch upon the moſt depending part of the thorax, which ſome have ſuppoſed to be between the eighth and ninth rib, and others, between the ninth and tenth, at ſuch a diſtance from the vertebræ, that the depth of the fleſh may not be an impediment to the perforation: this diſtance is determined to be about a hand's-breadth; and here with a knife, ſciſſars, or trocar, we are ordered to make the perforation; but, in doing it, there are a great many difficulties: in fat perſons, it is not eaſy to count the ribs, and the wound will be very deep, and troubleſome to make; it is hardly poſſible to eſcape wounding the intercoſtal artery, which runs in this place between the ribs; or, if you avoid it, by cutting cloſe to one of the ribs, a caries of the bone will follow from the preſſure of the tent employed afterwards: again, the inflammation of the wound may poſſibly affect the diaphragm, which is ſuppoſed almoſt contiguous to it, and this may prove of very ill conſequence; ſo that upon the whole, without any farther recital of objections to the Empyema thus performed, it cannot appear an adviſeable operation. But if the only advantage, propoſed by this ſituation of the wound, is from its dependency; the purpoſe of diſcharging the fluid will be as well anſwered, by an opening between the ſixth and ſeventh rib, halfway from the ſternum towards the ſpine; which, by laying ourſelves down, becomes in effect as depending an orifice, as the other in ſitting up; and, by opening in this manner, we avoid all the inconveniences in the other method: for, in this part of the thorax, there is very little depth of muſcles; the artery lies concealed under the rib; and the diaphragm is at a great diſtance; ſo that none of thoſe miſchiefs can enſue I have ſuppoſed in the other method; which conſequently will give it the preference. The opening is beſt made with a knife, and ſhould be about an inch long through the ſkin, and half an inch through the ſubjacent muſcles: though, to make the inciſion with leſs riſk of wounding the lungs, it may be adviſeable to dilate it with the blunt-pointed knife after having made a ſmall puncture with a common knife. If it ſhould be objected, that the fluid cannot be diſcharged by this orifice, while we are erect, whereas, by making it in the lower part of the thorax, it will be continually draining; I think it may be anſwered, that, after it is once emptied, it will hardly in twelve hours be generated in greater quantity than what will lie upon the diaphragm below the opening made even by that operation, and conſequently cannot be more readily diſcharged by one orifice, than the other. The treatment of the wound will be according to the nature of the diſcharge; if, after a few days, there appears no drain, you may let the orifice heal up; but, if it continues, it may be kept open with a ſhort ſilver cannula, till ſuch times as an alteration, in that circumſtance, will give us leave to cicatrize with ſafety. *Sharp's Surgery.*

ENA'MEL (*Dict.*) — The workers in Enamel muſt be very cautious of the good or bad qualities of the oil of ſpike they employ to mix their colours with. It is a thing very ſubject to adulterations.

adulterations. Sometimes with ſpirit of wine; ſometimes with oil of turpentine. In the firſt caſe it wants body, as there is uſually too much ſpirit added; and, in the latter, the ſmoak of the turpentine, when heated, ſpoils the colours. A ſmall mixture of ſpirit of wine does well; and the beſt method, for the nice artificer, is to refine the oil, and afterwards add to it ſuch a quantity of ſpirit as is found beſt.

The common matter, which is the baſis of all Enamels, is thus made: take fine lead, thirty pounds; fine tin, thirty-three pounds; calcine theſe together in a kiln, then ſift them; boil this powder in water, in clean earthen veſſels, and pour off the water, which will carry with it the finer part of the calx; put freſh water on the remainder, boil it again, and pour off in the ſame manner; do this ſo long as the water will carry off with it any part of the calx. Recalcine the remaining matter, and waſh off its finer part in the ſame manner again; then evaporate all the waters, which have waſhed off the finer calx, and keep the fire low, towards the end of the operation, that the calx may not be waſted; this will be found, at the bottom, of an extreme fineneſs.

Take of cryſtal frit, made with tarſo, and this fine calx, each fifty pounds; white ſalt of tartar, eight ounces; powder and ſift theſe, and mix them well. Put this mixture into a new earthen pot, give it a fire for ten hours, then powder it, and keep it in a dry covered place. *Neri's Art of Glaſs.*

Azure ENAMEL. To make this, take of the common matter of Enamels, four pounds; zaffer prepared, two ounces; braſs thrice calcined, forty-eight grains. Mix all theſe well together, and melt them in the furnace in the uſual way. *Neri's Art of Glaſs.*

Black ENAMEL. To make the black Enamel, take of the common matter of Enamels, four pounds; tartar, four ounces; mangane e, two ounces. Grind and mix theſe powders well with the matter of the Enamel, then ſet them in a furnace in a large pot; when melted and refined, caſt them into water, and, putting them again into the furnace, let them refine. *Neri's Art of Glaſs.*

Green ENAMEL. To make this, take of the common matter of Enamels, four pounds; melt it, and caſt it into water, return it again to the furnace, and, when purified, add of braſs, thrice calcined, two ounces, crocus martis, made with vinegar, forty-eight grains. Mix theſe firſt in fine powder, and put this in at three ſeveral times; when all is well incorporated, take it from the fire. *Neri's Art of Glaſs.*

Milk-white ENAMEL. To make this uſeful colour in Enamels requires no more than this: take the common matter of Enamels, ſix pounds; mangane e prepared, forty-eight grains; melt them in the furnace, caſt the whole into water, and afterwards return it again into the furnace, and, when refined, uſe it. *Neri's Art of Glaſs.*

Purple ENAMEL. To make this, take of the common matter of Enamels, ſix pounds; of manganeſe, three ounces; braſs, thrice calcined, ſix ounces; mix all well together, and ſet them in a furnace, let them refine, then caſt them into water, return the matter to the furnace again, and, when thoroughly melted, take it out for uſe. *Neri's Art of Glaſs.*

This mixture, with a ſmaller proportion of braſs, makes the red Enamel.

Violet-coloured Enamel. The method of making the violet-coloured Enamel is this: take of the common matter of Enamels, ſix pounds; of manganeſe prepared, three ounces; of thrice calcined braſs, forty-eight grains; mix the two powders well together, then mix the whole, put them into the furnace, and, when refined, caſt them into water, return the matter again to the furnace, and, when refined, take it out. *Neri's Art of Glaſs.*

Yellow ENAMEL. To make this, take of the common matter of Enamels, ſix pounds; of tartar, three ounces; of manganeſe, ſeventy-two grains; mix all well together, and put them into the furnace, in a large pot; when refined, caſt them into water, then return them to the furnace again, and, when melted, take it out for uſe. *Neri's Art of Glaſs.*

ENCAU'STUM *Sacrum*, a name given, by many authors, to that fine red colour, uſed for illuminating the capital letters in ſome old manuſcripts. The Latin writers have got a way of calling all thoſe liquid paints, which may be uſed by means of a pen, by the general name of atramenta, and we call them inks. Thus the tincture of logwood, or brazil-wood, is called red ink; the tincture of fuſtic, brown ink; and the ſolution of gamboge, yellow ink. The Greeks expreſſed ink by the word melan, which ſignifies only black; and the atramentum of the Latins is as plainly derived from atrum, ſignifying alſo black. The Greeks kept ſtrictly to this ſenſe of the word, and acknowledged only two kinds of ink, the graphicon, and the burſodepſicum; the firſt uſed in writing, and the other in dreſſing of leather. Some ſuppoſe that they mentioned a third kind, under the name of melan Indicon, which many have been idle enough to imagine the ſame that we call by the name of Indian ink; but they have uſed the word melan not as the ſubſtantive, or the name of ink, but as an adjective, expreſſing deep blue, as Theophraſtus uſes it, ſpeaking of the deep blue of the fine ſapphire, and others of the violet. This red colour, uſed in the illuminations, was never called ink by the Greeks. Procopius calls it baphe, ſome have called it coccus, and ſome cinnabar. It is ſaid that it was made of the purple colour, extracted from the murex, or purple fiſh, with ſome other additions. It is to be obſerved, that however well this colour, when laid on the parchment, or paper, might reſemble the colours of enamel, yet, it was as improper to call it Encauſtum, which ſignifies a colour burnt in, as in enamelling, as it would have been to have called it atramentum, or ink.

ENCU'RECK, in natural hiſtory, a venomous inſect, found in Perſia, and ſuppoſed, by ſome, to be a kind of tarantula. It neither ſtings nor bites, but lets fall its venom like a drop of water, which cauſes inſufferable pain in the part for a time, and afterwards ſo profound a ſleep, that, we are told, nothing can raiſe the patient from it, but cruſhing one of thoſe creatures on the part affected. It is nevertheleſs ſaid, that the ſheep eat theſe inſects without damage. *Olearius.*

ENDI'VIA *marina*, ſea endive, in natural hiſtory, the name of a ſpecies of ſea plant, deſcribed by count Marſigli: there are two ſpecies of it, the one having broad and jagged leaves, reſembling thoſe of the vine, the other much narrower. This laſt kind grows on ſtones, ſhells, pieces of wood, or any other ſubſtances, accidentally found at the bottom of the ſea. It ſeldom grows in very deep water, and thrives beſt in places where the ſea is calm and quiet. It is of a duſky greeniſh colour, variegated in ſome places with yellow. It exactly reſembles the ſhape of the endive common in our gardens, and its leaves are cut and fringed in the ſame manner; but they are of ſo tender a ſubſtance, that a ſlight touch deſtroys them; they are indeed tender and more delicate than any other known plant, either of the ſea or land. When this plant is examined by the microſcope, its ſurface is found to be compoſed of a great number of eminencies, and cavities, or little holes, between and among them; and, when the leaves are cut tranſverſely, there are ſeen a great number of glandules in them. *Marſigli, Hiſt. de la Mer.*

E'NGINE (*Dict.*)—The following Engine for raiſing water by fire is an improvement of Savary's conſtruction (given under this article in the Dictionary) to render it capable of working itſelf, invented by Mr. De Moura of Portugal, F. R. S.

This Engine conſiſts of a receiver, a ſteam, and an injection-cock; a ſuction and a forcing-pipe, each furniſhed with a valve; together with a boiler, which, on account of its bulk and weight, was not ſent with the reſt; but, as it may be of the common globular ſhape, and having nothing particular in its conſtruction, a deſcription of it will not be neceſſary, as alſo, the reſt of theſe parts already mentioned being eſſential to every machine of this kind, a further account of them may be diſpenſed with. What is peculiar to this Engine, is a float within the receiver, compoſed of a light ball of copper, which is not looſe therein, but faſtened to the end of an arm, which is made to riſe and fall by the float, while the other end of the arm is faſtened to an axis; and, conſequently, as the float moves up and down, the axis is turned round one way, or the other. This axis is made conical, and paſſes through a conical ſocket; which laſt is ſoldered to the ſide of the receiver. Upon one of the ends of the axis, which projects beyond the ſocket, is fitted a ſecond arm, which is alſo moved backward and forward by the axis, as the float riſes and falls. By theſe means, the riſing and falling of the ſurface of the water within the receiver communicates a correſpondent motion to the outſide, in order to give proper motions to the reſt of the geer, which regulates the opening and ſhutting of the ſteam and injection-cocks; and ſerves the ſame purpoſe as the plug-frame, &c. in Newcomen's Engine. The particular conſtruction, and relation of thoſe pieces, will better appear by the figure and references, than can be done by a general deſcription.

A B, *plate* XVII. *fig.* 11. an arm, which is faſtened to *a b*, a conical axis, which goes through a conical ſocket in C, a triangular piece ſoldered to the receiver. This piece has this ſhape to give liberty to the arm to riſe and fall, that carries the float on the inſide. D E, is a ſmall ciſtern, ſoldered to the receiver, which, being kept full of water, keeps the axis and ſocket air-tight. This ciſtern is conſtantly kept full of water, by means of a ſmall leakage through the wooden peg *c*, which follows the pack-thread *c d* to the ciſtern.

e, Is a ſmall weight to counterpoiſe the float within.

f, Is a ſlider; which, being ſet nearer to, or farther from, the axis, will riſe, or fall, a greater or leſſer ſpace, as may be required; and is faſtened by the ſcrew *g*. This ſlider is furniſhed with a turn-about, *h i*, which is alſo faſtened by a ſcrew and nut at the end *i*, and ſerves to adjuſt the length of F G G H, a chain, which gives motion, by means of the ſhorter chain *k l*, to I K L, the balance, which opens and ſhuts the cocks; and moves upon the ſmall axis L.

G G, are two pullies ſupported by two arms, that are faſtened to the ſide of the receiver, and give the chain a proper direction in order to move the balance.

M N, is the ſteam-cock; the end N being ſuppoſed to be detached from a pipe that gives it communication with the boiler.

O, is the injection-cock, whoſe key is turned by the arm O *m*.

P Q, is the injection-pipe, communicating between the forcing-pipe above the valve, and the top of the receiver.

R S, is the arm, by which the key of the steam-cock is worked.

I K, two rollers annexed to the balance, which, by striking upon the arm R S, open and shut the steam-cock, as the balance is moved backward and forward.

R *n o*, is the steam-cock's key-tail, which is furnished with two small rollers, *n o*, which open and shut the injection-cock, by acting upon the arm O *m*, in such a manner, that, when the steam-cock is opened, the injection is shut, and vice versa.

T, is a bell of advice, which, moving along with the balance, continues to ring as long as the Engine is at work.

V, is a cock, which serves to discharge the air from the receiver, and is opened by hand, when necessary.

W, is a weight sufficient to raise the balance to a perpendicular posture, when it is inclined to the right, and also, to overcome the friction of the float, axis, pullies, chain, &c.

To put the Engine in motion, press down the arm A B, which will bring the balance over to the right side, and in its motion will open the steam-cock, and shut the injection; set open the cock at V, that the air may be discharged by the entrance of the steam into the receiver. This being done, shut that cock, and let go the arm; the weight W will bring over the balance to the left, and in its motion shut the steam-cock, and open the injection; this, presently condensing the steam into water, in a great measure, leaves a vacuum in the receiver. Things remain in this situation, till the pressure of the atmosphere has caused the water to mount through the suction-pipe into the receiver, where, as its surface rises, it causes the float to ascend; and, depressing the arm A B, raises the balance till it has passed the perpendicular; and, in its descent, which is done by its own gravity, the roller K lays hold of the arm R S, again opens the steam-cock, and shuts the injection. The receiver being now almost filled with water, the balance cannot return, till the surface of the water therein subsides, and suffers the float to descend. This is performed by the elasticity of the steam, which, at the same time that it fills the receiver, drives out the water through the forcing-pipe; and, when the surface is descended so low, as to suffer the weight W to bring the balance beyond the perpendicular towards the left, it then falls of its own accord, and, in falling, the roller I lays hold of the arm R S, shuts the steam-cock, and opens the injection, as before.

When the Engine is desired to be stopped, observe, when the balance lies to the right, to turn round the arm O *m* of the injection-cock, so that the tail of the steam-cock may miss it in the next motion; so that, at the same time that the receiver is filled with steam, and the steam-cock shut, the injection not being opened, the motion will stop for want thereof. *Phil. Trans.* Vol. XLVII.

ENGLISH *Tongue* (*Dict.*) — Mr. Welstead is of opinion, that the English language is not capable of a much greater perfection, than it has already attained; we have trafficked, he observes, with every country for the enriching it: the ancients and moderns have both contributed to the giving it splendor and magnificence; the fairest cyons that could be had from the gardens of France and Italy, have been grafted on our old stocks, to refine the savageness of the breed; we have laid aside most of our harsh, antique words, and retained few but those of good sound and energy: the most beautiful polish is at length given our tongue that it will bear, without destroying and altering the very basis and ground-work of it: its Teutonic rust is worn away, and little or nothing is wanting, either of copiousness, or harmony. He goes on to argue the maturity and perfection of the English from another very extensive principle, viz. by comparing the time and circumstances of the improvements, made since the first refiners of it, with those of the Greek, Latin, French, and other tongues, that confessedly have risen to their height.

Every civilized nation, that author thinks, has its classical age; and he suggests, that the English are not far from it. So that what remains to be done for the English tongue, should not be to advance, but to fix it where it is, and prevent its declining. There is in effect a point of perfection, which when a language has once arrived at, it cannot exceed, though it may degenerate from it; and thus it happened to the two finest languages the world has known.

It may seem odd to talk of fixing so unstable a thing as language: the Greek liturgies of St. Basil and St. Chrysostom, still used in that church, the one for solemn, the other for common days, have been a long time unintelligible to the people: so much is the vulgar Greek degenerated from its original purity! Polybius testifies, that the articles of truce between the Romans and Carthaginians could scarce be understood by the most learned Roman antiquaries, 350 years after the time of their making. In effect, from the days of Romulus, to those of Julius Cæsar, the Latin was perpetually changing; and what was wrote three hundred years before Tully, was as unintelligible in his time, as the English and French of the same period are now: and these two have changed as much since William the Conqueror, in about 700 years, as the Latin appears to have done in the like term.

Whether our language will decline as fast as the Roman did, may admit of some doubt; there being many circumstances in the affairs of the nation, which contributed to that corruption, that may not, in all probability, find place among us. — The French, for these fifty years past, has been polishing as much as it will bear; and appears to be now declining, by the natural inconstancy of that people, and the affectation of some late authors to introduce cant words, which is the most ruinous corruption in any language. But, without some such consideration, there does not seem any absolute necessity, why a language should be perpetually changing.

We find examples to the contrary: from Homer to Plutarch, are above a thousand years; and so long, at least, Dr. Swift thinks, we may allow the purity of the Greek: the Grecians spread their colonies round all the coasts and islands of Asia minor and the Ægean sea, where the language was preserved entire for many ages after they themselves became provinces to Rome, and were over-run by the barbarous nations. The Chinese have books in their language above 2000 years old; neither have the frequent conquests of the Tartars been able to alter it. And the German, Spanish, and Italian, have admitted few or no changes for some ages past.

On such considerations, that author moved the then prime minister, the earl of Oxford, to establish a society, or academy, for the settling, and ascertaining, the purity of our tongue; to set a mark on the improprieties which custom has made familiar, to throw out vicious phrases and words, to correct others, and perhaps retrieve some others now grown obsolete, and to adjust the orthography, pointing, &c.

Without some such means, he complains, that the fame any writer can expect will be so short and scanty, as by no means to be a sufficient motive to call forth and engage a man to exert his genius. Our language is chiefly confined to these two islands; and it is hard our authors fame should be limited in time as well as place. Were it not for the bible and common-prayer, we should hardly have been able to understand any thing written a hundred years ago.

It is a melancholy reflection, that Petrarch still speaks good Italian; whereas Chaucer, who lived a hundred years later, is not to be understood without a Saxon and French glossary. And what security has Pope himself, while things continue on their present footing, that he shall not in a like space of time become as obsolete as Chaucer is?

Grammars and dictionaries, with whatever care and judgment they are composed, will prove but a feeble stay to a fleeting language, unless they have some extraordinary sanction and authority. And, what is to be lamented, such writings have contributed to the corruption almost as much as the perfection of our tongue.

ENGRA'VING *on precious stones*, is the representing of figures, or devices, in relievo or indented, on divers kinds of hard polished stones.

The art of Engraving on precious stones is one of those wherein the ancients excelled; there being divers antique agats, cornelians, and onyx's, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent Engravers we read of: the former was so esteemed by Alexander, that he forbad any body else to engrave his head: and Augustus's head, engraven by the latter, was found so beautiful, that the succeeding emperors chose it for their seal.

All the polite arts having been buried under the ruins of the Roman empire, the art of Engraving on stones met the same fate. It was retrieved in Italy, at the beginning of the fifteenth century; when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be despised. From that time, such sculptures became common enough in Europe, and particularly in Germany, whence great numbers were sent into other countries; but they came short of the beauty of those of the ancients; especially those on precious stones; for, as to those on crystal, the Germans, and, after their example, the French, &c. have succeeded well enough.

In this branch of Engraving, they make use either of the diamond, or emery. — The diamond, which is the hardest, and most perfect of all precious stones, is only cut by itself, or with its own matter.

The first thing is to cement two rough diamonds to the ends of two sticks, big enough to hold them steady by, in the hands; and to rub or grind them against each other, till they be brought to the figure desired. The dust, or powder, rubbed off, serves afterwards to polish them; which is performed with a kind of mill, that turns a wheel of soft iron.

The diamond is fixed in a brass dish, and thus applied to the wheel, which is covered with diamond dust, mixed up with oil of olives: and, when the diamond is to be cut facet-wise, they apply first one face, then another, to the wheel.

Rubies, sapphires, and topazes, are cut and formed the same way, on a copper wheel; and polished with tripoli, diluted in water.

As to rubies, emeralds, hyacinths, amethysts, garnets, agats, and other of the softer stones, they are cut on a leaden wheel, moistened with emery and water; and polished with tripoli, on a pewter-wheel. Lapis, opal, &c. are polished on a wooden wheel.

To fashion and engrave vases of agat, crystal, lapis, or the like,

like, they have a kind of lathe, like that of the pewterers; excepting, that whereas the latter is to hold the veſſels, which are to be wrought with proper tools; the former generally holds the tools, which are turned by a wheel, and the veſſel held to them to be cut and engraved, either in relievo, or otherwiſe; remembering, from time to time, to moiſten the tools with diamond duſt and oil; or, at leaſt, emery and water.

To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, or ſeals, &c. they uſe a little iron wheel, the two ends of whoſe axes are received within two pieces of iron placed upright, as in the turner's lathe, to be brought cloſer, or ſet further apart, at pleaſure. At one end of one of the axes, are fitted the proper tools, being kept tight by a ſcrew. Laſtly, the wheel is turned by the foot; and the ſtone applied by the hand to the tool; and thus ſhifted and conducted, as occaſion requires.

The tools are generally of iron, ſometimes of braſs. As to their form it is various, but generally bears ſome reſemblance to chiſſels, gouges, &c. ſome have ſmall round heads like buttons, others, like ferrels, to take the pieces out; others flat, &c. Theſe tools are not applied directly againſt the ſtone, but, as it were, ſidewiſe; thus wearing, and as it were, grinding off the ſubſtance. And ſtill, whether it be figures, or letters, or characters, the manner of application is the ſame. The tools, as above obſerved, are to be frequently moiſtened with diamond duſt, and oil of olives. When the ſtone is engraven, they poliſh it on a wheel of bruſhes, made of hogs briſtles, with tripoli. For the larger and leſs delicate works, they have copper, or pewter tools, on purpoſe to poliſh the ground, or plain parts, with tripoli, &c. which they apply after the ſame manner, as thoſe wherewith the graving is performed.

ENGRAVING *on ſteel*, is chiefly employed in cutting punches, matrices, and dies, proper for ſtriking coins, medals, and counters. See the article COINING in the Dictionary.

The methods of Engraving, with the inſtruments, &c. are the ſame for coins, as for medals and counters: all the difference conſiſts in their greater or leſs relievo; the relievo of coins being much leſs conſiderable than that of medals; and that of counters ſtill leſs than that of coins.

The engraver in ſteel uſually begins with punches, or punchions, which are in relievo, and ſerve for making the creux, or cavities of the matrices, and dies. Though, ſometimes, he begins immediately with the creux; but it is only when the intended work is to be cut very ſhallow. The firſt thing is to deſign his figures; then he moulds them in white wax, of the ſize and depth required; and from this wax he graves his punch.

This punch is a piece of ſteel, or at leaſt of iron and ſteel mixed; on which, before they temper or harden it, the intended figure, whether a head, or a reverſe, is cut, or carved in relievo. The inſtruments uſed in this graving in relievo, which are much the ſame as thoſe wherewith the finiſhing of the work in creux is effected, are of ſteel. The principal are gravers of divers kinds, chiſſels, flatters, &c. when the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer, wherewith it is ſtruck, to give the impreſſion to the matrice.

What they call matrice, or matrix, is a piece of good ſteel of a cubic form, called alſo a die; whereon the relievo of the punch is ſtruck in creux. It is called matrix, becauſe, in the cavities or indentures thereof, the coins, or medals, ſeem formed, or generated, as animals are in the matrix of their mother.

To ſoften this ſteel, that it may more eaſily take the impreſſions of the punch, they make it red-hot; and, after ſtriking the punch thereon in this ſtate, they proceed to touch up or finiſh the ſtrokes and lines, where, by reaſon of their fineneſs, or the too great relievo, they are any thing defective, with ſome of the tools abovementioned.

The figure thus finiſhed, they proceed to engrave the reſt of the medal, as the mouldings of the border, the engrailed ring, letters, &c. All which, particularly the letters, and graining, or engrailment, are performed with little ſteel punches, well tempered, and very ſharp. Add, that as they ſometimes make uſe of punchions, to engrave the creux of the matrix; ſo, on ſome occaſions, they make uſe of the creux of the matrix, to engrave the relievo of the punch.

To ſee and judge of the Engraving in creux, divers means have been deviſed to take the impreſſions therefrom, as the work proceeds. Sometimes they make uſe of a compoſition of common wax, turpentine, and lamp black; which, always retaining its ſoftneſs, eaſily takes the impreſſion of the part of the graving it is applied to. But, this only ſerving to ſhew the work piece-meal, they have had recourſe to other ways, to ſhew the whole figure. The firſt, by pouring melted lead on a piece of paper, and clapping the matrice thereon: the ſecond, with melted ſulphur, managed the ſame way: and the third, proper only where the graving is ſhallow, by laying a piece of ſoft paper on the graving, and over the paper a leaf of lead; when, giving two or three blows with a hammer on the lead, the paper takes the impreſſion of the work.

When the matrix is quite finiſhed, they temper it, rub it well with pumice-ſtone, and clean out the ſtone again with a hair-bruſh; and, laſtly, poliſh it with oil and emery. In this condition it is fit for the mill, to be uſed to ſtrike coins and medals.

ENNEAHÆ'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek ἐννέα, nine, and ἕδρα, a ſide.

The bodies of this genus are ſpars, compoſed of nine planes, in a triagonal column, terminated at each end by a triagonal pyramid.

ENNEA'NDRIA *, in botany, a claſs of plants, with hermaphrodite flowers, and nine ſtamina, or male parts, in each.

* The word is derived from the Greek ἐννέα, nine, and ἀνήρ, male.

The plants of this claſs are the bay-tree, rhubarb, &c.

ENNE'RIS, in the ancient ſhip-building, a name given to thoſe gallies, or veſſels, which hold nine tiers of rowers.

ENRI'CHING *Plants*, a term uſed, by the Engliſh farmers, to expreſs ſuch plants as are found to do good to land, rather than to exhauſt it, and in conſequence of which the ſame piece of land will produce a good crop of corn, though it would, without the aſſiſtance of their having been planted on it, have yielded a very poor one. The myſtery of this difference between plants, ſome of which are found to burn up, that is, impoveriſh land, while others enrich it, and leave it fitter for ſucceeding crops than they found it, had been long a perplexing thing to account for. Though it was eaſy to conceive that ſome plants mighty exhauſt the earth more, and others leſs, yet, it was hard to conceive, while all exhauſted it in ſome degree, how any could leave it better than they found it; but this was at length explained by Mr. Tull. This author, having obſerved, that breaking the earth, by digging, or horſe-hoeing, between the plants, gave them great increaſe, found that it was this practice that enriched the earth, and that, while corn and ſuch plants as ſtand cloſe, and cannot be hoed between, impoveriſh the ground, and ſuffer no means of enriching it again to be uſed, there were ſome other things, the crops of which, being planted thinner, gave room to the earth to be plowed, dug, or hoed between, and that theſe were the plants which were called the Enriching kind, by the farmers; and the whole ſecret lay in this, that the hoeing, plowing, or otherways breaking the earth between them, in order to kill the weeds, enriched the ground greatly more, in proportion, than theſe plants exhauſted it; and the conſequence was, that, though they had thriven very well, yet, the earth was left richer than before, notwithſtanding all that they had imbibed from it. See his *Horſe-hoeing Huſbandry*. On this obſervation, this excellent author ſeems to have founded the ſyſtem of what he calls horſe-hoeing huſbandry, concerning which he has written a large and uſeful treatiſe. He found that this ſtirring up of the earth enriched it ſo greatly, that, where it was uſed in a proper manner, the kind of plant need not be changed, but that the ſame earth would yield a ſucceſſive ſeries of crops of the ſame plant, and that even without dunging, or ever lying fallow, and every crop for a long time would be better than the former ones. The method of ſowing, to this purpoſe, is not by ſcattering the corn with the hand, but ſowing it in rows, and leaving large intervals between, the naked earth of which might be turned up by the hoe. *Tull's Horſe-hoeing Huſbandry.*

ENTA'LIUM, *the pipe-ſhell*, in the materia medica, a ſhell of the ſame genus with the dentalia, being a ſpecies of the tubuli marini. It is frequent in the Eaſt-Indies, and ſometimes is found on our own ſhores. The virtues aſcribed to it are the ſame with thoſe of the dentalium; but neither of them have any title to more than thoſe of alkaline abſorbents, like the other teſtaceous powders.

The modern Italians call all ſtones, metals, woods, cut in with lines or figures, or barely channelled, entaglia; from whence, and from the nearneſs of the word dentalium, the learned and ingenious Dr. Liſter conjectures the name Entalium to have its original. *Dale.*

ENTHU'SIASM (*Dict.*) — Mr. De Piles is of opinion that Enthuſiaſm contains the ſublime, as the trunk of a plant does the branches.

This is the Enthuſiaſm felt in poetry, oratory, muſic, painting, ſculpture, &c. But this Enthuſiaſm which belongs to the works of art, is very different from that attributed to the ſibyls and prieſteſſes of the oracles, and heathen gods; which was little elſe but fanaticiſm, and conſiſted principally in grimace, and contortions of the body.

There is a degree of aſſent, ſays Mr. Locke, which, with ſome men, has the ſame authority, as either faith or reaſon; and that is Enthuſiaſm; which, laying by reaſon, would ſet up revelation without it; whereby, in effect, it takes away both reaſon and revelation, and ſubſtitutes, in the room of it, the ungrounded fancies of a man's own brain, and aſſumes them for a foundation both of opinion and conduct.

Immediate revelation being a much eaſier way for men to eſtabliſh their opinions, and regulate their conduct by, than the tedious labour of ſtrict reaſoning; it is no wonder, that ſome have been very apt to pretend to it, eſpecially in ſuch of their opinions and actions as they cannot account for by the ordinary methods of knowledge, and principles of reaſon.

Hence we ſee, that, in all ages, men, in whom melancholy has mixed with devotion; or whoſe conceit of themſelves has raiſed them into an opinion of greater familiarity with God,

 than

than is allowed others; have often flattered themselves with the persuasion of an immediate intercourse with the Deity, and frequent communications from the divine spirit.

Their minds being thus prepared, whatever groundless opinion comes to settle itself strongly upon their fancies, is an illumination from the spirit of God; and, whatsoever odd action they find in themselves an inclination to do, that impulse is concluded to be a call, or direction, from heaven, and must be obeyed. This we take to be properly Enthusiasm, which, though rising from the conceit of a warm or overweening brain, works, where it once gets footing, more powerfully on the persuasions and actions of men, than either reason, or revelation, or both together; men being most forwardly obedient to the impulses they receive from themselves.

When men are once got into this way of immediate revelation, of illumination without search, and certainty without proof, reason is lost upon them; they are above it: they see the light infused into their understandings, and they cannot be mistaken; like the light of bright sun-shine, it shews itself, and needs no other proof but its own evidence: they feel the hand of God moving them within, and the impulses of the spirit, and cannot be mistaken in what they feel.—But, of this seeing and feeling, is it a perception of an inclination to do something, or of the spirit of God moving that inclination? These are two very different perceptions, and should be carefully distinguished.

If they know the thing to be a truth, they must do it, either by its own self-evidence, or by the rational proofs that make it out to be so: if they know it to be a truth, either of these two ways, they in vain suppose it to be a revelation: for thus all truths, of what kind soever, that men uninspired are enlightened with, come into their minds. If they say, they know it to be true, because it is a revelation from God, the reason is good; but then it will be demanded, how they know it to be a revelation from God? If they say, by the light it brings with it; they should consider, whether this be saying any more, than that it is a revelation, because they believe it to be true; for all the light they speak of, is but a strong persuasion of their own minds, that it is a truth; which is a very unsafe ground to proceed on, either in our tenets or actions. True light in the mind is nothing else but the evidence of the truth of any proposition: and, if it be not self-evident, all the light it can have, is from the clearness of those proofs upon which it is received.

God, when he makes the prophet, doth not unmake the man: he leaves his faculties in their natural state, to enable him to judge of his inspirations, whether they be of divine original, or no. If he would have us assent to the truth of any proposition, he either evidences that truth by the usual methods of natural reason, or else makes it known to be a truth which he would have us assent to by his authority; and convinces us, that it is from him, by some marks, which reason cannot be mistaken in. The holy men of old, who had revelations from God, had something else besides internal light of assurance in their own minds, to testify to them, that it was from God. They had outward signs to convince them, of the author of those revelations. And, when they were to convince others, they had a power given them to justify the truth of their commission from heaven; and by visible signs to assert the divine authority of the message they were sent with. Moses saw the bush burn without being consumed, and heard a voice out of it. God, by another miracle, of his rod turned into a serpent, assured him likewise of a power to testify his mission, by the same miracle repeated before them to whom he was sent.

ENTRO'CHUS, in natural history, the name of a genus of fossils, of a very regular figure and structure, supposed, by many authors, to be lapides sui generis, and stones in their native state. They are, however, in reality, the fossil remains of some marine animal, probably either of the echinus, or of the star fish kind, filled, like the fossil species of the echini, with a plated spar. Our imperfect knowledge in the animal history has not yet been able to ascertain to what creature they really belong; but their analogy with the other animal remains, found in the fossil world, plainly evince, that they are of that origin. They are cylindric columns, usually about an inch in length, and are made up of a number of round joints, like so many small wheels, or segments of cylinders. These joints, when found separate, and naturally loose, as they sometimes are, are called trochitæ. They are all striated, from the center to the circumference, and have a cavity in their middle, which is sometimes found empty, but more frequently filled up with various matter, of the nature of the stratum, in which they have lain, or of other of the native fossil substances.

Some of the Yorkshire Entrochi are swelled or tumid in the middle, and go off tapering to each end, and some others resemble the lapides Judaici. These, however, are true Entrochi: They are jointed in the same manner with the rest, and consist of a small stalk, or pedicle, formed of three or four joints, and on this an oval body is placed, broken off at both ends. Some of these have also been the natural summits or fastigia of the bodies, for they have a little jointed button on the top, hollow, and not seeming to have been divided, or broken off from any thing else. *Phil. Transf.* N°. 100.

The hollows of the Entrochi are usually filled up with earthy or stony matter, but sometimes with another smaller Entrochus, so that they resemble a pair of screws, one nicely fitted into the other, and the one making a sort of pith to the other, and having gone regularly through its whole length.

ENTROCHO-*asteriæ*, in natural history, the name given by authors to a peculiar kind of Entrochus, differing from the common kind, in having a stellar cavity, instead of a round one, in its center.

ENTROCHUS *pyramidalis*, a name given, by some of the writers of natural history, to the ortho-ceratites, or tubulus marinus concameratus, a species of shell-fish, not known to us in its recent state, but very common in the stones brought over from Sweden for pavements.

ENTROCHUS *ramosus*, in natural history, the name of a fossil body, the several parts of which resemble the Entrochi; but, as they are joined together in this body, when perfect, they shew themselves in their proper light, and a sight of them, in this state, is sufficient to explode the opinion, advanced by some persons, of the Entrochi being of a vegetable nature, or, as they have pleased to call them, rock plants.

E'PERON, in natural history, *the spur-shell*, so called from its resembling, in some degree, the rowel of a spur. It is a species of snail, of the round mouthed kind, or class of the cochleæ lunares; all its volutæ are surrounded with double rows of prickles.

EPE'RVIERS, in natural history, a name given, by the French authors, to a class of butterflies, which make the sixth in Reaumur's method.

EPHE'DRA, *sea-grape*, in botany, a genus of plants whose characters are:

The root is perennial: the plant has the appearance of a shrub; and the stalks, branches, and leaves, resemble those of horsetail. The flower is male; has no petals, but consists of testiculated stamina, growing on a thin substance, the congestion of which furnishes the floscule with a sort of calyx: these are the flowers which grow on the male or hermaphrodite plant. The fruit, which either grows on another part of the same plant, or on another plant which bears no flowers, is a red juicy berry; consists of a pair of squamous or scaly substances, laid across, upon a pair of others like them, and upon that a third, and over this a fourth pair, in like order as the first and second, the series gradually increasing from the least and lowest scales to the uppermost and greatest, which in a bifid cleft, a little gaping, contains two smooth oval seeds, gibbous on the back part, and flat on the other, and covered with a coriaceous membrane. *Boerhaave.*

EPHE'MERA (*Dict.*)— This fever is, properly, an attempt of nature to ease herself of a load of a plethora, either by an absolute discharge of part of the blood by an hæmorrhage, or, by resolving it into serum, and expelling it in that form, the secretory and excretory motions, being increased beyond their natural degree. The diary fever, properly so called, lasts only twenty-four hours; but this differs in nothing, except the time of its duration, from the ephemeron plurium dierum, which commonly lasts four days. To this it is to be added, that some authors have called the sudor Anglicus Ephemera maligna, diary fever, as it generally destroyed the patient in the space of one day.

The simple diary fever usually seizes the patient without any preceding shivering, and immediately is attended with a degree of heat of the flesh, which continues the same without intermission or exacerbation, till the close. This is usually not very violent, and is always attended with pains in the head, sometimes heavy and dull, sometimes pulsative and very acute. Such persons as fall into this fever, from drinking large draughts of cold liquors while they are hot, as is very frequently the case, always have a pain in the right hypochondrium. The face is red, and inflated in this disease, and there is a lassitude and weariness in all the limbs; the pulse is strong and quick, the urine is of a deep orange colour, and deposits a reddish sediment.

Method of treatment. When the peculiar disposition of the blood, and other accidents, render this fever worse than it naturally would be, the proper course is to attemperate the violent emotions of the blood with nitrous, and the fixed antimonial medicines, and occasionally, with the gentle acids, such as lemon juice, and the like: And indeed, in all cases of this kind, the frequent use of warm and weak liquors, with lemon juice among them, is highly to be commended. The free eruption of the sweat, by which nature attempts to ease herself of the disease, is to be promoted by the gentle sudorifics; nitre, crab's eyes, and a small quantity of the juice of lemons, just enough to saturate the alkali of the crab's eyes, prove an excellent medicine, to be repeated in small doses every three or four hours; and, towards night, the sudorifics should be joined to these, such as the contrayerva root, or the like. And when it is over, there should be given a few doses of some gentle purge, as an infusion of rhubarb and sena, or the like. Bleeding is unnecessary in this fever. *Juncker's Consp. Med.*

EPHE'MERON (*Dict.*)—This insect is found about the mouths of the Rhine, and some other rivers in Germany, and seems a sort of middle species between the May fly, common with us, and bred from the cadew worm, and the libella, or dragon fly. It has four wings, two long, and two short; two short horns,

six

six legs, and two very long straight hairs, issuing from the tail. They are seen flying about the surface of the water, about Midsummer, for three days, and no longer; they eat nothing, and their only business is to drop their eggs on the surface of the water, after they have copulated. These eggs, sinking to the bottom, produce a sort of worms, or maggots; these soon hollow themselves cavities in the clay, where they remain three years, growing every year about an inch in length. When the worm is come to its full growth, it rises to the surface of the water, about six o'clock in the morning, and there issues from it this fly, which lays its eggs, and dies about six o'clock the same night; so that the life of the creature, in the fly state, is only about twelve hours. *Swammerdam. Hist. Inf.*

EPICERA'STICA, ἐπικεραστικά, from κεράννυμι, to mix, or attemperate. Medicines which attemperate or obtund the acrimony of the humours, and mitigate the uneasy sensation of the parts thence arising. Among medicines of this kind, are reckoned emollient roots; as those of the marsh-mallow, mallow, and liquorice.

The leaves of mallows, water-lily, the large house-leek, purslane, and lettuce.

The seeds of barley decorticated, white henbane, lettuce, flax, white poppy, and rue.

The fruits, jubebs, raisins, sweet apples, sweet prunes, sebestens, sweet almonds, and pine-nuts.

Among juices and liquors; almond-milk, starch, barley-water, pinguious broths, the milk of the sow-thistle, cremor of ptisan, and the juices of the leaves of night-shade, and winter-cherry.

Among the parts of animals; the whites of eggs, butter, milk of all kinds, whey; the head and the feet of a calf, and also a sheep's head, and broths prepared of them; jellies of hartshorn and ivory.

Among mucilages; the seed of fleawort, quinces, of the seed and root of marsh-mallows; of the seed of flax, mallows, and of the root of borrage.

Among oils; oil of olives, violets, sweet almonds, expressed oils of the seed of gourd, white henbane, and white poppy.

Among ointments; the unguentum rosatum and unguentum album camphoratum.

Among syrups; the syrups of violets, of apples, of marshmallows, of Fernelius, of liquorice, jubebs, poppies, and of purslane.

Among the various shop preparations; the pulp of cassia, diacodium, diapenidium, sugar of violets, julap of violets, honey of violets. *Morellus, de Materia Medica.*

EPIDE'MIC (*Dict.*)—Pertinent to the present subject are the observations of the celebrated Boerhaave, on epidemical diseases: we must remark, says this author, that though every particular disease of the fluids, in various epidemical constitutions, appear, to unattentive observers, the same with regard to their names, signs, and their consequences in some measure, yet the same diseases, appearing in one epidemical constitution, differ exceedingly from those produced in another, with respect to their obscure natures; their appearances not observable, except by the judicious; the various times of their increase, state, coction, crisis, effect, event, and method to be pursued for the cure. Hence it is evident, that they require a different administration of the non-naturals, different treatment and medicines: this variety, however, in epidemical distempers, is so obscure, that physicians have not yet been able to deduce it from any abuse of the non-naturals: and yet there are many circumstances which make it highly probable, that the causes reside in the air, but depend more upon the inexplicable variety of exhalations contained therein, which, by their mixture with the fluids of the body, or their stimulus, injure the human machine, than upon any change in the sensible qualities thereof. But it is very surprizing, that these epidemical disorders should be principally propagated by contagion, received from one by another person unaffected.

Upon the invasion of any unknown epidemical distemper, the physician will receive some information with respect to the cure: first, by reducing the distemper to some more known species, which it most resembles.

Secondly, by observing its tendency at the vernal and autumnal equinoxes, at which seasons it is generally most prevalent.

Thirdly, by attending to the spontaneous phænomena, which precede, accompany, or follow, the death or recovery of the patient, and the better or worse state of the disorder.

Fourthly, by diligently remarking the benefit or injury received, from whatever the patients are unavoidably obliged to do; whatever is taken into; or discharged out of, the body.

Fifthly, by comparing the cases of a great many patients labouring under the distemper at the same time.

Sixthly, by abstaining from all remedies which are dubious, which exagitate and induce a considerable change in the humours, and thereby obscure the genius of the disease.

From these circumstances, duly attended to, the curative indication arises.

EPIME'DIUM, *barren-wort*, in botany, a genus of plants whose characters are:

The leaves are like those of ivy, and grow three on the top of each branch: the stalk is divided into three branches at each joint, and the triple division is continued in the subdivisions: the calyx is composed of four leaves: the flower consists of four petals, which are tubulated and hollowed into blind canals, and furnished with four stamina: the ovary is seated in the bottom of the calyx, and is furnished with an erect tube or pointal, which becomes an unicapsular bivalve pod, containing round flat seeds. *Boerhaave, Index alter.*

EPI'PHORA (*Dict.*)—Some confound this disorder with a fistula lachrymalis, but improperly; since, in the latter, pure tears are not discharged, but tears, mixed with a purulent matter, flowing from a latent ulcer in the saccus lachrymalis. But, that we may the more easily and accurately discover the nature of both these disorders, we shall, as briefly as possible, exhibit the state, figure, and situation, of the lachrymal ducts or passages. In *Plate* XX. *fig.* 7. the letters *a a* represent the puncta lachrymalia in the eye-lids; and *b*, the caruncula lachrymalis. *Fig.* 8 and 9, represent the ductus lachrymalis of both eyes intire, separate, and in such a state as they pass from the eye-lids to the nostrils. The letters *a a* exhibit the saccus lachrymalis; *b b*, the puncta lachrymalia, with their ducts or small tubes, *c c c c*, running off to the saccus lachrymalis. The letters *d d* represent the nasal duct; and *e e*, its mouth, opening in the nostrils. *Fig.* 10. represents the communication of these ducts with the eyes; *a a*, the puncta lachymalia; *b*, the caruncula lachrymalis, *c c*, the ducts running from the puncta lachrymalia to the saccus lachrymalis *d*; *e*, the nasal duct; and *f*, its extremity, opening into the nostrils.

This disorder may arise from various causes; for whatever prevents the course of the humours from the eye through the puncta lachrymalia and nasal duct to the nostrils, produces an Epiphora, or weeping eye; for, so long as the eye or lachrymal duct are sound and intire, that liquor discharged from the glandula lachrymalis, for moistening and cleansing the eye, insensibly drops through the puncta lachrymalia, the saccus lachrymalis, and the nasal duct, into the nostrils. A weeping eye, or the oculus lachrymans, is produced:

First, when any tumor, or tubercle, such as an encanthis, appears in the greater canthus, or that which is next to the nose, and disorders the puncta lachrymalia.

Secondly, when, after an exulceration, burn, or any other misfortune of the eye-lids, the puncta lachrymalia are closed up and obstructed.

Thirdly, when the nasal duct is either obstructed, or totally conglutinated; for, when the saccus lachrymalis is so full, that no more can enter therein, it must necessarily happen, that the humours, continually discharged in large quantities from the glandula lachrymalis, must run down the cheeks. The nasal duct is generally obstructed, when it is either filled with a thick, viscid, and glutinous matter, or when just by the nostrils it is affected with an inflammation capable of conglutinating it.

Fourthly, an Epiphora may be produced by a polypus, a caruncle, or fleshy excrescence of the nose; for these substances obstruct and compass the ductus lachrymalis nasalis.

Fifthly, this disorder may arise from a fistula lachrymalis.

Sixthly, from an inversion of the eye-lids, or that species of disorder called ectropium.

Seventhly, from an erosion or defect of the caruncula lachrymalis.

Eighthly and lastly, from a wound of the lachrymal ducts, and their agglutination by a bad cicatrice.

The prognostics, and method of cure, in this disorder, are various, according to the different causes from which it may possibly proceed; for, if a tumor of the large canthus, a polypus of the nose, a distortion of the eye-lids, or a fistula lachrymalis, should produce an Epiphora, or weeping eye, the disorder cannot be removed, till its respective causes are taken away. When the Epiphora arises from a conglutination of the puncta lachrymalia, we ought carefuly to examine, whether their ducts *c c*, in *fig.* 8 and 9, are totally conglutinated, or whether their mouths, *b b* are only closed up by a slender cuticle; for, when the ducts of the puncta lachrymalia are totally conglutinated, either by some internal cause, or cicatrices formed after wounds or burns of the lachrymal ducts, there remain little or no hopes of a cure. But, if a slender cuticle should only block up the ducts of the puncta lachrymalia, which sometimes happens, the most proper method is cautiously to perforate that cuticle with a needle, and then to pass a hog's bristle, or a piece of slender silver wire, anointed with oil of eggs, into the perforations. Various wires for this purpose are represented by *fig.* 11, 12, and 13, *Plate* XX. and these measures must be persisted in, till the mouths of the perforations are so effectually indurated as to prevent a future conglutination.

But if, in this disorder, the puncta lachrymalia are sound, and sufficiently pervious, the nasal duct must necessarily be obstructed. And this obstruction, when proceeding from a glutinous matter, which, by long continuance, is not preternaturally indurated, is very often capable of being removed. For this purpose the patient is frequently every day to be laid upon his back, and have resolvent liquors dropped into the greater

greater canthus; then the ſaccus lachrymalis is carefully to be compreſſed with the fingers, leſt the humours, by remaining long in it, ſhould contract a certain acrimony, corrode the lachrymal ducts, and gradually produce a fiſtula lachrymalis. Among the reſolvent medicines ſuited to this intention, the moſt conſiderable are eſſence of aloes, prepared with the aqua ophthalmica; eſſence of the gall of the eel-pout; prepared nearly in the ſame manner; warm infuſions of the herbs hyſſop and Paul's betony; mineral waters ſuch as thoſe of Wiſboden, the Caroline ſprings, thoſe of Emſer, the Selteran, the Sedlitz, and other waters of a like nature, or any ophthalmic waters, to be frequently dropped warm into the eye, with an admixture of a ſmall portion of mineral ſalt, obtained from the abovementioned waters. Beſides theſe, it is expedient ſometimes to draw up the noſtrils an errhine, or mild ſternutatory, prepared of marjoram, lilies of the valley, marum, and other herbs of a like quality. Spirit of hartſhorn, or ſal ammoniac, may alſo be applied to the noſtrils. If all theſe medicines ſhould prove ineffectual, it will be expedient to uſe that new method of cure in a fiſtula lachrymalis, recommended by Anel, in which a certain ſlender ſilver probe, like thoſe repreſented in *Plate* XX. *fig.* 11, 12, and 13, is cautiouſly and dexterouſly paſſed to the noſtrils through the ſuperior punctum lachrymale, the ſaccus lachrymalis, and the lachrymal duct of the noſe. But, in performing this operation, the ſituation and ſtructure of the lachrymal ducts muſt be carefully adverted to; the operator's eye muſt be quick and diſcerning, his hand ſteady, and well accuſtomed to the niceſt chirurgical operations; otherwiſe he will hardly ſucceed in the operation. This method ought to be perſiſted in for ſome days; and every morning and evening, after introducing the ſilver probe or wire now mentioned, a ſmall quantity of the above recommended liquors is, by means of the ſmall ſyringe, repreſented in *Plate* XX. *fig.* 14, to be injected into the inferior punctum lachrymale, in order to cleanſe the lachrymal ducts, leſt the paſſage of the tears to the noſtrils ſhould again be obſtructed. When this ſpecies of diſorder continues long, it generally degenerates into a fiſtula lachrymalis, and is to be treated as ſuch. When an Epiphora ariſes from a total want of the caruncula lachrymalis, all attempts of relief are unſucceſsful; becauſe that gland cannot be reſtored. *Heiſter. Chirurg.*

EPIPLO'CELE (*Dict.*)— There have been a few inſtances where ſo great a quantity of the omentum has fallen into the ſcrotum, that, by drawing the ſtomach and bowels downwards, it has excited vomiting, and inflammations, in which caſe the operation of opening the ſcrotum is neceſſary: it is neceſſary alſo the rings of the muſcles ſhould be dilated, or otherwiſe, though you have taken away ſome of the mortified part of the omentum, the reſt that is out of its place, and ſtrangled in the perforation, will gangrene alſo. What I have here deſcribed as an inducement to the operation, ſhould, by the experience I have had, be the only one. There are a great many people, who are ſo uneaſy with ruptures, though they are not painful, that a little encouragement from ſurgeons of character will make them ſubmit to any means of cure; but, as I have ſeen two or three patients, who were in every reſpect hale and ſtrong, die a very few days after the operation, the event, though very ſurpriſing, ſhould be a leſſon, never to recommend this method of treating an Epiplocele, unleſs it is attended with inflammation, &c. *Sharp's Surgery.*

E'PITHEM (*Dict.*)— There are three kinds of Epithems; firſt, the liquid; ſecondly, the dry, or ſolid; and, thirdly, thoſe of the ſoft and poultice kind. The two former retain the general name of Epithem, and the latter is called cataplaſm, poultice, or malagma.

A liquid Epithem, called alſo ſometimes, a fomentation, is a medicated liquor, either ſimple or compound, applied either cold or hot, by the intervention of a proper vehicle, to the ſurface of the body; and calculated either for inducing ſuch a change on it, or the ſubjacents parts, as the intention of the phyſician ſhall require.

The liquors for theſe intentions may be water, milk, wine, vinegar, ſpirit of wine, liquid juices, oil, or urine, either ſimple by themſelves, or variouſly prepared, and mixed either with each other, or with other officinal and extemporaneous medicines, of whatever conſiſtence, ſuch as diſtilled waters of all kinds, vinegars, infuſed oils, decoctions, aromatic ſpirits, tinctures, eſſences, ſaline liquors, lixiviums, forge-water, lime-water, and, eſpecially, infuſions and decoctions prepared from theſe and other proper materials, expreſſed juices, emulſions, and mixtures of various kinds.

The choice of the phyſician, with reſpect to proper materials, is to be directed by the nature of the part to be changed, or to which the application is made, the malignant or benign nature of the ſymptoms, and the particular quality of the liquor to be uſed.

The ſame cautions are to be uſed in the management of theſe, as in that of ſuch forms for internal uſe: only, as in the former caſe, it is not neceſſary we ſhould regard the taſte, the ſmell, or the colour of the medicines; ſo, for this reaſon, we are to omit the ſugars and ſyrups uſed for correcting internal remedies.

A pretty thick conſiſtence is no diſadvantage to liquid Epithems, though, at the ſame time, when a deep penetration into the part affected is required, thoſe of a leſs thick conſiſtence are, when all other circumſtances are alike, to be preferred.

As a change of the part only to which the application is immediately made, is not always intended, but, ſometimes, alſo, of the viſcera and organs lying under it; ſo the ſubſtances moſt proper for applications of this kind are thoſe, whoſe virtues conſiſt in their volatile, highly fine, and penetrating principles, eſpecially when a change of the internal parts is intended: for this reaſon, ſubſtances of an earthy or ſtony nature, aſtringents, and materials of an inſpiſſating nature, can poſſibly be of no ſervice for this purpoſe; ſince, in conſequence of their thickneſs, they either cannot be abſorbed, or, by bracing up the mouths of the pores, prevent their own ingreſs. But, perhaps, better effects may be produced by adding ſome penetrating aromatic, or ſpirit, to gentle aſtringents.

It is alſo to be carefully conſidered, whether the nature of the part, to which the application is immediately to be made, is ſuch, as, without being injured, is capable of bearing the liquor, whether oil, water, ſpirits, or acrid fluids; leſt, whilſt we do ſervice to one part, we ſhould injure or hurt another.

EPU'LIS, ἐπουλὶς, from ἐπὶ upon, and οὖλα, the gums, a ſpecies of tubercles growing on the gums, of which there are two kinds; for ſome are intirely without pain, whilſt others afflict the patient in a moſt terrible manner, becauſe they are of a malignant nature, and gradually degenerate into a cancer: tubercles of this kind are alſo in ſome meaſure diſtinguiſhed from each other by their different bulks and conditions; ſince ſome are as big as a large nut, and others no bigger than a ſmall one; ſome hard, others ſoft; ſome have a ſlender, and others a larger and broader root: when theſe tubercles are of the large kind, they not only diſtend and deform the jaws, but alſo prove a conſiderable obſtruction to maſtication and ſpeech, for which reaſon they require a ſpeedy and expeditious cure: now, no method of cure is more expeditious, than a total extirpation of theſe caruncles, as is uſual in other tubercles of a like nature: when, therefore, the roots are ſmall, a thread is carefully to be paſſed about them, with which they are to be tied pretty tight: but, when the inferior part of the tubercle is pretty large, the uſe of ſome gently corroſive medicine is proper; and this intention is excellently anſwered, by oil of tartar per deliquium, or a ſolution of ſal ammoniac. But in caſes of this nature we are abſolutely to abſtain from the more draſtic and poiſonous corroſives, ſince, for the moſt part, they not only excite violent inflammations, and exulcerations of the mouth, but may alſo produce the death of the patient, if they ſhould happen to be unfortunately ſwallowed: for this reaſon, in caſes where the milder corroſives are not ſufficient, it is more expedient and ſafe to ſeek the means of relief from the knife, whilſt theſe caruncles, being laid hold of by a pair of forceps, or a ſmall hook, are to be extirpated and cut out, either by the knife or a pair of ſciſſars: but this is to be done cautiouſly, leſt, by cutting out the whole ſubſtance of the gum at the ſame time, a caries ſhould be excited in the denudated bones of the jaw. The diſcharge of the blood is to be permitted for ſome time; but, if it ſhould continue too long, in order to ſtop it more eaſily, and cleanſe the blood out of the mouth, it is highly proper to make the patient often waſh his mouth with warm wine, eſpecially of the red and aſtringent kind, or with oxycrate, mixed with a little alum, till he has ſpit out all the blood: when the diſcharge of the blood is ſtopped, the wound is to be daily anointed, till healed, with oil of myrrh per deliquium, or eſſence of myrrh mixed with honey of roſes. If any part of the tubercle ſhould remain, or if it ſhould begin to appear afreſh, it is with all expedition to be conſumed by the corroſives already mentioned, or by blue vitriol, or any other corroſive medicine; or it may be again extirpated by means of the ſciſſars or knife. The actual cautery is by ſome recommended in caſes of this nature, and inſtances of cures happily performed by it alledged; but it is not only incommodious to apply, but alſo excites intolerable pain; it is however to be uſed when the tubercle cannot be repreſſed by other means. Meckren, in his twenty-eighth obſervation, gives us a ſingular inſtance of a cure of this diſorder, together with the deſcription of a knife, accommodated to this purpoſe. Scultetus, in his thirty-fifth obſervation, informs us, that, by means of a forceps uſed in eradicating polypuſes, he happily extirpated a caruncle of this kind, adhering to the gum of the anterior teeth, hard by the palate. Some years ago, I myſelf ſays Heiſter, ſaw ſuch a caruncle in the palate of a monk, behind the dentes inciſores; but, becauſe his miſfortune was complicated with a ſpina ventoſa in the bones of the palate, and becauſe he would not ſubmit to the uſe of the actual cautery, the caruncle could not be totally removed; but the patient, gradually loſing his ſtrength, at laſt died. *Heiſter. Chirurg.*

EQUA'TION (*Dict.*)— Dr. Halley's method for the ſolution of Equations is thus: let the root z of any Equation be taken equal to $a \pm e$; where a is ſuppoſed to be taken near to the true value. Then from the quantity $a \pm e$ let all the powers of z, found in the propoſed Equation, be formed; and to theſe

let

let their respective coefficients be prefixed. Let the power to be resolved be subducted from the sum of the parts of the first column, where e is not found; and let the difference be $\pm b$, then take the sum of all the coefficients of e in the second column, which call s: and having added all the coefficients of ee, the sum of which is called t; the root sought, z, will, in a rational form, $= a \pm \frac{sb}{ss \pm tb}$; and, in an irrational form, $= a \frac{\mp \frac{1}{2} S \mp \sqrt{\frac{1}{4} ss + bt}}{t}$.

For instance, let it be proposed to find a root of the Equation $z^4 - 3zz + 75z = 10000$, where 10000 is the resolvend.

For a first supposition let $a = 10$; we shall therefore have the Equation

$$z^4 = a^4 \pm 4a^3e + 6a^2ee \pm 4ae^3 + e^4$$
$$-dzz = da^2 \pm dae - dee$$
$$+cz = +ca \pm ce$$
$$= 10000 \pm 4000e + 600ee \pm 40e^3 + e^4$$
$$-300 \pm 600e - 3e$$
$$+750 \pm e\,75e$$
$$-10000$$

$$+450 \mp \underset{s}{4015}e + \underset{t}{597}ee \mp \underset{u}{40}e^3 + e^4 = 0.$$

The signs + and — with respect to e and e^3 are left doubtful, till it be known whether e be affirmative or negative; in which there is some difficulty, as in Equations having several roots, the homogenea comparationis, as they are called, are often increased by diminishing a, and on the contrary diminished by increasing a. But the sign of e is determined by the sign of the quantity b; for, the resolvend being subtracted from the homogeneum formed from a, the sign of se, and, therefore, of the parts prevailing in its composition, will always be contrary to the sign of the difference b. Hence it will appear whether e be affirmative or negative, or whether a has been assumed greater or less than the true root. But e is always equal to $\frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$, as often as b and t have the same sign; but, when they are connected with different signs, e becomes $= \frac{\sqrt{\frac{1}{4}ss + bt} - \frac{1}{2}s}{t}$. After that e has been found to be negative, e, e^3, e^5, &c. must be made negative in the affirmative members of the Equation, and affirmative in the negative members, that is, they must be writ with a contrary sign: but if e be affirmative, then must e, e^3, e^5, &c. be affirmative in the affirmative members, and negative in the negative.

In the proposed example we have 10450 instead of the resolvend 10000, or $b = +450$; from whence it appears, that a was taken greater than the true root, and, consequently, that e is negative. Hence the Equation becomes $10450 - 4015e + 597ee - 4e^3 + e^4 = 10000$; that is, $450 - 4015e + 597ee = 0$. Therefore, $450 = 4015e - 597ee$, or $b = se - tee$; the root of which is $e = \frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$, or $\frac{s}{2t} - \sqrt{\frac{ss}{4tt} - \frac{b}{t}}$, that is, in the present case, $e = \frac{2007\frac{1}{2} - \sqrt{3761406-}}{597}$, from whence the approximated root is found to be $= 9.886$. Now, this root being taken for a second supposition, and the operation being repeated, we shall have $a + e = z = 9.8862603936495$, which is very exact, scarcely exceeding the truth by above 2, in the last figure.

This is sufficient to give a notion of Dr. Halley's method: those who desire more examples, and farther instructions, may consult the the Philosophical Transactions, N°. 210, or Lowthorp's Abridg. vol. I, p. 85.

EQUATION *of the center (Dict.)*— This Equation not being constant, there is a place in the planet's orbit where it is greatest. Hence several questions in astronomy arises; as, what is the greatest Equation for every planet? To what mean anomaly does this Equation correspond? Also, as the greatest Equation is determined by the excentricity of the planet's orbit, it may be reciprocally requisite to determine the excentricity by the greatest Equation.

The rigorous solutions of these questions being no where extant, Mr. Euler has enquired into them, in Mem. de la Acad. de Berlin, Tom. II, p. 225. Where he solves the following problems.

1. To find the true and mean anomaly, corresponding to the planet's mean distance from the sun; that is, when the planet is in the extremity of the conjugate axis of its orbit.

2. The excentricity of a planet being given, to find the excentric anomaly corresponding to the greatest Equation.

3. The excentricity being given, to find the mean anomaly corresponding to the greatest Equation.

4. From the same data to find the true anomaly corresponding to this Equation.

5. From the same data to find the greatest Equation.

6. The greatest Equation being given, to find the excentricity. Mr. Euler observes, that this problem is very difficult, and that it can only be solved by approximation and tentatively, in the manner he mentions. But, if the excentricity be not great, it may be then found directly from the greatest Equation. Thus, if the greatest Equation $= m$, and the excentricity $= n$, then

$$m = 2n + \frac{11}{48}n^3 + \frac{899}{5120}n^5 +, \&c.$$

Whence, by conversion,

$$n = \tfrac{1}{2}m - \frac{11}{768}m^3 - \frac{587}{2^{10}.15}m^5 -, \&c.$$

Where the greatest Equation m must be expressed in parts of the radius, which may be done by converting the angle m into seconds, and adding 4.6855749 to the logarithm of the resulting number; for this will be the logarithm of the number m.

The mean anomaly to which this greatest Equation corresponds, will be, $x = 90° + \frac{5}{8}m - \frac{5}{2^9.3}m^3 - \frac{1}{2^9.5}m^5 -$, &c.

Whence, if to 90° we add $\frac{5}{8}$ of the greatest Equation, we shall sufficiently approximate to this mean anomaly.

Mr. Euler gives us a table, in which may be found the greatest Equations, the excentric and mean anomalies, corresponding to these greatest Equations, for every hundredth part of unity, which he supposes equal to the greatest excentricity, or when the distance of the foci and the transverse axis become infinite. The last column of his table also gives us the logarithm of that distance of the planet from the sun, where its Equation is greatest. By the help of this table, any excentricity being given, we may find the greatest corresponding Equation, by interpolation. But the principal use of the table is, to determine the excentricity when the greatest Equation is known, and Mr. Euler thinks the question insoluble without this help.

EQUISE'TUM, *marsh horsetail*, in botany, a genus of plants whose characters are:

The root is very creeping: the leaves are round, hollow, and articulated by a pyxidated insertion, or after the manner of boxes, a less within a greater: the flower has no petals, is stamineous or thready, has a fungiform or mushroom-like head, and is male in one plant. The fruit consists of black rough grains, growing close together on the plant, which bears no flowers.

The great horsetail has many hollow, whitish-green, smooth, and neatly channeled round stalks, having many joints at some distance one from another, the uppermost being always set-in or articulated in that next under it: they grow to be a foot and a half, or two feet high, taper, and scarce half an inch thick: They are surrounded, at every joint, with a great number of long, very slender, rough leaves, which, like the stalks, are jointed one within another, and stand so thick, that the whole stalk appears like a horse's tail: early in the spring, before the stalks come up, there arise from the root several short stalks, without leaves, but jointed as the others, having at their tops a brownish round head like the top of an asparagus, in which lies the seed: the root is long and slender, full of joints, and spreading much. It grows in ditches and marshy grounds.

Horsetail is restringent, drying, and binding; good to stop bleeding in wounds, and all hæmorrhages in any part of the body, redundant catamenia, and the fluor albus, for ulcerations in the kidneys or bladder, and is useful in all kinds of ruptures. *Miller's Bot. Off.*

Horsetail has an herby saltish taste; it is detersive, and gives hardly any tincture of red to blue paper: its salt seems to resemble that of coral; but it is mixed with a little sal ammoniac and sulphur: by the chemical analysis, it affords several acid liquors, a little oil, a great deal of earth, no concreted volatile salt, but a little urinous spirit: its fixed salt does not easily dissolve in the air, neither does it give an orange colour to the solution of corrosive sublimate. *Martyn's Tournefort.*

Frederick Hoffman recommends a decoction or infusion, by way of tea, made of this plant, as excellent in the stone; and Fuller gives a decoction thereof, intended against ulcers of the bladder.

E'QUUS, in natural history, the horse. See the article HORSE.

ERE'TRIA *Terra*, *Eretrian earth*, in the materia medica, the name of a very peculiar kind of bole, dug in the Negropont, near the ancient Eretria, and once in great use as an astringent and a sudorific.

The grey, or genuine Eretrian earth, is a fine and pure greyish-white earth, moderately heavy, naturally of a smooth surface, of a friable texture, easily crumbling to pieces between the fingers, but not staining the skin in handling; it sticks firmly to the tongue, but melts into a butter-like substance in the mouth; it burns to a perfect snow white, and effervesces violently with aqua-fortis. But what abundantly distinguishes it from all other earths, is, that, if a little wetted and drawn over a plate of brass or copper, so as to mark a line, the mark will, a little after, appear bluish.

ERI'CA, *common heath*, in botany, a genus of plants whose characters are:

The leaves are small and ever-green, monopetalous, bell-shaped, naked, and often shaped like a pitcher. The ovary in the bottom of the flower becomes a roundish fruit, gaping in four places, divided into four cells full of small seeds, and covered with the lower part of the flower as with a calyx.

The flower of this plant is of a very singular structure. It is a little bell prolonged and double. The outer one, which is the longest, is formed by four petals, encompassing the other, which seems to be monopetalous, open only at the fore part, and cut into four equal segments. The cavity of this inner one is filled with eight chives, disposed round a pointal, which does not exceed the thickness of a middling pin's head, and is raised with eight rounded ribs, and surrounded by a style, terminated with a button, which usually juts out of the flower. These parts are sustained by a little empalement, like a cup, cut to the very base into four equal parts. This double flower is purple, as is also the style; but the chives are white.

The decoction of heath is diuretic. Clusius affirms, that Rondeletius, the famous professor of physic at Montpelier, used the oil of its flowers for tetters, with a great deal of success. Tabernæmontanus says, that it is a specific for these sorts of diseases; and that a fomentation, with the flowers of heath, eases the pain of the gout. For the same disease they prepare a vapour bath, with its leaves and flowers. *Martin's Tournefort.*

ERMI'NEUM *Animal*, the ermin, or creature whose skin is the ermin, so much esteemed as a fine furr.

This creature is properly a species of weasel, and is called by Mr. Ray, and other authors, mustela candida, the white weasel. It is in all respects like the common weasel, and is all over of a pure snow-white, except the tip of the tail, which is of as beautiful a black; and that it has a little yellowish-grey about the eyes, and a mark, or spot, of the same colour, on the head, another on the shoulders, and a third near the tail. Its colour is, however, very different in degree and elegance, according to the season of the year. It is frequent about rivers, and in meadows, in those countries which produce it, and feeds on moles, mice, and other small animals. *Ray's Syn. Quad.*

ERU'CA, *wild rocket*, in botany, a genus of plants, whose characters are:

The pod is full of roundish seeds, and the plant has a particular taste, and a particular fœtid smell above all others.

This rocket has a long white root, with many fibres at the bottom; from which arise a great many striated stalks a foot or two high, full of narrow, long, and deeply laciniated leaves. The flowers are pretty large and yellow, of four leaves a-piece, which are succeeded by long, narrow, angular pods, full of small, hot, bitterish seed. The whole plant has an ungrateful, fœtid smell. It grows frequently upon old walls, as on the walls of the city of London, in great plenty, flowering great part of the summer.

This rocket is hot and dry, and much of the nature of the following; but is very rarely used in physic. *Miller's Bot. Off.*

This plant is of a state altogether acrid and burning, mixed at last with a little bitterness; it gives a pretty deep tincture of red to the blue paper, and its smell resembles that of fœtid oils rectified over quicklime; which makes us believe, that it contains a salt very acrid, which in some measure resembles the sal ammoniac, mixed with a great deal of fœtid oil and earth.

Thus it is no wonder, that the plant, of which we are speaking, should be aperitive, incisive, and diuretic. Matthiolus affirms, that, being boiled with a little sugar, it is good for the cough in children, which is generally occasioned by glutinous matters, irritated in the bronchia and vesicles of the lungs. *Martyn's Tournefort.*

ERUCA, *garden-rocket*.—The common garden-rocket has a slender white woody root, of a hot biting taste; the leaves somewhat resemble mustard in shape, but are much smoother; the stalks grow to be two or three feet high, cloathed with lesser leaves, having on their tops many flowers of a whitish yellow colour, full of dark purple veins; the seed vessels, which succeed them, are long, slender, and smooth, parted in two by a thin membrane, and opening at the sides when the seed is ripe, which is very small, of a reddish yellow colour, and a roundish shape, and hot taste. It is sown in gardens, and the seed is ripe in July.

Rocket is eaten frequently among other herbs as a sallad, though many people dislike it for its strong ungrateful smell; it has the name of a provocative, and exciter to venery, and is likewise a good diuretic. Matthiolus commends the leaves, boiled with sugar, to be given to children for a cough: I suppose he means, that they should be made into a syrup. Camerarius says, that an equal part of the powder of rocket and cumin seed is a mighty preservative against an apoplexy. *Miller's Bot. Off.*

ERU'CÆ *aquaticæ*, water caterpillars. It might seem incredible that there is any such creature as a caterpillar, whose natural habitation is under water; but experience and observation prove that there are such, and that they feed on the water plants as regularly as the common kinds do on those at land. These are not named at random, like many of the aquatic animals of the larger kinds, the sea-wolf, and the sea-horse, &c. which might as well be called any thing else as wolves and horses; but they are properly what they are called, and do not respire in the manner of the fish tribe, but by thin stigmata, as other caterpillars. Mr. Reaumur, in his observations, met with two species of these; the one upon the potamogiton, or pond-weed; the other upon the lenticula, or duck-meat. These are both very industrious animals; but, the first being much the larger, its operations are more easily distinguished.

This, though truly an aquatic animal, swims but badly, and does not at all love to wet itself. The parent butterfly lays her egg on a leaf of the potamogiton, and, as soon as the young caterpillar is hatched, it gnaws out a piece of the leaf of a roundish shape. This it carries to another part of the same leaf, and lays it in such a manner, that there may be a hollow between, in which it may lodge. It then fastens down this piece to the larger leaf with silk of its own spinning, only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It easily gets out, though the aperture be naturally small, since a little force from its body bends up the upper leaf, and bends down the lower, both being flexile; and when the creature is out, it has a sort of down that defends it from being wetted, and the natural elasticity of the leaves, and of the silk, join the aperture up again, so that no water can get in. The leaves of this kind of plant are also naturally very slippery, and not easily wetted by water. It soon happens, that this habitation becomes too small for the animal, in which case it makes just such another, and after that, at times, several others, each being only made fit for it at the size it is then of. The changes of this creature into the chrysalis and butterfly state are in the common method. The butterfly gets out of a chrysalis which was placed on the surface of the water, the lightness of the animal easily sustains it on the water till its wings are dried, and it then leaves that element never to return to it again. *Mem. Acad. Par.* 1736.

E'RVUM, *bitter vetch*, in botany, a genus of plants whose characters are:

The pods are articulated, undulated on both sides, as if knotted, and full of roundish seeds. The leaves grow by pairs, as if conjugated to a middle rib.

This vetch seldom grows to above a foot and an half, or two feet high; full of weak angular stalks, having many winged tare-like leaves, whose obtuse pinnæ are more numerous and slender. The flowers grow at the setting on of the leaves, singly, in shape like the flower of a tare or vetch, but less, and of a white colour; and are succeeded by small round pods, containing two or three large round white seeds, which swell out the pod, making it appear, as it were, jointed: it grows in Italy, and some parts of France; and flowers in June.

The powder of bitter vetch, mixed with honey, is accounted good to cleanse the lungs of tough phlegm. It is a strong diuretic, and expels the stone and gravel; but, if taken too frequently, it causes bloody urine: it is but seldom used. *Miller's Bot. Off.*

ERY'SIMUM, *hedge mustard*, in botany, a genus of plants whose characters are:

It has a long, thin, slender pod, full of very small round seeds; and it has a peculiar appearance.

The root of hedge mustard is long, whitish, frequently crooked, and full of small fibres. The stalk arises to be a foot and a half, or two feet high, tough, and pliant, branching out, usually, on all sides, like a shrub, or bush. The lower leaves are long and narrow, cut into several jagged segments, set opposite to one another, with one more blunt at the end, and are somewhat hairy; the leaves, which grow on the stalks, have fewer segments, the upper many times but three, appearing like the head of an halbert; the flowers are yellow, very small, and four-leaved, growing thick together at the lower end of the branches; which flowering gradually, and the stalk still extending itself, the spikes of the seed-vessels grow to a great length, being round, sharp-pointed, clapping close to the stalks, and are full of hot biting seed. It grows everywhere, by the way-side, flowering good part of the summer.

Hedge mustard is hot and dry, opening and attenuating, and, by its warming quality, is good to dissolve thick, gross, slimy humours in the lungs, to help a cough, and shortness of breath; and it is particularly recommended against an habitual hoarseness, to recover the voice. Riverius praises a decoction of it, in wine, against the cholic. *Miller's Bot. Off.*

ERYSI'PELAS (*Dict.*)— Heister thinks that the grand intention, in the curing this disorder, must be to dilute the inspissated blood, and break and divide it where it stagnates and is obstructed. Plenty of thin and weak drinks are therefore to be administered, by which a gentle and lasting sweat may be excited, and the testaceous powders, and nitrous medicines, are frequently found also to have great and good effects. If the inflammation be but very slight, it is often cured by external warmth; but, when warmth alone does not prove sufficient, cloths, with the rob of elder spread upon them, are found of great benefit, being laid on the part, and kept on by warm compresses, and the proper bandages. Ointments made of the middle green bark of elder are also very beneficial, and, notwithstanding that many do not approve the practice, yet spirit of wine camphorated, with a mixture of saffron and Venice treacle, are found often of very great service, applied warm with coarfe paper, or with linen rags: and a mixture of lime water and fpirit of wine camphorated often does great fervice. It fometimes happens, that an Eryfipelas comes to fuppuration; and from this generally arife the moft untractable fpreading and eating ulcers. In this cafe, the ulcer is to be carefully cleanfed, and dreffed with ointments of cerufs, red lead, or litharge, and plaifters of the fame ingredients; and muft, at the fame time, take internal remedies to fweeten the blood, fome gentle purges, and a ftrict regimen in regard to diet. *Heifter's Surgery.*

ES'CHATON, in mufic, the difference between the diefis enharmonica and the hyperoche; that is, what remains, after taking the difference between the femitone minor and diefis enharmonica from the latter.

Thus the difference between the femitone minor and the enharmonic diefis is $\frac{25}{24} : \frac{128}{125} = \frac{3125}{3092}$, and this, taken from the diefis, is $\frac{128}{125} : \frac{3125}{3072} = \frac{393216}{390623}$. This interval is about $\frac{53}{100}$ of a comma, as will eafily appear by logarithms.

Mr. Henfling has taken notice of this interval. He calls it Efchaton, from its being the leaft and laft interval that occurs in his fyftem.

ESPA'LIERS, (*Dict.*) — Efpaliers of fruit trees are commonly planted to furround the quarters of a kitchen garden; for which purpofe they are of admirable ufe and beauty: for, by laying out the walks of this garden regularly, which are bounded on each fide by thefe hedges, when they are handfomely managed, they have a wonderful effect in fheltering the kitchen plants in the quarters, and alfo fkreening them from the fight of perfons in the walks; fo that a kitchen garden, well laid out in this manner, and regularly managed, will be equal to the fineft parterre for beauty.

The trees chiefly planted for Efpaliers are apples, pears, and fome plums; but the two former are moftly ufed: fome plant Efpaliers of apples grafted upon paradife ftocks; but thefe, being of a fhort duration, are not fo proper for this purpofe; therefore I fhould rather advife the having them upon crab ftocks, or (if in fmall gardens, where the trees cannot be allowed to grow fo high) upon what the gardeners call the Dutch ftock; which will caufe them to bear much fooner, and prevent their growing too luxuriant.

In chufing the trees for an Efpalier, endeavour, as near as poffible, to plant the feveral forts which are nearly of the fame growth in one line, that the Efpalier may be the more regular, and of an equal height, which greatly adds to their beauty; for, if you plant trees which fhoot very unequally in the fame line, it will be impoffible to make the Efpalier regular: befides, the diftance the trees are to be planted muft be directed hereby; for fome trees, viz. thofe of a larger growth, fhould be planted twenty-five or thirty feet afunder; whereas thofe of fmaller growth need not be above fixteen or eighteen feet diftance from each other.

The width of the walks between thefe Efpaliers fhould (in a large garden) be fourteen or fixteen feet at leaft; and, if they are defigned to be carried up pretty high, the diftance fhould be greater, that each fide may receive the advantage of the fun and air, which is abfolutely neceffary, if you would have the fruit well tafted. And, if your ground is fo fituated, that you are at full liberty which way to make the Efpaliers, I would advife the placing the lines from the eaft a little inclining to the fouth, and toward the weft a little inclining to the north, that the fun may fhine between the rows in the morning and evening, when it is low; for in the middle of the day, when the fun is advanced far above the horizon, it will fhine over the tops of the Efpaliers, and reach the furface of the earth about their roots; which is a matter of more confequence than many people are aware of.

The forts of apples proper for Efpaliers are the golden pippin, nonpareil, rennette grife, aromatic pippin, Holland pippin, French pippin, Wheeler's ruffet, Pile's ruffet, with feveral others. The feafon for planting, and the method of pruning and training thefe trees, you will fee under the articles of APPLES and PRUNING.

The forts of pears proper for an Efpalier are fummer and autumn fruits; for fome of the winter pears feldom fucceed well in an Efpalier. Thefe trees, if defigned for a ftrong moift foil, fhould be upon quince ftocks; but, if for a dry foil, upon free ftocks. Their diftance of planting muft alfo be regulated by the growth of the trees, which are more unequal in pears than apples, and fhould therefore be more carefully examined before they are planted. As for thofe pears upon free ftocks, the diftance fhould never be lefs than twenty-five feet for moderate-growing trees; but, for vigorous fhooters, the fpace of thirty or five and thirty feet is little enough, efpecially if the foil be ftrong, in which cafe they fhould be planted at a greater diftance. The particular forts of pears I would recommend for an Efpalier, are the jargonelle, blanquette, poir fans peau, fummer boncretien, Hambden's burgamot, poir du prince, autumn burgamot, l'ambrette, gros roufelet, chaumontelle, beurre du roy, le marquifs, creffane, with many others of lefs note, always remembering, that thofe pears which are of the melting kind, will do better in Efpaliers than the breaking pears, which feldom ripen well on Efpaliers: you fhould alfo be careful of the ftocks thefe are grafted on, for, if the breaking pears are grafted on quince ftocks, the fruit will be ftony. As to the method of planting, fee the article PEAR; and, for pruning and managing, fee PRUNING.

I fhall now give directions for making the Efpalier, to which the trees are to be trained: but this I would not have done until the third year after the trees are planted; for, while they are young, it will be fufficient to drive a few fhort ftakes into the ground on each fide of the trees, to which the branches fhould be faftened in an horizontal pofition, as they are produced; which ftakes may be placed nearer, or at a farther diftance, according as the fhoots produced may require, and will be fufficient for the three firft years; for, fhould you frame the Efpalier the firft year the trees are planted, the poles would rot before the Efpalier is covered. The cheapeft method to make thefe Efpaliers is with afh poles, of which you fhould have two forts; one of the largeft fize, which contains thirteen poles in a bundle, and the other fize thofe of half a hundred; the firft or largeft fize poles fhould be cut about feven feet and an half long; thefe are intended for upright ftakes, and muft be fharpened at the largeft end, that they may, with more eafe, be driven into the ground; thefe fhould be placed at a foot diftance from each other in a direct line, and of an equal height, about fix feet above ground; then you fhould nail a row of ftraight flender poles along upon the tops of the upright ftakes, which will keep them exactly even, and continue to crofs the ftakes with the fmaller poles, and the tops which were cut off from the larger ones, at about nine inches diftance, row from row, from the top to the bottom of the ftakes. Thefe rows of poles fhould be faftened with wire, and the largeft end of the poles fhould be nailed to the upright ftakes, which will fecure the Efpalier almoft as long as the poles will endure; whereas, if your faftening is not ftrong, the poles will be continually difplaced with every ftrong wind. When your Efpalier is thus framed, you muft faften the branches of the trees thereto, either with fmall ofier twigs, or fome fuch binding, obferving to train them in an horizontal pofition, and at equal diftances; being careful not to crofs any of the branches, nor to lay them in too thick: the diftance I would allow for the branches of pears and apples, fhould be proportioned according to the fize of their fruit; fuch of them whofe fruit is large, as the fummer boncretien, monfieur John, and beurre du roy pears, and the rennet guife, Holland pippin, French pippin, and other large apples, fhould have their branches fix or eight inches diftance at leaft; and to thofe of leffer growth four or five inches will be fufficient. But for further directions I fhall refer to the articles of the feveral fruits; as alfo that of PRUNING, where the particulars will be fufficiently explained.

But, befides this fort of Efpalier made with poles, there is another fort that is by many people preferred; which is framed with fquare timbers cut to any fize, according to the ftrength thereof, or the expence the owner is willing to go to; thefe, though they appear more fightly, when well fixed and painted, are not of longer duration than one of the former, provided it is well made, and the poles are ftrong which are fet upright; nor will they anfwer the purpofe better, though they are vaftly more expenfive; for the greateft beauty confifts in the difpofing the branches of the tree, which, efpecially in fummer, when the leaves are on, will intirely hide from the fight the frame of the Efpalier: therefore all expence in erecting thefe is needlefs, farther than making provifion to fecure the branches of the trees in a regular order.

Fruit-trees thus planted, and well managed, are much preferable to thofe trained up in any other figure, upon feveral accounts: as, firft, thefe take up very little room in a garden, fo as to be hurtful to the plants which grow in the quarters; and, fecondly, the fruit upon thefe are better tafted than thofe which grow upon dwarfs, the fun and air having freer accefs to every part of the tree, whereby the dampnefs arifing from the ground is fooner diffipated; which is of fingular advantage to fruit-trees. *Miller's Gard. Dict.*

ETRU'SCA *Terra*, in the materia medica, a kind of bole of which there are two fpecies, the white and the red; thefe are called, by many authors, the terra figillata alba & rubra magni ducis, as they are brought to us fealed with different impreffions.

The white Tufcan earth is a denfe and compact fubftance of a dull deadifh white, which in drying acquires fome degree of yellownefs; it is of a fmooth furface, and does not ftain the fingers in handling. It is not eafily broken, and but flightly adheres to the tongue, and freely melts into a fubftance like butter in the mouth. It makes a flight effervefcence with acid menftruums.

The red Tufcan earth is an impure bole, very heavy and of a fomewhat lax texture, and of a pale red colour. It is naturally of a fmooth furface, breaks eafily between the fingers, and is apt to ftain the hands; it adheres ftrongly to the tongue, and melts freely in the mouth, and has a ftrongly aftringent tafte, but leaves a fandy harfhnefs between the teeth. It makes no effervefcence with acid menftrua. Thefe are the characters by which both thefe earths may be known from others of the fame colour; they are both dug in feveral parts

parts of Italy, particularly in the neighbourhood of Florence: they are kept in the shops there, and prescribed with success in fevers of many kinds, and in diarrhoeas, dysenteries, and the like cases. *Hill's Hist. of Fossils.*

EVAPORA'TION (*Dict.*)—The Evaporation of fluids is generally supposed an effect of heat, but experience proves that cold which is just a contrary cause is able also to produce the same effect, and that in a very considerable degree; the Evaporations of liquors in the severest frosts being at least equal to those when the air is in that degree which we call temperate. An ounce of water by weight being set out at six in the evening to freeze, Mr. Gauteron found that by eight o'clock the next morning, it was reduced to a solid lump of ice, and had lost twenty-four grains in weight; and, this ice being thawed into water with all possible caution, the water weighed twelve grains less than the ice. The same experiment repeated several times always gave the same phænomenon, only in different degrees; the loss of quantity being always greater, as the weather was more severe, or the wind higher. This effect is also different in different fluids. This gentleman set out to freeze at the same time an ounce of common water, the same quantity of nut oil, the same of brandy, the same of oil of turpentine, and the same of mercury. The water froze almost immediately and lost six grains in weight; and the oil of nuts in the same time lost eight grains; the brandy and the oil of turpentine lost twelve grains each; but the oils of olives and the mercury seemed rather to have increased than diminished in weight. The next morning, the loss of the water was thirty-six grains; that of the nut oil was forty grains, though it had not been frozen; and the loss of the brandy and oil of turpentine was fifty-four grains each, though neither had been at all frozen; the mercury and oil of olives remained as before. The greater cold and more rough winds always increased the Evaporation, and the lesser cold and calmer weather made it less. Water, when reduced to the state of ice, does not cease to evaporate: for this ice of an ounce of water had lost thirty-six grains from eight o'clock in the morning to three in the afternoon, and thirty-six more between that and eight at night; and during the night the Evaporation had not been continued in any less degree, and, upon the whole, an ounce of ice was found to lose by Evaporation a hundred grains in twenty-four hours.

EUO'NYMUS, *the spindle-tree*, in botany, a genus of plants whose characters are;

The calyx is monophyllous, and quinquefid, or quadrifid; the flower rosaceous, tetrapetalous, and sometimes pentapetalous, and furnished with four or five stamina. The ovary in the bottom of the calyx is furnished with a bifid tube, or pointal, and becomes an angulous, membranaceous fruit, divided into four or five cells, full of oblong seeds. *Boerhaave, Index alter, Part II.*

They say its fruit purges both upwards and downwards: the peasants make use of the powder of its fruit, to kill lice; or else wash their hair with the decoction of its seeds. *Martyn's Tournefort.*

It grows frequently in the hedges, and flowers in May. The fruit is in use, but of a noxious quality, and not to be taken inwardly without danger; externally used, it is an emollient and resolvent, kills lice, and deterges furfuraceuos heads. *Dale.*

EUPATORIOPHA'LACRON, *naked-headed agrimony*, in botany, a genus of plants whose characters are:

It is a corymbiferous plant, which in some species has radiated flowers, whose flowers are hermaphrodite, and the half-florets are female; but, in other species, the flowers are produced in a disk, and are for the most part hermaphrodite. The ovaries have naked heads, and are placed on a woolly placenta. All these parts are contained in a flower-cup, which is divided into many parts to the placenta. To these notes must be added, the leaves growing opposite on the branches.

EUPATO'RIUM, *hemp agrimony*, in botany, a genus of plant, whose characters are:

Its root is fibrous and perennial; the leaves grow two, three, or four together at intervals; the calyx is long, smooth, and scaly. The flowers form an umbella, furnished with many long bifid capillaments, or threads.

This species of Eupatorium has a spreading stringy root; from which arise reddish square stalks, two or three feet high, somewhat woolly, having at each joint two leaves, divided into three long narrow serrated hemp-like sections, green above, and whitish underneath. The flowers grow on the tops of the stalks in clusters, umbelwise, each being somewhat slender and naked, composed of several fistular flowers, of a purple colour, divided into five parts at the top, and passing away into down. It grows by rivers and ditch-sides, and flowers in July.

Schroder commends this as a very good vulnerary plant, used inwardly, but especially outwardly, useful to correct an ill habit of body, and cure coughs and catarrhs; though Gesner, upon trial, found the root to be a strong purger. It is but seldom used. *Miller's Bot. Off.*

EUPHRA'SIA, *eye-bright*, in botany, a genus of plants, the characters of which are these:

The leaves are small, conjugated, roundish, and serrated; the the flower monopetalous, anomalous, personated, bilabiated, the upper lip erect and multifid; the lower divided into three parts, each bifid; the fruit is an oblong bicapsular pod.

Eye-bright has a small woody root, full of fibres, from which springs, usually, one stalk, branched out into several smaller, somewhat of a reddish brown colour. The leaves are small, set on by pairs, opposite, without foot-stalks, hard, and veiny, roundish but indented at the ends.

The flowers grow at the tops, among the leaves, small and white, and gaping or galeated, with a yellow spot in the middle, and several black stripes running lengthways; after the flowers are fallen, come small, long, flattish seed-vessels containing very small seed. Eye-bright grows in fields and commons, and flowers in July. The whole plant is used.

This plant is famous for all disorders and distempers of the eyes, especially for dimness of sight, and to strengthen it when weak and decayed, either given in the juice, or a decoction of the powder of the leaves. A powder made of two ounces of eye-bright, and half an ounce of mace, is very much commended for the same purposes, especially after proper evacuations.

Some commend it as good against the jaundice. *Miller's Botan. Offic.*

It is very bitter, and gives a faint tincture of red to the blue paper; which makes us conjecture, that the sal ammoniac, though involved in a great deal of oil and earth, may predominate in this plant. It dissolves the humours, disposes them to circulate, and carry off the obstructing particles. Every body agrees, that it clears, strengthens, and even restores the sight. The powder is given from one drachm to three, in a glass of fennel, or vervain-water. The use of the conserve, alone, or mixed with worm-wood-leaves, continued for a long time, is good for the same purposes. Arnaldus de Villa nova, in his treatise concerning Medicinal Wines, very much commends that of eye-bright. In vintage-time they put this plant in must, and drink it, when it is well clarified. Pena and Lobel prefer the use of the powder to the wine: they affirm that one of their friends in Switzerland, who had but a slight defluxion in his eyes, had like to have lost his sight by drinking eye-bright wine, for three months. *Martyn's Tournefort.*

EXCHA'NGE.—Under this article, in the Dictionary, we have given an account of the trade of money carried on between one place and another by means of bills of Exchange; but there is another kind of Exchange extremely worth our notice and consideration, and this is a negociation by which one merchant transfers to another whatever effects he has in a foreign country, at a price agreed on.

We must particularly remark two things in the transaction of this affair, the transfer, and the value of the transfer.

The transfer is made by a mercantile contract called a letter of Exchange, which intimates the effects thereby ceded or granted.

The value of this transfer is a compensation of the value between one country and another: this they call the value of Exchange; this is divided into par and course of Exchange or currency.

An exact equality of the money of one country to that of another is the par of the value of Exchange.

When the circumstances of commerce alter the par of this compensation, the variations which result from these circumstances make and determine the course or value of Exchange.

The value of Exchange may be defined, in general, a present compensation of the coins of two countries, in proportion to their reciprocal debts.

To render what has been said more perspicuous, it will be necessary to consider Exchange in different views, and all its parts. We shall consider Exchange as a transfer which one merchant makes to another of effects he has in foreign parts, the nature, end, and consequences of it: and then explain the origin of the value of Exchange, or compensation of coins, its essence, par, currency, the propriety of this currency, and the commerce that results from it.

The first commerce among men was transacted by way of Exchange. Trade grew more extensive, and mutual wants increased with the number of commodities. Every nation soon found they had fewer commodities to exchange, than they had necessities to relieve: or, what they had to barter, was not wanted by the nation with which they trafficked. To supply their wants, and remove this inconvenience, they had recourse to some certain pieces to represent the value of merchandises.

That these pieces might be durable and capable of being divided into parts of different value without loss, they fixed upon metals, and those the most rare, to make the transfer more easy and commodious.

Gold, silver, and copper, became the mediums of buying and selling: different quantities of these metals, in every state, had a value in proportion to their weight and fineness, which every government imposed arbitrarily; every legislator stamped these bits of metal with what impression he pleased, and these pieces were called monies.

As commerce extended itself, mutual debts multiplied, by which means the transfer of these metals, in lieu of merchandises, became difficult, and men were driven to find out some method of representing monies by signs.

Every country buys in, and sells out, merchandises, and consequently fequently becomes both at once debtor and creditor: to pay these reciprocal debts, they concluded it fufficient to transfer the reciprocal credits between two countries mutually, or even between feveral countries that correfponded together. It was therefore agreed, that monies fhould be reprefented by an order which the creditor fhould give in writing to the debtor, to pay the value to the order of the bearer.

The multiplicity of reciprocal debts is therefore the origin of Exchange, confidered as the transfer that one merchant makes to another of the effects he has in a foreign country.

As Exchange fuppofes a reciprocal debet, its nature confifts in the Exchange of this debet: if the debet were not reciprocal, the negociation of Exchange would be impracticable, and the payment for the merchandifes muft neceffarily be made by a transfer of money.

The end and defign of Exchange is, confequently, to avoid the rifk, and fave the expence of transferring money.

The confequence is, that bills of Exchange reprefent money fo effectually, that there is no difference between the one and the other. An example will fet thefe propofitions in a clearer light.

Let us fuppofe Peter of London debtor to Paul of Paris for goods received, and, at the fame time, that Anthony of Paris has bought of James of London goods of an equal value: if the two creditors, Paul of Paris and James of London, exchange their debtors, a transfer of money is needlefs. Let Peter of London pay to James of London the fum he owes to Paul of Paris, and let James for the faid fum transfer to him, by an order in writing, that which he has at Paris in the hands of Anthony. Peter, the proprietor of this order, will transfer it to Paul his creditor at Paris, and Paul, on prefenting it to Anthony, will receive cafh for it.

If no merchant of Paris had owed money in London, Peter would have been under the neceffity of fending over money to Paris to pay his debt: or, if James had fold, at Paris, only to half the value that Peter was indebted there, the half of Peter's debt would have been acquitted, the other half by fending over the fpecie.

It is evident, therefore, that Exchange fuppofes reciprocal debts, that without them it could not exift, and that it confifts in the Exchange of the debtors.

The example propofed proves alfo, that the object, end, and defign of Exchange, is to fpare the hazard and expence of transferring money. Let us fuppofe the debt between the two 100l. and value the rifk and charges on merchandife in trade at 40 l. it is plain each muft pay 110l. inftead of 100 l. without an Exchange of debtors.

The confequence is alfo completely demonftrated by this example, for the bill of Exchange drawn by James of London, or Anthony of Paris, was fo effectually the fign of money, that Paul of Paris, to whom it was fent, has actually received 100 l. on prefenting it.

The part of Exchange we have defined, the transfer which one merchant makes to another of effects which he has in a foreign country, is applied to the reprefentation of metals ftamped or coined: the fecond part or value of Exchange is applied to the thing reprefented.

When gold, filver, and copper were introduced into trade to be the medium of commerce, and were converted into money of a certain denomination and weight, the coins took their denomination from their weight, that is, as among the French, the livre or pound was a pound weight of filver.

The neceffity or difhonefty of men leffened the weight of every piece of money, which, notwithftanding, retained its former denomination.

Thus, there is in all countries a real and ideal money. Ideal monies are preferved in accounts for the fake of convenience; the alterations that have happened in money, have been different, in different countries: the proportion of the weight being not always equal, no more than the intrinfic value, the denomination is often different: fuch is the origin of the comparifon we muft make of thefe monies to exchange, compenfate, or weigh them one againft another.

The greater or leffer occafion we have for this Exchange, the eafe or difficulty with which it is tranfacted, the contingencies and charges, have a value in trade, and this value has an influence which we ought to confider in the eftimation of money.

Therefore, their compenfation or value in Exchange contains two proportions, which we muft examine.

Thefe proportions conftitute its effence; for, if the monies of all countries were of the fame real value, of the fame denomination and weight, in fhort, if the particular contingencies were not eftimated in commerce, there could be no difference in current coin, and, confequently, no compenfation to make; a bill of Exchange would be fimply the reprefentation of a certain weight of filver or gold.

A bill of Exchange on Paris for 100 livres would be equivalent to 100 l. in London, which on this fuppofition are real and exactly equal.

But, in fact, the difference between the real coins of England and France, and the contingencies of commerce, will have an influence on the quantity of money of the one country, to be paid for a quantity of money of the other.

Of thefe two proportions, that, which refults from the mixture of the metals coined, is the moft effential, and the neceffary bafis of compenfation or the price of Exchange.

To find the juft proportion of the mixture of metals in both coins, we muft know the weight, the finenefs, and ideal value of each, with the greateft exactnefs; and the proportion of the weights made ufe of in each country for the weight of metals.

Silver coined in France is of the fame finenefs, as filver coined in England, that is, to 11 penny-weights fine 2 penny-weights alloy.

The pound fterling is ideal money, or a collective name which contains within its value feveral pieces of real coin; as crowns, half-crowns, fhillings, &c.

The crowns weigh each one ounce, three penny-weights, thirteen grains; the ounce Troy confifts of no more than 480 grains, therefore, the crown of 565 grains, and is worth 60 pence, or 5 fhillings.

In France, there are two forts of crowns (écus) the écu or crown in Exchange and accounts, always valued at 60 fols, or 3 livres Tournois, values equally ideal.

The fecond fort of écus or crowns, are real pieces of filver current; they are of the fame ftandard as Englifh money of the fame denomination; 16 $\frac{3}{4}$ make a marc which weighs 8 ounces, reckoning 576 grains to the ounce; they pafs current for 60 fols, but are intrinfically worth no more than 56 fols and $\frac{1}{4}$; the marc is 46 livres, 18 fols.

This difference arifes from the contingent expences of coinage, mixture, &c.

This being prefuppofed, we muft compare their weight and value, to know the proportion of the French to the Englifh crown in value.

938 Sous are the value of a marc of France, = to 8 ounces French.

The ounce of France = to 576 grains.

565 Grains, the weight of a crown, = to 60 pence fterling.

Intrinfic value = to 56 d. $\frac{1}{4}$, the intrinfic value of the écu current.

The proportion, 29 pence $\frac{1}{2}$.

The number found of 29 d. $\frac{1}{2}$ fterling, is the juft proportion of the comparifon of thefe two monies, or the par of the price of Exchange; that is, the French crown of the intrinfic value of 56 fous 6 deniers at London, is worth 29 d. $\frac{1}{2}$ fterling, but the écu in accounts of 3 livres, or 60 fous Tournois, reprefenting the real crown, its value muft be the fame.

The weight and ftandard of money evidently fix its comparative value with other money, and the proportion that indicates what quantity of the one is equivalent to the other, is the par of the price of Exchange.

We have hitherto only confidered the real par of Exchange as it relates to filver coin, becaufe that is more commonly circulated; but we fhall run into a very great error, if we form our ideas of the benefit a nation receives by Exchange, on this foot only.

It is very well known, that, befides the uniform and general proportion in all countries, between the degrees of finenefs of gold and filver, there is a particular value in every ftate fet upon thefe metals, which is regulated by the quantity that ftate circulates.

The French louis d'or and our guinea are of the fame finenefs; the guinea weighs 156 grains, and is worth 21 fhillings, or 252 pence fterling: the louis d'or weighs 153 grains, and confequently is worth 247 pence $\frac{1}{7}$ Englifh; now in France 8 écus are change for a louis d'or, the écu we have demonftrated to be worth no more than 29 d. $\frac{1}{2}$ eight times which fum amounts to no more than 236 pence fterling, yet, thefe eight crowns, reprefented by a louis d'or, are apparently worth 247 pence $\frac{1}{7}$ fterling. The difference is 4 pence $\frac{1}{7}$ fterling, and it is evident, that, if this be divided among the écus in Exchange of the louis d'or, each écu muft be valued at 30 pence $\frac{1}{10}$ fterling, inftead of 29 pence $\frac{1}{2}$.

This difference arifes from this caufe: in France, they give 153 grains of gold for 2216 grains of filver, the weight of eight crowns, which fettles a proportional value between thefe metals in the ratio of 1 to 14 $\frac{7}{15}$. In England we give 156 grains of gold for 21 fhillings, each fhilling weighs 113 grains, and they in all amount to 2373 grains, which is in the proportion of 1 to 15 $\frac{1}{5}$.

Wherefore, if a Frenchman pays cafh in England, it will be to his advantage to pay it in gold; but it is the intereft of an Englifh-man to pay cafh in filver in France; becaufe the guinea is worth no more than 22 livres, 14 fous, 7 den. French, whereas twenty-one fhillings, the value of a guinea, weigh 2373 grains, and are worth 24 livres, 2 fous, 10 den.

Different contingencies alter the price of Exchange from the real par: and, as thefe accidents have an infinite variety, the alteration of the equality is continually floating up and down; this alteration is called the courfe of Exchange.

The caufes of the alteration of the par of Exchange, are the alteration of public credit, and the abundance or fcarcity of credits of one country upon another.

A variation in the current coin is an example of the variation which the lofs of public credit makes in the par of Exchange; although, at the very inftant this change was made in the current coin, a new real par of Exchange commenced, yet, the public credit declining, on account of the uncertainty of the property and the ſpecie not circulating, what repreſents the ſpecie muſt of courſe be under its value.

The ſecond cauſe of the alteration of the par of Exchange, is the abundance or ſcarcity of credits of one country upon another; and this abundance or ſcarcity proceed in general from two cauſes.

One is the neceſſity that obliges the body politic of a ſtate to tranſport large ſums into foreign countries, as in caſe of a war.

The other lies in the proportion of the current mutual debts of private perſons in each ſtate.

The private perſons of two nations may contract two kinds of reciprocal debts.

The inequality of reciprocal ſales will form a firſt kind of debts.

If one of the two nations has a great deal of money at lower intereſt than the other, the rich private perſons in the former nation will buy up all the public ſecurities of the other, becauſe they will receive more intereſt for their money: the product of this intereſt, which muſt be paid every year, forms a ſecond ſpecies of debts: this may be looked upon as the product of a commerce, becauſe the national funds are negociated; and, if you obſerve attentively, this is not a matter of ſpeculation only; in this caſe and ſeveral others, money is the merchandiſe, and thus theſe two debts belong properly to what is called the balance of trade, and will occaſion an abundance or ſcarcity of the credits of one country upon another. See BALANCE *of trade*.

When two nations would ſettle the balance of their commerce, that is, pay their reciprocal debts, they have recourſe to the Exchange of debtors; but, if the reciprocal debts are not equal, the Exchange of debtors will only pay a part of theſe debts, the ſurpluſage or balance of trade muſt be paid in ſpecie.

The deſign and intention of Exchange is to ſave the expence and hazard of tranſporting money; conſequently, every private perſon, before he determines on this method of trade, will ſeek credits on the country where he ſtands indebted.

Theſe credits will be dear in proportion to the difficulty of acquiring them, and conſequently, to have the preference, we are obliged to pay above their real value; if the credits are eaſy to come at, we ſhall pay under their value.

Let us ſuppoſe the merchants of Paris owe the manufacturers of Rouen 20,000 livres, and that the manufacturers of Rouen owe the bankers of Paris 10,000 livres; to ſatisfy theſe demands, we muſt make a bill of Exchange for the 10,000 livres, the reciprocal debts between Paris and Rouen, and ſend the other 10,000 livres from Paris to Rouen.

Let us rate the charge and hazard of ſending this ſum at five livres per m. Every merchant in Paris will try to ſave this expence, and will ſeek to purchaſe a credit of a 1000 livres on Rouen; but as theſe credits are ſcarce, and difficult to procure, he will gladly give 1004 livres for a draught of 1000 livres on Rouen, and ſave one livre per m. thus the ſcarcity of bills of Exchange on Rouen will lower the price of this Exchange four livres per m. under par.

It is proper to obſerve, that the riſe and fall of Exchange is always underſtood of the country on which we draw. Exchange is low, when this country pays leſs real value for the bill, than it coſt the purchaſer: Exchange is high, when this country pays more real value for the draught, than it coſt the purchaſer.

The par of Exchange between London and Paris is at 29 ½ d. per écu of three livres; if the Exchange at London drops to 29 pence, London will pay beneath the intrinſic value of the écu; if the Exchange riſes to 30 pence per écu, London will pay above its real value.

To reſume the foregoing example, it has been ſhewn from the ſcarcity of credit on Rouen, a merchant at Paris is obliged to pay 1004 livres for a draught, to receive 1000 livres at Rouen.

Juſt the reverſe of this is the caſe of Rouen; credits on Paris are frequent and numerous; the manufacturers of Rouen who owe money at Paris, will give orders to the banker of Paris to draw upon them, becauſe they know that, for 1000 livres on Rouen, they ſhall pay 1004 livres at Paris: or, if you offer them draughts on Paris, they will purchaſe them at the ſame præmium as the draughts on Rouen are at Paris, which will raiſe the Exchange in favour of Rouen to four livres per m. which will therefore pay no more than 996 livres. When the reciprocal debts are paid, Paris muſt ſend to Rouen the remainder of the balance in ſpecie. But in the mean time it is clear, that, in the payment of the reciprocal debts, Rouen pays 1000 livres with 996, and Paris pays 1004 livres for 1000.

If Exchange ſubſiſts long on this foot between theſe two cities, it is evident, that Paris owes more to Rouen, than Rouen owes to Paris.

From whence we may conclude, that the courſe of Exchange indicates which ſide the balance of commerce inclines to.

We have already ſeen that the par of the price of Exchange is the compenſation of the monies of two countries; this compenſation is made uncertain by ſeveral accidents, and is therefore only momentaneous: its courſe indicates which ſide the balance of commerce inclines to; thus the price of Exchange is a momentaneous compenſation of the monies of two countries in proportion to their reciprocal debts.

As the nature of the accidents in trade which alter the par of the compenſation of monies, or price of Exchange, continually varies, the courſe or price of Exchange varies with theſe accidents.

The fluctuation of the courſe of Exchange has two effects. Firſt, it makes a daily uncertainty what quantity of money one ſtate muſt pay to another for ſuch a quantity of money of another ſtate. Secondly, it occaſions a trade of money by repreſenting the ſpecie by bills of Exchange.

When the quantity of money which one ſtate gives in compenſation for ſuch a quantity of money in another ſtate, is undetermined from one week to another: it follows that of theſe two ſtates one propoſes a certain, the other an uncertain value; becauſe every proportion ſuppoſes an unity as the common meaſure of both the terms of this proportion, and which ſerves to value it by.

Let us ſuppoſe that London to-day gives thirty pence ſterling for an ecu of Paris, it is certain Paris will always accept thirty pence for an écu, but it is uncertain whether London will continue to give ſo much. In terms of Exchange, this is called giving the certain or uncertain.

If the quantities were certain on both ſides, there would be no variation in the par of Exchange, and conſequently no courſe of Exchange.

This difference is introduced into every country; according to the different method of keeping their accounts; they fix a quantity, the valuation of which ſerves for a ſecond term, to find the value of another quantity of the ſame kind as the firſt. As, for example, if one écu or French crown be worth thirty pence ſterling, what are 100 worth at the ſame rate? Thus, between two places, one ought always to propoſe a certain quantity of its money, for an uncertain quantity which the other ſhall give it.

But, while one place gives the certain to one other place, it ſometimes gives the uncertain to a third. Paris gives the certain to London, that is, an écu to have from 29 pence halfpenny to 33 pence ſterling: but Paris receives from Cadiz a piaſtre for an uncertain quantity of ſous from 75 to 80 per piaſtre, as the accidents of commerce ſettle the value.

The ſecond effect of the fluctuation of the courſe of Exchange, is a trade of money carried on by repreſenting the ſpecie by bills of Exchange.

The merchant or banker is continually attentive to every alteration in the courſe of the price of Exchange, between the different places that have a mutual correſpondence; he compares theſe changes with each other, and conſiders what is the reſult; he ſeeks into the cauſe of them, to foreſee their conſequences, and by theſe means is enabled to make the moſt of his credits. But this is not the ſole object which ought to employ the views of the merchant; before he ſells his credits in any place, he ought to conſider the profit or loſs there will be in withdrawing his effects from this place; if the courſe of the price of Exchange is not in favour of the place of his reſidence, he will ſeek ſome other methods more lucrative, and his money will be returned by different channels. The knowledge of this trade conſiſts therefore in laying hold on all the advantageous inequalities of the par of Exchange, which offer between two cities, and theſe two cities and others: for, if five places of trade differ between each other in the ſame proportion with regard to the par of Exchange, no gain can be made by this commerce with them, the intereſt of money and expence of commiſſion would turn to nett loſs. This reciprocal equality between the courſe of the price of Exchange of ſeveral places is called the political par.

If we agree about this parity

$$a = b$$
$$b = c$$
$$c = a$$

It is certain that, a, b, &c. being equal quantities, there can ariſe no benefit by exchanging one with the other, which correſponds with the real par of the price of Exchange; let us ſuppoſe now

$$a = b$$
$$b = c$$
$$c = a + d$$

Here the parity is deſtroyed, we muſt Exchange b with c, which will give $a + d$: now, we have ſuppoſed $a = b$, therefore, the profit of this Exchange will be d. This difference correſponds with the inequalities of the courſe of Exchange between two or more places: the parity will be re-eſtabliſhed, if theſe quantities are increaſed equally

$$a + d = b + d$$
$$b + d = c + d$$
$$c + d = a + d;$$

This parity correſponds to the political par of the price of Exchange or equality of its courſe among ſeveral places.

The parity will be altered again, if

$$a + d = b + d$$
$$b + d = c + d$$
$$c + d = a + d + f;$$

In this caſe the Exchange muſt be made as before, and the

profit

profit of $b + d$ will be f; if, cæteris paribus, $a + d - f = c + d$, and we Exchange these two quantities, it is evident the proprietor of $c + d$ will receive less the quantity f: therefore, to avoid this loss, he will Exchange $c + d$ with $b + d$, which is equal to the quantity $a + d$.

The operation of Exchange consists in changing quantities one for another; he that is forced to Exchange a quantity for another quantity less than his own, seeks a third that may be equal to his, and reputed equal to that for which he is forced to make the Exchange, to prevent his own loss; he that deals in this commerce, endeavours to Exchange lesser for greater quantities, and his gain is consequently the excess of the quantity which different Exchanges have procured him, in his own country, on the quantity he has furnished abroad.

This commerce is not lucrative, unless it be more beneficial than putting the money out to interest at home; from whence follows this consequence, that those people among whom the interest of money is lowest, must have the balance of this trade against another nation which pays higher interest for money.

If the people which pay the lowest interest have plenty of money, an intercourse of this trade must be very prejudicial to the other people, and the latter cannot bring foreign wealth into their dominions by this method.

This trade does not principally tend to increase the quantity of money in a nation, but is more connected with the political springs of government, and requires more refined judgment than any other. It results from the continual variations in the price of Exchange, on account of the disparity of the mutual debts between different countries; as Exchange itself owes its rise to the multiplicity of mutual debts.

From what has been said on the nature of Exchange, we may draw the following general principles.

1. We shall know whether the general balance of trade has been in favour of a nation for some time, by the mean course of its Exchanges with other nations for the same space of time.

2. Every Excess of the reciprocal debts of two nations or the balance of trade ought to be paid in money, or by credits on a third nation, which is always a loss, because the money that ought to be returned is carried elsewhere.

3. That nation, which is debtor to the balance loses by an Exchange of debtors a part of the profit it might have by sales, besides the money it must part with to satisfy the balance of the mutual debts: and that nation which gives the credit, gains, beside the money, a part of the mutual debt by the Exchange of debtors.

4. If one nation is so much indebted to another, that the debt has effect sufficient to lower the course of Exchange, it will be more beneficial to that nation to export cash in specie, than augment their loss by trading in bills of Exchange.

EXCRE'SCENTIA *faba Bengalensis*, Bengal bean.—It is round, flat, wrinkled, and hollowed in the manner of an umbilicus, large, brown on the outside, and blackish within, of a styptic and astringent taste, and no smell.

It is a powerful astringent, and highly serviceable in repressing all sorts of hæmorrhages, particularly a spitting of blood, moderately incrassating the blood, and shutting the mouths of the veins and arteries, consolidating ruptures, and tempering and allaying acrimonious and corrosive humours.

D. Marloe, who gives the foregoing account of its virtues, was the first, as far as I know, says Dale, who communicated this exotic medicine, with its uses, to the learned world, under the name of faba Bengalensis. Hence some took it for a fruit which comes from Bengal, others for a species of myrobalans, and others again for the flower of the citrine myrobalan; because it is very often found among those fruits. But to me, says Dale, it seems to be a kind of excrescence excited by the puncture of a certain insect, or, more properly, the wounded fruit itself of the citrine myrobalan, which, from the venom of the stroke, assumes this monstrous form. I have very often myself, he says, observed plums deprived of their natural shape by a wound of this nature inflicted by an insect, and rendered hollow, without any stone. *Dale.*

EXCU'TIA *ventriculi*, a name, by modern surgeons, given to that instrument represented in *Plate* XX. *fig.* 1. It is generally made of soft bristles formed into a bundle, and fixed to a flexible brass or iron wire B B B, which may have flaxen or silken thread closely wrapped about it. Authors of very considerable note assert, that this instrument is highly commodious, not only for removing small bones from the fauces, but also for cleansing the stomach. When it is to be used for this latter purpose, they lay down the following directions, as necessary to be observed: a small draught of warm water, or, according to others, of brandy, is to be taken before the instrument is used; since, by this means, the mucus and sordes are the more easily resolved and attenuated in the stomach. Then the Excutia A is to be immersed in some proper liquor, and, by means of the wire BB, gently passed through the œsophagus, as far as the stomach. Then it is to be moved up and down through the fauces, like the sucker of a siphon or pump, but must be soon totally extracted. These authors order the Excutia, and repeated draughts of the above-mentioned liquor, to be used, till no more sordes can be brought away from the stomach. This practice is, according to them, so highly beneficial, that by its means the lives of men may be protracted to an uncommon age, especially if it is repeated every week, every fortnight, or every month. However great the encomiums bestowed on this practice may possibly be, yet, it is certain, we have very few instances of cures happily brought about by its means; since the sense of pain, and the danger of suffocation, attending the use of this instrument, must certainly create a just aversion to it. But these points are at greater length discussed by Wedelius and Teichmeierus, in their Disputationes de Ventriculi Excutia. These authors have also shewn, that this is not altogether an instrument of modern date, but long ago described by some authors. *Heister. Chirurg.*

EXO'MPHALOS (*Dict.*)— This rupture is owing to a protrusion of the intestine, or omentum, or both of them, at the navel, and rarely happens to be the subject of an operation; for, though the case is common, yet most of them are gradually formed from very small beginnings, and, if they do not return into the abdomen upon lying down, in all probability, they adhere without any great inconvenience to the patient, until some time or other an inflammation falls upon the intestines, which soon bring on a mortification and death; unless, by great chance, the mortified part separates from the sound one, leaving its extremity to perform the office of an anus: in this emergency however, I think it adviseable to attempt the reduction, if called in at the beginning, though the universal adhesion of the sac and its contents are a great obstacle to the success: the instance in which it is most likely to answer, is, when the rupture is owing to any strain, or sudden jerk, and is attended with those disorders which follow upon the strangulation of a gut.

In this case, having tried all other means in vain, the operation is absolutely necessary; which may be thus performed: make the incision somewhat above the tumor, on the left side of the navel, through the membrana adiposa; and then emptying the sac of its water, or mortified omentum, dilate the ring with the same crooked knife, conducted on your finger; after this, return the intestines and omentum into the abdomen, and dress the wound without making any ligature, but of the skin only. *Sharp's Surgery.*

EXPE'CTORANTS (*Dict.*)— Among the several species of evacuants, none are, perhaps, of more importance than those which eliminate the viscid lymph secreted from the arterial blood, and remaining in the glands, or rather the glandulous coats and emunctories. But in no part of the body is there a larger secretion of mucous lymph than in the internal ducts of the aspera arteria, and the bronchia of the lungs, which are internally lined with a glandular coat: hence, very often a serous, pituitous, viscid, and, sometimes, a purulent matter, is, in coughing, expectorated, and especially in disorders immediately affecting the lungs, whether of the acute or chronical kind. The medicines which promote this evacuation from the cavity of the thorax are called Expectorants; of which, the most considerable in the vegetable kingdom are, the roots of elecampane, arum, Florentine orris, and liquorice; the herbs Paul's betony, chervil, scabious, mouse-ear, germander, hyssop, and the tarragon; the flowers of violets, mallows, red poppies, and saffron; the seeds of anise and fennel; the bark of sassafras; and, among resinous gums, benjamin and gum ammoniac; among fruits, raisins, figs, jujubes, and pine kernels; honey, liquorice-juice, and oil of sweet almonds; among animal substances, sperma ceti and fats; among mineral substances, sulphur, together with its flowers and milk; among compound substances, the anisated balsam of sulphur, the anisated spirit of sal ammoniac, the lohoch sanum, the syrup prepared of the lungs of a fox, the pectoral elixir, the pectoral balsam of Meibomius, and the asthmatic spirit of Michaeli.

As all substances which promote excretion do not operate in the same manner, since some render the matter moveable, and dispose it for evacuation; others open the emunctories, that it may be separated from the juices; and others stimulate the vessels and ducts to an excretory motion; so Expectorants operate pretty much in the same manner; for, if the humour secreted is thin and acrid, and the ducts and pores of the glands from which it is to be thrown, too much constricted, those substances are most properly exhibited, which soften the passages, obtund the acrimony, and coagulate the too thin and fluid parts of the humours. These intentions are best answered by the juice of liquorice-root, saffron, sperma ceti, the flowers of violets, mallows, and red poppies, cream, oil of sweet almonds, fats of animals, syrup prepared from the lungs of a fox, the syrup of violets, the syrup of white poppies, and the pilulæ de styrace, especially exhibited with some diluting liquor, such as a decoction of oats, or of the shavings of hartshorn, in the form of a jelly. But, when a large quantity of thick and viscid matter is lodged in the bronchia of the lungs, it proves prejudicial to respiration, and when, for this reason, some stimulus to expectoration becomes necessary, the tough and viscid matter is excellently resolved by infusions of Paul's betony, hyssop, scabious, and germander; as, also, by the terra foliata tartari, a solution of crabs eyes, and antimoniated nitre. The nervous coats of the bronchia are stimulated to an excretory motion by a certain acrid, subtile, and oleous principle found in gum ammoniac, and its essence, the anisated ſpirit of ſal ammoniac, myrrh, benjamin, powder of the roots of elecampane, and Florentine orris, flowers, milk, and balſam of ſulphur. When a ſtronger ſtimulus is required, as in a pituitous aſthma, and a ſuffocative catarrh, oxymel of ſquills, or the ſpiritus aſthmaticus of Michaeli, which is prepared of gum ammoniac and the green cryſtals of copper, may be exhibited.

In the exhibition of Expectorants, great caution is to be uſed on account of their different methods of operation; and the phyſician who preſcribes them promiſcuouſly, without any regard to time, or the ſtate and condition of the peccant matter, certainly does more harm than good: hence, when in epidemical coughs, raging in the ſpring and autumn, highly ſtimulating Expectorants are exhibited, before the thin acrid matter is corrected; or, on the contrary, when after the matter is concocted and prepared, emollient and relaxing medicines are exhibited; more harm than good is produced by ſuch pieces of practice.

In coughs of the moiſt and chronical kind, as alſo in a pituitous aſthma, in which large quantities of phlegm fall into the bronchia of the lungs, ſweet ſubſtances, linctuſes, ſyrups, and oleous medicines, weaken the ſtomach, whoſe ſtrength is already too much impaired, diminiſh the appetite, digeſtion, and chylification, and not only promote the generation of more recrementitious matter, and the increaſe of the diſeaſe, but alſo diſpoſe the patient to a cachexy, œdematous tumors, or even a dropſy. In theſe caſes, it is therefore more expedient to uſe balſamic pectorals, which are grateful to the ſtomach, ſuch as the pectoral elixir, the eſſences of myrrh, gum ammoniac, and the tincture of tartar.

Expectorants ought alſo to be cautiouſly uſed in a phthiſis and ſpitting of blood; as alſo in dry coughs, difficulties of breathing, and oppreſſive pains of the breaſt, which rather ariſe from a congeſtion of blood, than matter to be expectorated; ſince, in theſe caſes, Expectorants, either by ſoftening or ſtimulating, augment the congeſtion of blood and humours, inſtead of removing it.

In acute diſorders of the breaſt, ſuch as a legitimate pleuriſy and a peripneumony, Expectorants are alſo to be cautiouſly uſed, eſpecially in the beginning, leſt by their means the inflammatory ſtagnation of the blood ſhould be increaſed. But when theſe diſorders are on the decline, and when the greater part of the inflammation is diſcuſſed, they are very properly and commodiouſly uſed, in order to draw the concocted and viſcid matter out of the pulmonary canals. *Frederic. Hoffman. Medicina Rationalis Syſtematica.*

EXPORTATION (*Dict.*)—The obvious meaſures, requiſite to promote the Exportation of produce and manufactures, may be comprehended under the following particulars:

1. That our lands be cultivated in ſuch quantities, as to render all the neceſſaries and conveniencies of life as cheap as they are in thoſe nations who are ſtruggling to rival and ſupplant us in our commerce and navigation.

2. To this end, that all taxes and incumbrances whatſoever, as ſoon as may be done with ſafety, be taken off from the neceſſaries and conveniencies of life, that our people may work as cheap as thoſe of other nations, and our commodities be carried to foreign markets as cheap as they do, and, if poſſible, better in quality for the price.

3. That reaſonable public encouragement be given to thoſe who ſhall make any capital improvements in huſbandry, farming, and agriculture, &c. ſo as to afford not only our native productions deſirably cheap, but to promote the cultivation of ſuch valuable exotics as our lands will admit of, in order to make merchandize of them to ſome other nations.

4. That all reaſonable public encouragement be given to thoſe who ſhall make any material diſcoveries in the mechanical and manufactural arts, either by improvements in the old commodities, or by the invention of new, whereby general induſtry may be promoted, and our traffic and navigation with foreign countries advanced.

5. That working, mechanical, and manufacturing ſchools be eſtabliſhed for children over the kingdom, in order to prevent ſloth, debauchery, and villainy, by habituating infants from their cradle to honeſt induſtry, and hereby to render labour in general cheap throughout the kingdom.

6. That all meaſures be taken to render the kingdom populous in uſeful artiſts and manufacturers, and ſeamen, more eſpecially in our own natives.

7. That our fiſheries of every kind be promoted to the utmoſt extent which they will admit of, as a nurſery to our ſeamen, as well as for the benefit of our traffic.

8. That we import rather foreign materials for manufactures, than things manufactured.

9. That we prevent the Exportation of ſuch quantities of wool as may injure our own woollen manufactures; and that every meaſure may be uſed to work up the whole of our wool, by the improvement of new kinds of woollen manufactures; as thoſe with wool and ſilk, wool and cotton, wool and linen, wool and hair, &c. and to apply the material of wool to whatever elſe it will admit of, eſpecially in the lieu of any general manufacture, wrought with foreign materials: ſuch, for example, as woollen hats for men, which, doubtleſs, might be properly ſtiffened for the purpoſe; woollen hats for the ladies, woollen wigs for labourers, &c. which not only might become generally faſhionable at home, and in our own plantations among the lower claſs of people, but might, perhaps, be exported in large quantities to other countries. In ſhort, to promote whatever manufactures could be thought of, whereby all the wool produced in Great Britain could be worked up; which ſeems the moſt natural and the moſt effectual way to prevent its being ſent abroad, to the detriment of our woollen manufactory at home.

10. That encouragement be given to thoſe who ſhould be inſtrumental to improve our fineſt wool in certain counties, that it may effectually anſwer the end of Spaniſh wool, ſo that we may have no occaſion to import the ſame from that kingdom; eſpecially ſince they have ſtole away our woollen manufacturers, ſhip-builders, and divers other artizans, in order to raiſe their own trade upon the ruin of our's, if they can.

11. That the produce of ſilk be duly encouraged in thoſe our plantations which may be proper for it, and that our own ſilken manufactures be preferred in our general wear to thoſe of foreigners.

12. That the trade of our colonies and plantations be improved to the utmoſt, ſo that they do not interfere with the commerce of their mother country; but that they be ſo regulated as to enable us to rival our competitors in ſuch branches as they are able to outdo us in.

13. That a ſtanding committee of trade be appointed by parliament, compoſed of perſons well verſed therein, whoſe buſineſs ſhould be conſtantly to conſider the ſtate thereof, and to find out ways and means to improve it; to enquire how the trades we carry on with foreign countries, grow more or leſs profitable; how, and by what means, we are outdone by others in the trades we drive, or hindered from enlarging them; what is neceſſary to be prohibited, both with regard to our exports as well as imports, and for how long time; to hear complaints from our factories abroad, and to correſpond with our miniſters there, in affairs relating to our trade, and to repreſent the reſult of their enquiries to parliament, with their opinion, what courſes may, from time to time, be proper to be taken for its encouragement; and to repreſent what bounties and drawbacks, &c. may be neceſſary for the advancement of particular branches. That this committee enquire into all the improvements that ſhall be made for the benefit of trade, and lay them before parliament; and that ſuch artiſts may be rewarded, at the public expence, according to their merits.

14. That proper treaties of commerce be made with nations, that may prove mutually and laſtingly beneficial.

15. That our merchants who export our product and manufactures, be ſecured in their foreign traffic, and the payment of their cuſtoms made as eaſy to them as poſſible. That good convoys and good cruizers, in time of war, be provided for the ſafety of their ſhipping and merchandizes, to the end that aſſurance may be kept low, and our merchandize come as cheap as poſſible to foreign markets, as well in times of war as peace.

16. That courts merchant be erected in the kingdom, conſiſting of able and experienced traders, for the ſpeedy deciding of all differences between merchants, relating to maritime and other commercial affairs.

EXTENSION *of fractured limbs*, in ſurgery. When the fractured bones maintain their natural ſituation, the ſurgeon has nothing to do but to apply a proper bandage to keep them in it; but, when the fractured parts recede from one another, ſome degree of Extenſion is neceſſary, which muſt always be ſuited to the diſtortion of the limb. The greater diſtance there is between the extremities of the divided parts of the bone, ſo much the ſhorter will the limb become from the natural contraction of the muſcles, and the Extenſion muſt be proportionably the greater; but, in theſe caſes, every thing is to be done tenderly, and with great care. 1. The patient is to be kept very firm and ſteady; the poſture of the body muſt be, in this operation, different, according to the different circumſtances of the caſe; ſometimes ſitting, and ſometimes lying, are the moſt proper. 2. An aſſiſtant muſt ſupport the limb with his hands, both above and below the fractured part. 3. The perſon who holds the lower part of the limb, muſt extend it ſtrongly and equally, till the fractured bone can be replaced; but when the ſurgeon is called at ſome diſtance of time from the accident, and a tumor and inflammations are come on, it is beſt, in ſuch caſe, to defer the Extenſion of the parts till theſe ſymptoms are removed, by letting blood, looſening the bowels, giving the patient large quantities of aqueous fluids, and preſcribing the proper internal remedies for abating inflammations, and fermenting the parts with warm diſcutient decoctions. Theſe applications will uſually ſucceed ſo well as to take down the inflammation, in twenty-four hours, in ſuch a manner, that the Extenſion of the limb may be ſafely attempted; but, when they do not take place ſo ſuddenly, they are to be repeated till they have the deſired effect; and, when the common fomentations fail, the following has often very great and happy ſucceſs: take two or three handfuls of ſcordium, and boil them for about a quarter of an hour in a pint of water, with ſix ounces of rectified ſpirit of wine; afterwards mix

mix with it an ounce of common salt, and half an ounce of salt-petre, and use this to the inflamed fractured limb. To make the proper Extension of a limb, the surgeon must, while it is kept at its proper length by two assistants, direct it with his hands, sometimes a little one way, and sometimes another, putting it into different positions, as the nature of the case shall require, till the parts have recovered their natural situation. This will be known by the remission or absence of pain, and by observing, that the fractured limb is of the same length as the sound one; and, if these signs of success in the operation are wanting, there is great reason to suppose that the operation is as yet ineffectual, and the Extension is to be repeated, or continued, till the bones are evenly and properly replaced. *Heister's Surgery.*

EXTRA'VASATED *blood.* In the contusions, fissures, depressions, fractures, and other accidents of the cranium, one or more of the blood vessels distributed on the dura mater are frequently divided. The blood that is discharged from these vessels greatly oppresses the brain and disturbs its offices, frequently brings on pains and other mischiefs, and often death itself, unless the patient be timely relieved. If the quantity of Extravasated blood be ever so small, it will certainly corrupt, and affect the meninges, and the brain itself, with the same disorder; and from hence will proceed violent inflammations, deliriums, and ulcers, and finally death; and this will frequently be the case, after a violent blow upon the cranium, though the bone should escape without injury. In these injuries of the head, the blood is spilt either between the cranium and the dura mater, or between the dura and pia mater, or between the pia mater and the brain; or, lastly, into the sinuses of the brain. Either of these cases is attended with very great danger, but, the deeper the extravasation happens, so much greater must the danger be. Blood Extravasated in the cavity of the cranium will be discovered from the violence of the symptoms that succeed a blow on the head; as if the patient lies still without sense or motion, if blood flows from the mouth, ears, or nose; if the eyes are much inflamed and swelled; if vomitings succeed; when, upon the remission of these symptoms, the patient complains of a remarkable heaviness of head, sleepiness, vertigo, blindness, spasms, and disorders of this kind. When the quantity of Extravasated blood on these accidents is very considerable, and oppresses the cerebellum, the patient dies upon the spot; but, when it is not in a very large quantity, or does not affect the cerebellum, life still remains, but the symptoms just mentioned come on. In this case, if no fissure or contra-fissure is to be found, nor any external injury on the integuments of the head after a violent blow, it proves very difficult to find in what part of the head the extravasation is seated. It will be proper in this case first to shave the head all over, and then thoroughly to examine it; for, if any part is softer than ordinary, or is enlarged, or red from stagnating blood, it is plain that this is the part that has received the injury. But, if neither this way, nor by enquiry among the persons present at the accident, you can get light into the affair, it will be proper to cover the whole head with an emollient plaister, laying over it medicated bags of herbs, &c. well heated. This application will in a few hours time produce a tumor and softness upon the injured part. Sometimes the patient also, though he lies speechless, and seemingly senseless, will be continually putting his hand to the injured part; and, if either side of the patient has lost sense or motion, and is become paralytic, it is an apparent sign, whatever some might think to the contrary, that the injury has been received on the contrary or sound side. If after accidents of this kind you can discover any wound in the skin, that must be enlarged with the knife till the injury on the cranium, of whatever kind it be, is come at.

When the seat of the injury is discovered, the first intention is to discharge the Extravasated blood, and then to clean the wound, and remove all splinters, or extraneous bodies. Some have recourse on these occasions to the instant use of the trapan; but patients have been often very successfully recovered without it. It is therefore best first to open a vein, and take away as much blood as the strength of the patient will permit; this will take off the impetus of the vessels, and prevent the extravasation of more blood. Prescribe after this a brisk purge to lessen the quantity of the fluids; foment the head with medicated bags, and apply a melilot plaister to it; endeavour to rouse the patient by volatile applications to the nostrils, such as sal volatile, spirit of sal armoniac, or spirit of hartshorn; and give frequently attenuating fluids, such as the decoctions of betony, sage, rosemary, lavender flowers, sassafras, and the like. This method does not immediately produce the desired effect, but is to be continued for some time, and the prescriptions frequently repeated, particularly when the bad symptoms seem by degrees to abate; and, if the patient find relief from the first bleeding, it will be proper to repeat it a second or third time, especially if he be of an athletic constitution. When, notwithstanding this method, the symptoms are found however rather to increase than abate, it will be necessary to make a perforation in the cranium with the trapan, to give a passage for the discharge of the confined grumous blood; and, when there is no finding out the part affected, the skull must be perforated in several parts till the right is found. *Heister's Surg.*

EYE (*Dict.*)—If the humours of the Eye decay by old age, so as by shrinking to make the cornea and coat of the crystalline humour grow flatter than before, the light will not be refracted enough, and for want of a sufficient refraction will not converge to the bottom of the eye, but to some place beyond it; and, by consequence will paint in the eye a confused picture; and, according to the indistinctness of the picture, the object will appear confused. This is the reason of the decay of sight in old men, and shews why their sight is mended by spectacles. For the convex glasses supply the defect of plumpness in the Eye, and by increasing the refractions make the rays converge sooner, so as to convene distinctly at the bottom of the Eye, if the glass has a due degree of convexity.

And the contrary happens in short-sighted men, whose Eyes are too plump. For, the refraction being now too great, the rays converge and convene in those Eyes before they come at the bottom; and, therefore, the vision caused thereby will not be distinct, unless the object be brought so near the Eye as that the place where the converging rays convene may be removed to the bottom; or that the plumpness of the Eye be taken off and the refraction diminished by a concave glass, of a due degree of concavity; or, lastly, that by age the Eye grows flatter till it comes to a due figure. For short-sighted men see remote objects best in old age, and therefore they are accounted to have the most lasting eyes.

In determining the magnitude of pictures upon the retina, only one ray in each pencil need be considered; because, when the picture is distinct, all the rays in any one pencil are collected to one and the same point of the retina. Or, which is much the same, we may suppose the pupil of the Eye contracted to a point: and, for greater simplicity and ease of the imagination, that this point O is a little hole at the center of a dark hollow hemisphere, *Plate* XX. *fig.* 2. admitting only single rays straight through it without any refraction at all. For then the length of these pictures pqr will increase and decrease as the angle pOr does, or as the angle POR does; which I am going to shew to be the property of the natural Eye: and, if the semidiameter Oq, of this hollow hemisphere, be about five eighths of an inch, or if the axis of an human Eye, the pictures of the same objects will always have the same bigness in both sorts of Eyes, very nearly.

The diameters or lengths of the pictures of objects upon the retina are measured by, or proportionable to, the angles which the rays that come from the extremities of the object do make in falling on the Eye, provided those angles be but small. For let two or more objects, *fig.* 3. and ϖx, either parallel or oblique to each other, subtend the same angle POQ, or $\varpi O x$ at O; and, because the particles of light flowing from P and ϖ describe the same line $P\varpi O$, they will be refracted to the same point p upon the retina; and in like manner those that flow from Q and x will be refracted to the same point q; and so the picture pq of the objects PQ, ϖx, which subtend the same angle at O, are the same in magnitude; which was the first thing to be proved.

Now the pictures of objects painted upon the retina of a dead Eye are found by experience to be perfectly well shaped and proportioned in their parts; that is, the proportion of the parts pq, qr, of the whole picture pqr, is the same as that of the parts PQ, QR, of the whole object PQR; and this latter proportion is very nearly the same as that of the angles POQ, QOR, subtended by the parts PQ, QR; and so the proposition is proved, when the objects PQ, QR, are both at the same distance from the Eye. And, since it was shewn just before that the objects PQ and ϖx have the same picture pq, it follows that the proportion of the pictures of the objects ϖx and QR is the same as that of the angles $\varpi O x$, QOR, subtended by them at the Eye.

When an object approaches towards the Eye, the diameter of its picture upon the retina increases in the same proportion as the distance between the Eye and the object decreases; and, on the contrary, it decreases in the same proportion as that distance increases. For the diameter of its picture increases in the same proportion as the angle increases, which the object subtends at the Eye; and this angle, when small, increases in the same proportion as the distance between the Eye and object decreases.

The degree of brightness of the picture of an object painted upon the retina continues the same, at all distances between the Eye and the object; provided none of the rays be stopped by the way, and that the pupil does not alter its aperture. For instance, when the Eye approaches as near again to the object, the picture upon the retina becomes double in length and double in breadth, and consequently quadruple in surface; for the surface would be double, if its length alone or breadth alone was double. The quantity of rays received through the same aperture of the pupil, at half the distance from the object, is also quadruple; and, being equally spread over four times the quantity of surface of the retina, they are just as dense as before, when the object was at twice the distance.

It

It follows then that the faint appearance of remote objects is owing to the opacity of the atmosphere, which hinders part of their light from coming to the Eye. Accordingly we find that the sun, moon, and stars appear very faint, when near the horizon, and brighter continually, as they rise higher; because the tract of vapours, which lies in the way of the rays, is longest and thickest near the horizon; and becomes thinner and shorter, as the objects rise higher, and consequently does less obstruct the passage of the rays.

The sensibility of the Eye, or its power to discern objects without inconvenience, by different quantities of light, is vastly extensive. For instance, the disproportion in the quantities of light, cast upon the horizon by the sun and moon, at any equal altitudes, I find no less than 90 thousand to 1, when the moon is full; or no less than 180 thousand to 1, when the moon is in the quarters. And the proportion between those parts of the lights of the sun and moon, whatever they be, which are reflected to our eyes from the same object by day and by night, can hardly be different from the proportion of the whole lights. Allowing then that the aperture of the pupil may possibly be eight or nine times less by day than by night (that is, about three times less in diameter) yet the proportion in the quantities of day-light and moon-light received by the Eye from the same object, to illuminate a picture of the same bigness, will be no less than twenty thousand to one, when the nights have a middle degree of moon-light; I say no less, because the numbers here given are deduced from a rule, which is built upon this principle, that the moon reflects all the light received from the sun; which cannot be true, by reason of the appearance of very large obscure places in her body; and, in all probability, a great part of the incident light is buried and lost even in the brightest places.

The rule I mentioned is this, day-light is to moon-light as the surface of an hemisphere, whose center is at the eye, to the part of that surface which appears to be possessed by the enlightened part of the moon: so that the whole heavens covered with moons would only make day-light. This will be evident enough from the following considerations, though I invented it another way. Day-light is made by innumerable reflections of the sun's rays from all sorts of bodies, till at last they come to our eyes; for, if this were not so, we we could see nothing in the world, even in the day time, but the sun and stars and self-shining substances. Accordingly we find that day-light is much the same, whether the sun shines out or not, in the place we are in; because his light is reflected to us from a vast quantity of earth, air, and clouds extended all round us, perhaps to a hundred miles or more. So that the absence of the sun's rays from a particular place scarce alters day-light. Another thing is, that the moon by day appears like a cloud in the air of a middle degree of brightness; some appearing duller and some brighter than the moon itself. The rays of the sun being therefore intercepted in the night from all the visible clouds, and being reflected to us by the moon only, it follows, that day-light is to moon-light, as the apparent surfaces of all the visible clouds to the apparent surface of the visible part of the moon, considered as the only cloud which remains enlightened. And these two lights, whatever be the distances of the moon and clouds, are just the same as if those bodies were all placed at any equal distances from us, and composed the surface of an hemisphere, whose parts are the true measures of the parts of the light which comes to us.

A vast disproportion between the lights of the sun and moon appears also by experiments made with burning-glasses; either by refraction of the rays through very broad lenses, or by reflexion from very broad concave-glasses or metals: which, by collecting the rays of the sun into a small round image at the focus, do excite a more violent heat and burn quicker than the hottest wind-furnaces: as appears by their melting and calcining the hardest metals, by vitrifying bricks and stones in much less portions of time than a minute. Yet the rays of the moon, being collected by the same glasses, do not excite the least sensible heat; nor do they sensibly affect the nicest thermometer, when cast upon the ball of it, though the brightness of the light be very sensibly increased. By measuring the breadth of the round image at the focus, and by comparing it with the breadth of the glass itself, it appears that some of these burning-glasses collect the incident rays into a space about two thousand times less than they possessed at their incidence. But by the preceding calculation the light of the full moon must be condensed about 90 thousand times, to make it as dense and as warm as the direct rays of the sun. It is no wonder then that the heat of the moon's rays is not sensible in the focus of the glass, being then even forty or fifty times thinner than the direct rays of the sun. For it is found by experiments made with these glasses, that the degrees of heat are proportionable to the densities of the rays: which being compared with a scale of the degrees of heat and warmth of several natural bodies, determined by Sir Isaac Newton, in the Philosophical Transactions, it appears there is a vast disproportion between the degrees of light which the Eye can bear and be sensible of, and the degrees of its heat which the touch can bear and be sensible of.

Dr. Hook assures us, that the sharpest eye cannot well distinguish any distance in the heavens, suppose a spot of the moon's body, or the distance of two stars, which subtends a less angle at the Eye than half a minute; and that hardly one of a hundred can distinguish it, when it subtends a minute. If the angle be not bigger than this, the two stars appear to the naked Eye, as if they were but one. I have been present at making the experiment, when a friend of mine, who had the best eyes of all the company, could scarce perceive a white circle upon a black ground, or a black circle upon a white ground, or against the sky-light, when it subtended a less angle at the Eye than two thirds of a minute; or, which is the same thing, its distance from the Eye exceeded 5156 times its own diameter: which agrees well enough with Dr. Hook's observation. Hence the diameter of the picture of that circle upon the retina was but the 8000th part of an inch at most; and this may be called a sensible point of the retina. That this point is very small any one may perceive from hence, that the breadth of the finest hair is visible at the length of one's arm. *Smith's Optics.*

Contusion of the EYE. When the Eye is, by any accident, contused, it will be intirely deprived of sight, unless the contusion be slight, or the proper remedies instantly applied. If the Eye have received a very slight contusion, it will be proper to wash it frequently, for the first day, with cold spring water, laying on it linen rags, wet with the same: on the next day it must be rubbed externally with camphorated spirits of wine, and covered up with stuphs wrung out of decoctions, made in wine of eye-bright, speedwell, hyssop, sage, chamomile-flowers, and fennel seeds; but, if these things are not to be had, bolsters dipped in warm wine must be applied, and renewed very often; and, if the patient be of a plethoric habit, bleeding is also necessary. If the contusion of the Eye is so violent, that you can plainly see the extravasated blood through the cornea, and all objects appear red to the patient, a vein must be opened either in the foot or neck, the Eye must be kept continually fomented with warm stuphs, wrung out of the same decoctions as are before mentioned, and the feet must be bathed in warm water two or three times a day, and a few drops of pigeons blood must be, two or three times a day, put into the Eye; and, if all these attempts prove fruitless, you may very probably succeed, by making an opening in the cornea with the lancet. *Heister's Surgery.*

Wounds of the EYE. If the Eye is wounded, but not so as to let out the vitreous or crystalline humour, the wound must be anointed two or three times a day, with a feather, or fine rag, well dipped in the white of an egg, or else in a mucilage made of quince seeds, or of fleawort seeds, in rose water; and, after each dressing, a compress is to be laid on, well saturated with a collyrium, made of the whites of eggs. 2. Two ounces and a half of rose water, half a drachm of oil of roses, and three grains of camphor, well mixed together, and thoroughly shook up every time it is to be used. If the accident is attended with any great degree of inflammation, as is very frequently the case, it will be proper to cover the small compress, first laid over the Eye, with a larger, dipped in warm spirits of wine, with camphor. The bowels must, in this case, be kept open, and the patient blooded, if of a plethoric habit. And, if it happens, that the crystalline humour, or any part of it, sticks in the orifice of the wound, it must, in this case, be pulled out, that it may not bring on a deformity, or worse mischief, to the Eye. *Heister's Surgery.*

Artificial EYE, is an optical machine, where objects are represented after the same manner as in the natural Eye; of considerable use in illustrating the nature and manner of vision.

Its construction is thus: provide two hollow hemispheres of hard, dry wood, well cemented together, to represent the ball of the Eye: let the anterior or fore hemisphere be perforated with a round hole in C (*Plate* XX. *fig.* 4.) to supply the place of a pupil; and therein fit a thin, plane glass, or, which amounts to the same, a concavo-convex glass, to serve for the cornea. In the inside, have a short draw-tube G, with a lens convex on both sides, to do the office of the crystalline therein. In the hind or posterior hemisphere, fit another drawn tube E F, with a plain glass therein, having its inner surface smooth, though not polished, representing the retina and optic nerve.

If now the aperture C be turned towards any object, and the draw-tube F E be gradually pulled out; you will have the object beautifully and strongly represented, in all its colours, on the retina, only in an inverted order.

EYES *of horses*, in the manege, &c. These should be bright, lively, full of fire, pretty large, and full; but not too big, goggling, or staring out of the head. They should also be resolute, bold, and brisk. A horse, to appear well, should look on his object fixedly, with a kind of disdain, and not turn his Eyes another way.

The diseases of the Eyes, in horses, proceed either from a defluxion, or from some external hurt. In the former case, the Eyes are watery, hot, red, and swollen, the distemper advancing by degrees; in the latter, the malady comes speedily to a height, and the skin on the outside of the Eye is peeled off.

If the distemper takes its rise from a rheum, or defluxion, it is is to be conſidered, whether it proceeds from the Eye itſelf, or from another aggrieved part: in the latter caſe, the redreſſing of the part will ſet the Eye free; in the former, it is proper to cool the horſe's blood with an ounce of ſal prunellæ, mingled every day with his bran; and, when it leſſens his appetite, to change it for liver of antimony, till he recovers his ſtomach.

For ſore Eyes, when a ſkin is growing over them, the following receipt is recommended: to the white of an egg add a little fine powdered ſalt; then ſet this on the fire till it be reduced to a powder. This, mixed with a little honey, is to be put into the horſe's Eye with a feather. If it is found inſufficient to eat off the ſkin, the powder alone muſt be blown into the Eye with a quill.

In caſe of a blow on the Eye, take honey, and, having added a ſmall quantity of powder of ginger, put it into the horſe's Eye; or elſe take hog's lard, with oil of roſes and elder, of each an equal quantity; then, having melted them together, anoint the Eye therewith.

Some horſes have naturally tender weeping Eyes, which void a ſharp eating humour; theſe are eaſily cured by waſhing or bathing them every morning and evening with brandy.

EYE *of a tree*, a ſmall pointed knot, to which the leaves ſtick, and from which the ſhoots or ſprigs proceed.

EYE-BROWS *wounded*. In wounds of this part, great care muſt be taken to guard againſt inflammations, leſt the Eye ſhould partake of the injury; all hot and ſharp things muſt be avoided, in eating and drinking, and the patient ſhould be blooded, if plethoric; the wound muſt be dreſſed with vulnerary balſams, and the dreſſings covered with compreſſes, dipped in camphorated ſpirit of wine. If the wound be large, and the Eye-brow intirely divided, it will be neceſſary to uſe the ſuture and dreſs of it, with a vulnerary balſam, covering both eyes, and keeping them as much as poſſible from motion. *Heiſter's Surg.*

EYE-LIDS *wounded*. Wounds, either of the upper or lower Eye-lid, will not readily heal, not ſo much from the thinneſs of the parts, as from the great quantity of fluids, with which the Eye is continually moiſtened. It is neceſſary, therefore, firſt to foment the part with decoctions of chamomile, hyſſop, or eyebright, till the flux of the blood is ſtopped, and the wound well cleanſed; then, if the wound is tranſverſe, it muſt be ſtitched up in the middle with a fine needle, and ſprinkled over afterwards with the powder of comfrey root, gum arabic, or other ſuch medicines, or anointed with balm of Gilead, Peru, or Capivi, laying over theſe applications a plaiſter of diachylon, and tying it up in ſuch a manner, that the Eye may have very little power to move about. If the wound is made lengthways, it will require ſeveral ſtitches, and muſt be dreſſed over them as before. *Heiſter's Surg.*

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FABA *Ægyptia*, in natural hiftory, the Egyptian bean, by fome called the Pontic bean, as it is not only copioufly produced in Egypt, but, alfo, in fome marfhy grounds of Afia and Cilicia. It has a very large leaf, a ftalk a cubit long, as thick as one's finger, and a flower whofe colour refembles that of a rofe, and which is as large again as a poppy-flower. But, when the flower falls, it bears fmall pods, almoft refembling little bladders, and in which the bean is fomewhat prominent above its covering, in the form of a bubble. They call it ciborium or cibotium, from the manner of planting it; which is, firft, to lodge it in a moift clod, by way of a cafe or box, which is afterwards immerfed in water. Its root is thicker than that of the common reed. This root is eaten, both raw and boiled, and is called colocafia. The bean itfelf is, alfo, eaten green; but, when dry, becomes black, and in bulk exceeds the Grecian bean. It is of an aftringent quality, and good in diforders of the ftomach. In confequence of its aftringent nature, an infperfion of its flower, inftead of polenta, is highly beneficial to dyfenteric patients, and fuch as labour under the cœliac paffion. This flower is, alfo, ufed by way of poultice: but the hufks made into a decoction, with mulfum, prove more effectual, if three cyathi of the mulfum are exhibited for a dofe. This bean, if boiled in oil of rofes, relieves pains of the ears, if dropped into them; becaufe, in the middle of the bean, there is a green fubftance, highly bitter to the tafte. *Diofcorides*.

The root of this bean, triturated, and made up, with fugar, in form of a preferve, is exhibited for the hæmorrhoids. The juice, extracted from the flowers, ftops immoderate difcharges of the menfes. *Dale* from *Henricus Adrianus Van Rheede*.

FABA *Sti Ignatii*, St. Ignatius's bean, in natural hiftory, a fruit of which Sir Hans Sloane gives us the following account:

It is about the bulk of a nutmeg, and triangular: the fhavings of it, drank in cold water, are highly beneficial for evacuating poifons by vomit, as alfo for the cure of bites inflicted by venomous animals, if, at the fame time, a few of the fame fhavings are applied to the bite: thefe fhavings, alfo, afford great relief, when applied to a part fpafmodically conftricted, and ftop hæmorrhages, when applied to the wounds. In the year 1692, a woman, who had, for a long time, been afflicted with floodings, was reftored to perfect health, by drinking thefe fhavings in fome proper liquor: the fame year, an infant, labouring under an highly intenfe fever, by drinking thefe fhavings, had its diforder forthwith removed in my prefence. They, alfo, afford relief to women in labour, and facilitate their delivery. I myfelf have found from experience, that this bean is of fingular fervice in all kinds of repletion, and crudities of the ftomach, as, alfo, in a dyfentery and tenefmus.

Divide each bean into three parts; and, when there is a neceffity, put one of thefe into the mouth, for a quarter or half a quarter of an hour, fwallowing the faliva difcharged; then drink about two or three ounces of cold water, and the effects of the medicine will be fenfible.

Another manner of ufing this bean is to put it into the concave part of a hard fhell with a little water, and rub it up and down. This water is to be put into a veffel with fome of the fhavings; and the like is to be done, till you have two ounces of the water thus prepared, which is to be taken for a dofe.

When this bean, divided into pieces, is rubbed in the concave part of a fhell, with oil, efpecially that of olives, this oil produces the fame effects with the former preparation, when drank; and is an excellent medicine, when applied to wounds, or members fpafmodically conftricted.

The moft ordinary method of ufing this nut is to put it entire into a little warm water, till the water is rendered bitter; and this infufion is afterwards to be exhibited. Others ufe a little of the powder in fubftance; others fwallow a piece of the bean; and others wear a whole bean, hung about their necks, by way of amulet.

When poifon is fufpected, and in cafes where there is an immoderate and tumultuous conflict of the fpirits, it is to be ufed without any regard to time. In other difeafes, it is to be ufed in a morning fafting. But, when the intention is to vomit, it is moft conveniently exhibited an hour or two after eating: the dofe is half a fcruple, in conjunction with other gentle emetics.

The powder, an infufion, or the oil, of this bean are exhibited in tertian and quartan fevers. It is alfo ufed for provoking urine, the menfes, and fuppreffed labours; for facilitating the birth, expelling the fecundines, the fœtus when dead, and worms; in all which cafes I have found it effectual. It is alfo exhibited in cholics, crudities of the ftomach, an injured concoction, diarrhœas, tenefmus, and obftructions of the liver and fpleen.

It is produced in the Philippine iflands, and thofe adjacent to them; but we are ignorant what kind of plant it grows on; only I learned from Raphael de Roa, a learned Spaniard, who lived long in thefe iflands, that it was a convolvulous plant, twifted itfelf round the talleft trees, and bare a fruit as large as a nutmeg. *Philof. Tranf.*

FACE *of a plant*, a word ufed by Tournefort and many other botanifts, to convey an idea of that general appearance of plants, which fhews a famenefs in thofe of the fame genus, and a diverfity from the other genus's, though not eafily charactered in words, yet very obvious to an eye accuftomed to thefe refearches. Thus all the fpecies of wormwood have the fame general face, by which they may be taken to be fpecies of the fame genus, and fo of many more; nay, in fome cafes, whole genera, and even claffes, have the fame kind of family face, as it may be called, by which they may be known: as the umbelliferous plants, except the perfoliata, and a few other inftances.

It has been attempted by many to make this general face an indicatory note of the virtues of the plant which wears it, and there would certainly be this great advantage in it, if it could be brought to any degree of certainty, that the moft obvious of all diftinctions would be applied to the moft valuable office: but, though an abfolute certainty cannot be arrived at, in an attempt of this kind, yet, allowing for the poffibility of a few exceptions, general conjectures may be made on the following rules, which will rarely fail. The umbelliferous plants before-mentioned make a very large clafs, and it is their general and obvious character to have their feveral flower branches arife from one center, and expand into an umbrella, every one having a tuft of flowers at the end; thefe flowers confift of five leaves, and the feeds are naked and double, and the leaves of the plant are generally deeply divided, as in parfly, carrots, and the like.

The verticillate plants are another clafs, which are eafily known by their general face; their flowers ftanding in ringlets round the ftalks, and being labiated or of fome fuch form. The leaves alfo in moft of thefe plants ftand in pairs, and they have generally an aromatic fmell. As the virtues of the umbelliferæ lie in the roots and feeds, fo do thefe in the hufks of the flowers. It has been a common opinion, that the flowers of thefe plants contained their virtues, but this is erroneous. The flowers of fage are almoft infipid, but the hufks tafte very ftrongly. Thefe plants are, in general, poffeffed of the fame virtues, and are all of a middle degree between the carminatives before-mentioned and the fpices.

The filiquofe plants have alfo the fame general face. Their flowers are compofed of four leaves, and their feeds contained in long pods, or in fhort and thick filiculæ. In thefe plants the feeds are found to contain the principal virtue in fome, and in others the leaves: fome have alfo virtue in their roots, but the flowers of all are neglected.

FA'LCO, *the falcon*, in ornithology, a bird of prey of the hawk kind, much efteemed for its ftrength and activity. There are many fpecies of this bird, but, when the word Falco is ufed fingly without any diftinctive addition, it is meant of that fpecies called, by authors, the Falco peregrinus, from its travelling into different countries, at different feafons of the year.

It has very long and large wings, reaching, when folded, to the tip of the tail. Its fhoulders are very large, its tail very long and ending like the fparrow hawk's in a point, its end being white variegated with orange-coloured ftreaks. Its feet are of a greenifh or bluifh yellow, its neck is long, and its head of a pale dove colour. There is a fpecies of this bird, which are of a much blacker colour on the back, and has been erroneoufly efteemed by fome a different fpecies; probably it is only owing to the difference of age or fex. This bird is caught in in France, Germany, and elsewhere; but it is not well known where it builds. It feeds on ducks, geese, and other large birds. *Ray's Ornithology.*

FALLACIES *in vision*, deceptions of the sight, from the objects appearing, from their situation, different to the sight than what they really are.

Since oblique distances appear longer in proportion as the eye is raised higher, to view them more fully; it follows that, being placed at a distance from a gentle ascent, like the stage at a play-house, or a rising mount at the end of a walk, we shall judge those ascents much longer than if they were level, especially if they be artfully contracted in the remoter parts. For, by not observing, or attending to, the reality of these ascents, we form the same idea of them, as is usually suggested to the mind by a longer level walk with parallel sides. Now, since the rising of the ground, together with a gradual diminution of its breadth, when not observed, do make it seem longer, and consequently less diminished in breadth, than if the same extent was level, with parallel sides; it should follow that a gentle ascent alone, whose sides are parallel, should still widen the appearance of their remoter parts, so as to make the parallel sides appear parallel or even diverging: which is contrary to the common appearance of parallel sides.

The oblique situation of an object seen alone is suggested to the mind by a greater apparent magnitude or a distincter perception of the nearer than of the remoter parts. And consequently, if the object be so remote or so uniform that we are not affected with a sensible difference in those perceptions, we are subject to mistake its position. For an object may appear under the same angle A O D (*Plate* XX. *fig.* 15.) in two oblique positions A D and *a d.*

Hence we sometimes mistake the position of a weather-cock or a flag; and, by taking the nearest end of the sail of a wind-mill for the remotest, we sometimes mistake the course of its circular motion. For if a spectator at O (*fig.* 16.) situated nearly in the plane of the sails produced, imagine the farthest end A of a sail A E to be the nearest, and the real motion of the sails be in the order of the letters A B C D E; when A is moved to B, and the line B O is drawn, cutting the circle A B C D E in D; since he first imagined the end A to be at E, he will not now conceive it at B but at D, and so will imagine the course of the motion to be from E to D; which is contrary to the real motion from A to B. The uncertainty we sometimes find in the course of the motion of a branch or hoop of lighted candles, turned round at a distance, is owing to the same cause: and also that we mistake a convex for a concave surface sometimes with the naked eye, but more frequently in viewing seals and impressions with a convex glass or a double microscope; and hills and vallies in the moon with telescopes, especially if they invert the object: being led into the mistake by an imperfect judgment of the distances of the parts of the objects, and confirmed in it by a contrary position of the shadows cast by a side light.

We are frequently deceived in our estimates of distance by any extraordinary magnitude of objects seen at the end, of it: as, in travelling towards a large city or a castle, or a cathedral-church, or a mountain larger than ordinary, we think they are much nearer than we find them to be on trial. For, since by experience the ideas of certain quantities of known distances are usually annexed to the apparent magnitudes of known objects of a common size, and since the apparent magnitudes of these larger objects at a greater distance are the same as of the smaller at a smaller distance, it is no wonder they suggest the usual idea of smaller distance annexed to more common objects. This is farther evident, because we are ignorant of the nature of the country, and of the inequalities in the ground interposed.

Animals and all small objects seen in vallies, contiguous to large mountains, appear extraordinary small, because we think the mountain is nearer to us than if it was smaller; and we should not be surprised at the smallness of the neighbouring animals, if we thought them farther off: In like manner, when they are placed at the top of the mountain, or upon a large building, and are viewed from below, we think they are extraordinary small for the same reason, and also because we judge the mountain or the building to be lower in proportion than if it was smaller, both because of its extraordinary magnitude and greater obliquity of its higher parts to the visual rays. Dechales tells us that, while he stood at the bottom of a mountain, he once observed a parcel of crows, which at first he thought were higher than the mountain, because, I suppose, they appeared so very small in comparison to it; but he found they spent half an hour in ascending, before they got to the top of it. The part of the monument extant above the tops of the adjoining houses, I am told, is five times longer than the height of the houses, and yet from below that part appears but two or three times longer at most, because of its unusual magnitude and obliquity to the sight.

Aquilonius mentions a Fallacy in distance which he had frequently observed and admired. In a warm summer's morning, when fogs are exhaled from moist ground, we frequently see them very near us in some known place; but, as soon as they are separated from the ground and are going to ascend, they appear so remote, that, says he, I could never have believed they hung over that place, had I not seen them there the moment before. The reason is, they then appear in the manner and direction of other remote clouds in the horizon, whose difference in distance cannot be discerned, for want of some visible surface extended between them; like the surface of the ground, when the rising cloud lay upon it.

It is said to be a common observation made by travellers in the night or the dusk of the evening, that near objects, as trees and houses, are often taken to be very large and remote. The reason may be, that, being unable to discern the quantity o ground interposed, they refer them to the brighter sky in the horizon, and so think they are remoter and consequently larger: as I remember a red coat of arms, upon the top of an iron gate at the end of a walk, was taken for a brick house in the fields beyond it. *Smith's Optics.*

FAMILIA, in natural history, a term used by authors to express a certain order of animals, or other natural productions, agreeing in their principal characters, and containing numerous individuals, not only different from one another, but, that in whole sets, several numbers being to be collected out of the same family, all of which have the family character, and all some subordinate distinction peculiar to that whole number; or, though found in every individual of it, not found in those of any others.

It has been too common to confound the words, class, family, order, &c. in natural history. But the determinate meaning of the word Familia seems to be that larger order of creatures, under which classes and genera are subordinate distinctions. Among the quadrupeds, the several genera of the unguiculated creatures agree one with another in many general characters common to all; and in which they differ from the ungulated animals, which have also their several peculiar characters common to all, and yet different from all those of the others. These naturally constitute certain larger divisions into families, and no one would ever break through these, or bring the cat and the horse into the same family.

In the same manner, in ichthyology, there are several genera of fishes, which agree perfectly in certain common characters, and disagree from all others in them. The bream and the herring, though very different in genus, may yet be brought into the same family, both having many characters in common, as well as many different ones; but no one would ever be for bringing the herring and the whale into the same family. The arrangement of natural bodies into these families, or general and larger classes, is of the utmost use to natural history, when it is properly done, and the divisions are genuine and natural; when otherwise, it is hurtful.

These divisions of animals into families are of two kinds; the one artificial or hypothetical, the other natural. The artificially contrived families, or classes of bodies, are founded on certain accidents of the things under consideration, not made from the parts of the bodies themselves. Of the artificial kind are those distinctions so much in use among the old naturalists, founded on the place of growth and time of flowering of plants, the time and manner of bringing forth in animals, the food of creatures, and their different magnitudes. And to these false foundations for general divisions may be added those founded on the number of certain external parts of the creatures.

The absurdity of the first of these methods is easily seen, since it requires a prior knowledge of the objects, before they come under our consideration. If an unknown plant mineral, or animal, be offered to a naturalist, how is he to inform himself of its time of flowering, its place of production, or its manner of bringing forth its young. And, as this is impossible, it is also impossible that he should ever refer to its family, or trace it out among the individuals of it. As to the latter method of making the number of certain external parts the character of a family, it is easy to see the absurdity of it in regard to the fishes, for the fins of these animals are not always the same in number, in the different species truly and properly belonging to one genus. Thus the pearch, gadus, syngnathus, and many others, have more or fewer fins, in the same genus. These are the errors of the artificial or hypothetical classes and families of natural bodies.

The natural families are liable to no such objections. In these all the genera, referred to the same family, agree perfectly and punctually in their principal parts; the several individuals, of which these families are composed, being reduced into genera, these are to be arranged into their proper classes, according to their natural agreements; and, of these classes, the smaller the number, the easier and plainer will be the whole method. These natural families can be only founded on essential characters, and, in the quadruped kingdom, they are to be taken either from the figures of the hoofs or claws, or from the teeth. In birds, the figure and proportion of the beak is a very proper character; and, in fishes, the figure of the head, and the situation of the tail, are to be considered, and are stable and essential characters. The whole animal world may easily be thus reduced to families, and from these two classes, genera and species, the study of nature rendered much more regular and easy, than it can be by any artificia ldivisions. *Linnæi Faun. Suec. Artedi Ichthyolog.*

FARM (*Dict.*)—It is commonly allowed that a Farm should make

make three rents, as they exprefs it; one for the landlord, one for the charges, and one for the farmer to live upon; but it is very feldom that a Farm will conftantly do this, or is to be maintained at that charge. In a Farm of one hundred pounds a year, if the land is worth twenty fhillings an acre, a hundred pound may defray the charges of it; but, if in a Farm of the fame rent the land be worth but ten fhillings an acre, a hundred and thirty pounds a year muft be allowed for the charges of this, or nearly fo; and two hundred and fifty acres of fuch land muft be reckoned to a farm of a hundred pounds a year, or elfe the farmer will be ruined, if it be not very improveable land.

FAST *Ground*, or *Faft country*, a term ufed by fome of our miners to exprefs what other call the fhelf. In digging, they frequently, after the paffing the feveral ftrata, which have been difturbed, and give proofs of having been toffed about in the water by their irregularity, meet with plain, firm, regular, and folid ftrata, which evidently fhew that they have undergone no change fince their original formation and inftitution. The workmen, who are very good philofophers in this refpect, affign the different ftructure, they thus find in the upper and lower ftrata of the earth, to its juft caufe, that is, the deluge; and determine, that all they find irregular has been wafhed up, and depofited there again in the time of that cataftrophe, but that the fhelf or Faft country is in its natural ftate and pofition. They obferve, in favour of this opinion, that their loads of ore run very irregularly in the irregular ftrata, but fo much more regularly in the fhelf or Faft ground. *Phil. Tranf.* N°. 69.

FA'THER-*Lafher*, in ichthyology, an Englifh name given to a fifh, called by fome authors, though improperly, fcorpæna, and fcorpius marinus. It is properly of the cottus kind, and is named by Artedi, the fmooth cottus without fcales, with feveral fpines upon the head, and with the upper jaw a little longer than the under. It more refembles the fmall fifh we call the bull-head or miller's thumb, than the fcorpæna. *Arted. Gen. Pifc.*

FA'TTENING *of horfes*. The being able to do this fpeedily is one of the greateft arts our dealers have, and indeed one of the greateft niceties of the whole management of that creature. Many methods have been prefcribed, but the following feems moft to be depended on: take elecampane, cimmun feed, tamarifk, and anifeed, of each two ounces; common groundfel, one handful. Boil all thefe very well, with two handfuls of garlic fcraped and cleaned, in a gallon of good ale; ftrain the liquor well off, and give the horfe a quart of it every morning made hot; keep him warm after it. After he has taken this for four or five mornings, he may be turned out to grafs, or kept in the houfe, as the feafon will permit. But, whenever provender is given him, a quantity of a powder is to be prepared of equal parts of cummin feeds and elecampane, and give him half an ounce of it every time, fprinkling it in by degrees, as he eats, that he may not naufeate the whole.

If this method does not fucceed in a fhort time, then take two fpoonfuls of diapente; brew it in a pint of fweet wine, and give it the horfe for three mornings. This will take off any inward ficknefs, and make the other things take effect. After this, feed him with good provender three times a day, that is, after his watering in the morning, after his watering in the evening, and at nine o'clock at night. If he does not eat the provender well and freely, it muft be changed for fome other kind.

If all this does not fucceed, let the horfe be blooded; and then take half a bufhel of coarfe barley meal, put it into a pail full of water, and ftir the whole together very well; then let it fettle by ftanding. Pour off the clear liquor into another veffel, and let him drink it for his common drink, and eat the remainder which falls to the bottom of the pail. If he refufe to eat this alone, there may be fome bran mixed among it. This fhould be given him three times a day, morning, noon, and night. If he does not rightly take to the meal with the bran, fome oats muft be mixed with it, and this will readily bring him to feed on it. But, which ever way is ufed, they muft be by degrees diminifhed in quantity, till at length he is brought to eat the meal alone; for that is the thing that muft fatten him up. Care muft be taken that the barley is ground frefh every day, as it is ufed, for it quickly grows four; and, when this has once been the cafe with one parcel, no art will ever bring the horfe to touch any of it afterwards. Scarce any horfe but will be well fattened by keeping him to this diet for about 20 days. Barley ground in this manner cools and purges the creature; but the greateft efficacy, as to the Fattening him, lies in the water, which by this management takes up all the rich part of the barley into itfelf. When the horfe grows lufty on this diet, it muft be taken from him by degrees, giving him at firft oats once, and barley-meal twice a day; and then oats twice, and the barley-meal once, till he is perfectly weaned from it. In the mean time, he muft have good hay, and he muft not be rid; only it will be proper to walk him gently about an hour or two in the heat of the day. If it be found that the horfe wants a good fmart purging during the time of his continuing in the barely diet, the beft time to give it him, is after the firft eight days, and the following is a very proper fort of phyfic: take of the fineft aloes one ounce, agaric in powder half an ounce, and powder of florentine orris one ounce. Let all thefe be mixed together, and put into a quart of milk warm from the cow. This will work very brifkly; and, after it is over, the ufual diet is to be continued. If horfes of value were to be kept to this diet once a year, it would make them lefs hot and dry, and not fubject to many difeafes which they are troubled with at prefent, and would be particularly ufeful after campaigns and long journies. If the horfe lofes his appetite by this diet, it will be proper to tie a chewing ball to his bit, renewing it fo often, till at length he begins to feed heartily on the barley; for thefe balls at once reftore appetite, and are themfelves of a Fattening nature. *Mortimer's Hufbandry.*

FAVORI'TO, in the Italian mufic, is an epithet given to fuch parts of any compofition as are performed to the greateft advantage. Thus, choro Favorito is a chorus in which are employed the beft voices and inftruments to fing the recitativo's, play the ritornellos', &c. This is otherwife called the little chorus, or choro recitante. *Broff. Muf. Dict.*

FAU'SSE *Chenille*, in natural hiftory, a term ufed by Mr. Reaumur, and others of the French writers, to exprefs a large clafs of worms produced from the eggs of feveral fpecies of four-winged flies.

The Fauffe chenilles are a clafs of animals almoft as numerous as the caterpillar. They are eafily diftinguifhed into feveral genera, according to the different numbers of legs, as thofe with eighteen legs, thofe with twenty, twenty-two, and twenty-four. The Fauffe chenille of the alliaria is of this laft kind. They are of feveral colours, in the different kinds; fome are white, fome brown, others black, but the greateft number of all are green. There are many of a flate colour, or bluifh black variegated with ftreaks and fpots of brown, and other colours. And, befide thefe, there are others variegated on feveral other grounds; in general, however, they are much inferior in beauty to the caterpillars. The colours of thefe infects are however very indiftinct marks to difcern them by, fince they are not permanent, but the creature varies them at different times of its life. Thefe infects, like the true caterpillars, change their fkin feveral times in their lives, and with it they change their colours alfo. The young ones of thefe animals are always much more handfome than thofe more grown; for, at every change of the fkin, there is a lofs of fome of the variegations; and ufually at the laft change they are all gone, and the creature puts on a colour different from any that it had before. This is an obfervation of the accurate Vallifnieri, who gives an inftance of it in a worm caterpillar of the elder. This creature, while young, is of a fine green, with a long ftreak of brown running all the way down the back; but, after the laft change of its fkin, it appears without the ftreak, and all over of a pale yellowifh hue.

Thefe creatures differ from the common caterpillars in their manner of remaining on the leaves of a plant. The caterpillar is always extended at its full length, whether it is eating or not; but the Fauffe chenille, though it extends its body to the full length while eating, always rolls it up into a fpiral when at reft, making feveral circular turns with it, of which the head is at the end of the outermoft, and the tail in the very center of the inner one. They give themfelves various odd contortions, when they are feizing on their food; and it is a very whimfical fight to obferve twenty or thirty of them, in thofe kinds which live in fociety, attacking the different portions of the fame leaf all at once, and each giving its body fome odd turn at the fame time. This is a common fight on the leaves of the ofier; a whitifh green kind being very frequent in large companies on that tree, and often feen thus feeding in covies. It is remarkable, that, as the caterpillar feeds indifferently on every part of the leaf, this animal ufually attacks only the edges. Some fpecies of thefe animals feed only early in the morning, and, as the leaves are then wetted with the dew, they cannot avoid taking in a large quantity of water with their food; in confequence of which, when they are examined afterwards, their bodies are frequently found covered with drops of a thick and vifcous matter of an ill fmell. It feems probable, that the abundant aqueous matter in this cafe finds its way out at thofe numberlefs apertures in the fkin, at which the creature takes in the air: thefe infects, as well as the caterpillars, having very numerous tracheæ.

The generality of the animals of this clafs feed on the leaves of plants and trees, but there are fome which affect other parts of them. There are a fmall fpecies very frequently found living within the young branches of the rofe-tree, which often deftroy that part of the fhrub. Others are found lodged in young pears, apples, and other fruit: They feem to have been placed there, when very young, and always deftroy the fruit, occafioning its falling off from the ftalk before half grown. Some fpecies of them are alfo found on the leaves of trees, which are rendered tumid, and make what are called leaf galls, thefe being often inhabited by animals of this clafs, in particular the leaf galls of the willow. The creature, when it finds the time of its change into the nymph ftate approaching, gives itfelf the trouble of forming a cafe in which it may pafs into that ftate, and remain in it during the deftined time, without being fubject to external injuries. It fpins a web of filk for this purpofe of the fhape of a little egg. This on the outfide fhews nothing remarkable, but when cut open, it is found to be compofed of two different fubftances, at leaft of two fubftances of very different workmanship, though the materials are the same in both. The outer case is reticulated, and formed of very strong threads wove into a loose open net work; but the inner one is formed of extremely fine threads, and those wove into a closer stuff than all that the loom can come up to. The outer strong and coarse web was plainly intended for no other purpose, but for the better defending and preserving them from injuries. And these two distinct cases do not any where adhere to one another, but barely touch; so that, on pulling asunder the outer one between the fingers, the inner one comes out whole. The strength of this exterior shell is extremely necessary, as also the close texture of the inner one, for the defending the inclosed animal in the nymph state from several devouring insects. The ants, in particular, are very fond of these nymphs, and will hunt out the cases wherever they are to be found; and, if they can eat their way through them, are sure to make a meal of the inclosed creature.

The rose worm, or Fausse chenille, is very singular in the manner of its performing this great work. This is a small greenish species often found on the leaves of the rose, and famous for the various odd attitudes into which it twists its body occasionally. It usually carries its tail erect, and often in the shape of the letter S. This species, though green on the sides and belly, is yellowish on the back, variegated with several specks of black or deep brown, from each of which there grows a long hair. This creature, when the time of feeding is over, goes into the ground, in order to spin its double web. The external one is of a reddish brown, and the internal one whitish. These when taken out of the earth are usually fouled with small particles of dirt, so that, to have them in perfection, it is best to keep the animal in a box, where it will spin them perfectly clear. There are some species of this animal that hide themselves in the holes of trees, and in the cavities between the bark and the wood; and these never spin any outer web, but are found inclosed in the fine thin internal one alone. They all, after having passed a proper time in this state, some only a few weeks, others a whole winter, become four-winged flies. The flies produced of these insects are of that kind which have no trunk, but have a strong tooth on each side of the head, which, meeting one with the other in the middle of the mouth, are able to cut any thing to pieces that the creature has occasion to make its way through. The first use of these is the eating a hole through the double web, in which the creature finds itself inclosed at its birth. All the flies of this kind have a general resemblance one to another, and may be known to belong to the same family, though they are very different in colour, and other obvious characters. They are never very handsome, and are all as it were stupid, having very little motion, and standing readily at any time to be caught between the fingers. Their wings always are crossed over the body, and form a sort of raised covering over it; they are not smooth and even, as those of most other flies, but have prominencies and cavities, and seem as if they had been but ill expanded, at the time of the creature's hatching from the nymph state. *Reaumur's Hist. Inf.*

FEE'DING *of fish.* The owner of fish-ponds will find this an article very worthy of his consideration, as the trouble or expence of it are very little, and the profit very great. In a stew, thirty or forty carps may be kept up from October to March, without any other food than what they will find there for themselves. And, by fishing with trammels or flies, it will be proper in March or April to take, from the larger waters, some to replenish the stews; but after this, from March to October, it is necessary to feed them as much as to feed chickens that are cooped up, and it will turn to as good account. The care of doing this is best committed to the gardener, who is always at hand and on the spot; for the regular serving them is of the utmost consequence.

Any sort of grain is good to feed them with, especially pease and malt coarse ground, and grains after brewing, while they are fresh and sweet, are very proper; but it is to be observed, that that one bushel of malt, not brewed, will go as far as two bushels of grains. Chippings or raspings of bread steeped in the droppings of malt liquors, especially of ale, are very good for carp. The quantity of these should be about two quarts a day to thirty carps; and it is better to have it given twice a day, that is, morning and evening, than all at once. Pease or other seeds or grains, boiled and prepared for the food of carp, may be let down into the water on a square board like a trencher, supported by four strings, one at each corner, and with some leads fastened to its bottom to sink it a proper depth; it is to be supported by a pole or otherwise, and it is a very entertaining sight to observe the manner in which they will come all about it, and take off their food.

When large ponds which contain great numbers of fish are to be fed in this manner, it will be some expence to the owner; but on taking out the fish, and observing how they thrive by it, this will be easily borne with.

Grains are the cheapest and most staunch food that can be procured for fish, and, where breweries are near, they are easily had, but even in country places it will be easy to agree with the neighbouring families, who brew, to throw their grains into the pond at a certain price. Carp and tench will be fed like fowls in this manner. Pike also may be fed with eels to fatten them quickly, and with any other fish at other times. Pearch are not at all proper for this sort of management.

FEE'LERS, *antennæ*, in natural history, are the horns, as they are usually called, upon the heads of insects.

FELLI'NG *of timber.* Many circumstances are well known and constantly observed in the Felling of timber for building, which though, to a hasty observer, they might appear trifling, yet prove, on experience, to be of the utmost consequence. One thing observed by Mr. De Buffon, which very greatly increases the solidity and strength of timber, is that the trees, intended to be felled for service, should first be stripped round of their bark, and suffered to stand and die upon the spot before the cutting. The sappy part, or blea of the oak, becomes by this management as hard and firm as the heart, and the real strength and density of the wood has been proved, by many experiments, to be greatly increased by it; nor is this a practice of any detriment to the proprietor, since the remaining stumps of these trees send up their young shoots as vigorously, as if they had been cut down in their natural condition. *Memoires de l' Acad. Scienc. Par.*

When any tree is to be cut down for timber, the first thing to be taken care of is a skilful disbranching such limbs as may endanger it in its fall. Many trees are utterly spoiled for want of a previous care of this kind. In arms of timber that are very great, it is always necessary to chop or sink in them close to the bole, and then, meeting it with downright strokes, it will be severed from the tree without splitting. In Felling the tree, take care always to cut it as close to the ground as possible, unless it is intended to be grubled up; and the doing this is of advantage both to the timber, and to the wood; for timber is never so much valued, if it be known to grow out of old stocks. When an oak is down, the bark is to be stripped off, and set so that it may dry well. Trees that are nine inches girt about a yard from the ground, are commonly reckoned timber trees; but none under this size, because such will be about six inches girt in the girting-place, when the bark is off: the knowledge of this will save the trouble of climbing up to measure them.

The common method of felling timber is as it stands, but the feller is liable to great cheat and imposition in this respect. It is sold either by the load or ton; forty feet is reckoned a ton in some places, and fifty a load; and in others fifty in the ton, and the load is but forty; so that whoever sells timber standing, should mention how many feet he means in the ton or load. The trees, when felled, are measured either by girth or square measure; it is usually reckoned, that forty feet of round timber, or fifty feet of hewn or square timber, weigh the same, that is, twenty-hundred. And this is usually counted a cart load; and, as they seldom strip the bark off from elm, the buyer commonly allows an inch for the bark, which is a great deal more than it comes to; and therefore, if the owner can strip off the bark in the measuring-place, which should be about the middle of the tree, it will be much the better.

Some allow four feet out of every load for ash, and five feet for oak and elm; and, as for the computation of the feet, if it is square measure, the square is taken by a pair of callipers, or by two rules clapped to the side of the tree, measuring the distance between them, and, if the sides are unequal, they add them together, and take half the sum, which they account the true side of the square.

If girth measure be used, they do it by girting the middle of the body of the tree with a line, and taking a quarter part of this girt for the square, measuring the length from the butt end so far forwards, till the tree comes to be but six inches in the girth, that is, twenty-four inches in circumference; and, if the trees have any great boughs which are timber, that is, which hold six inches girth, they measure them by themselves, and then add them to the whole. For the casting up the contents of this, they make use of Gunter's line, upon which, if a pair of compasses be extended from twelve to the number of inches contained in the square, they place one foot of the compasses at the length, and keep the same extent with them; if the square is under twelve inches, the compasses are to be returned twice from twelve, and it will shew the contents. This is the common practice of measuring, and therefore the seller must generally acquiesce in it; it is a very false way, being almost one fifth part less than the whole. *Mortimer's Husbandry.*

FEN *(Dict.)* — What the farmers call Fens or fenny-lands are of two kinds. First, those which are only drowned by upland floods and great rains, and are very large and lie upon the levels, so that the water cannot run off from them, but must be there till the hot weather and winds dry it off: and, secondly, those that are constantly wet, only that in dry times they are shallower covered with water than in others. In draining of these sorts of lands, which is the only means of making them useful to the world, two things are to be considered: first, the laying them perfectly dry, which can only be effected by the making cuts and drains for the carrying off the water from their lowest parts, and thence from the whole; or, secondly, the taking off from the great additional wetting they have from land floods, and long continued rains. The first method makes a perfect cure; the other is only a temporary relief, and makes the lands more serviceable in dry times, and leaves less for the sun to dry up.

Whatever is attempted in regard to the draining of Fens, the lowest

lowest part of the ground is to be found out first, and the overflowing from great rains, and from land-floods, must be provided for, in the carrying off that way; for, should this be neglected, all the labour and cost employed on the other principle would be thrown away. If it is found that this can be done, there must be afterwards be cut a large drain through the middle of the land, and several smaller drains communicating with this.

The great drain must be dug deep enough to drain the whole level, and this, and all the others, must be made the narrowest at the head, and wider all the way to the mouth, where it must be widest of all.

These drains must be all well cleansed from mud and weeds every spring and autumn, and the water from land-floods must be kept from coming in upon these lands, as much as possible, that there may be the less to be drained off; the lower edges of the Fen-land must be for this purpose guarded with banks to turn the water into other channels. In Essex, they have many lands that lie below the high-water mark, and are above the low-water mark, and have land-floods or fleets running through them, which make a sort of small creek. These lands they have a very easy way of draining, though they are naturally very moist, when they first inclose them from the sea; they do it with a bank, which they extend from one side of the land they design to take in to the other, excepting a space that they leave, where the creek or land-floods run into the sea. They then prepare a wooden frame, well planked and of a considerable thickness, fitted to the head of the creek, and capable of shutting it wholly up; in this frame they make several holes, in which are placed wooden troughs, made each of four boards, and suited in size and number to the quantity of water that is to be discharged through them from the land-floods. Each of these trunks is open towards the creek, but on the sea-side it has a door or flap, which opens when the land-flood presses against it, and gives it free passage out; but, when the sea-water is risen to the height of it and presses it, it is shut by the force, and no sea water is let in. When this head is prepared, they let it in, and, stopping up the whole creek, they continue the banks on each side till they meet it: thus all the land-floods are let out at low water, and not a drop of sea water can be admitted, so that the lands are kept dry and useful, which were before rendered useless, by being drowned with salt water at every high-water mark. The fresh water of the creek is thus kept unmixed with the sea water, and therefore affords good drink for the cattle, which is commonly very difficult to be had in this sort of lands, the tides spoiling what fresh waters there are, every time they come up. *Mortimer's Husbandry.*

The wet grounds called Fens in Lincolnshire and elsewhere in England, bring many advantages to the inhabitants of those countries. Fowl and fish are very plentiful in them. The pike and eels are large and easily caught, but they are usually coarse. The duck, mallard, and tail are in such plenty, as is scarce to be conceived; they are taken in decoys, by prodigious flocks at a time. They send these fowl to London from Lincolnshire, twice a week on horse-back, from Michaelmas to Lady-day, and one decoy will furnish twenty dozen, or more, twice a week, for the whole season, in this manner. The decoy-men contract with the people who bring them to London at a certain rate, and they are obliged to take the whole number that is catched off their hands. Two teal are usually reckoned equal to one duck, and six ducks and twelve teal are accounted a dozen of wild-fowl; and the usual market price is about nine shillings, for such a dozen. About Midsummer, when the moulting season is, a great number are destroyed also by the people of the neighbourhoods. The poor birds at this time are neither able to swim nor to fly well; and the people going in with boats among the reeds, where they lie, beat them down with long poles.

A little before Michaelmas, vast flights of these birds arrive at the decoys from other places; they soon grow fat in them, and continue there a prey to the masters or owners, as long as the decoys are unfrozen; but, when they are iced over, they fly away again, and go to the neighbouring seas for food. *Philos. Trans.* N°. 223.

The Fens also abound in a sort of herbage that is very nourishing to cattle: sheep and horses always grow fat upon it. These Fens are common, and the owners of cattle mark them, that they may be known. It is remarkable, that, though all is open, the cattle, used to one particular spot of ground, seldom leave it, but the owner may find them always in or near the same place. The Fens have many large and deep drains. In these the pike and eels grow to a vast size; and they are full of geese which feed on the grass, but these eat rank and muddy, and may even be smelt, as soon as a person comes into a room where they are roasting. But the people have another very great advantage in these, beside the eating them, that is, their feathers and quills; and the produce of these is so great, that the Custom-house books in the town of Boston shew, that there are frequently sent away, in one year, three-hundred bags of feathers, each bag containing a hundred and a half weight. Each pound of feathers brings in the owner two-pence, and it may be thought strange by people unacquainted with these things, but it is a certain truth, that the owners pull them five or six times a year for their feathers, and three times for their quills. Each pulling comes to about a pound, and many people have a thousand geese at a time, or more. They are kept at no charge, except in deep snowy weather, when they are obliged to feed them with corn.

FENCES, in gardening. — In hotter climates than England, where they have not occasion for walls to ripen their fruit, their gardens lie open, where they can have a water Fence, and prospects; or else they bound their gardens with groves, in which are fountains, walks, &c. which are much more pleasing to the sight than a dead wall: but in colder countries, and in England, we are obliged to have walls to shelter and ripen our fruit, although they take away much from the pleasant prospect of the garden.

Since therefore we are under a necessity to have walls to secure our gardens from the injury of winds, as well as for the conveniency of partitions or inclosures, and also to ripen our fruit, brick walls are accounted the best and warmest for fruit: and these walls, being built panel-wise, with pillars at equal distances, will save a great deal of charge, in that the walls may be built thinner, than if they were built plain without these panels; for then it would be necessary to build them thicker everywhere: and, besides, these panels make the walls look the handsomer.

Stone walls are to be preferred to those of brick, especially those of square hewn stones. Those that are made of rough stones, though they are very dry and warm, yet, by reason of their unevenness, are inconvenient, to nail up trees to, except pieces of timber be laid in them, here and there, for that purpose.

But in large gardens it is better to have the prospect open to the pleasure garden; which should be surrounded with a fosse, that from the garden the adjacent country may be viewed; but this must depend on the situation of the place: for, if the prospect from the garden is not good, it had better be shut out from the sight by a wall, or any other Fence, than to be open. As also, when a garden lies near a populous town, and the adjoining grounds are open to the inhabitants; if the garden is open, there will be no walking there in good weather, without being exposed to the views of all passengers; which is very disagreeable.

Where the fosses are made round a garden which is situated in a park, they are extremely proper; because hereby the prospect of the park will be obtained in the garden; which renders those gardens much more agreeable than those which are confined.

In the making these fosses there have been many inventions; but, upon the whole, I have not seen any which are in all respects preferable to those which have an upright wall next the garden; which (where the soil will admit of a deep trench) should be five or six feet high; and, from the foot of this wall, the ground on the outside should rise with a gradual easy slope to the distance of eighteen or twenty feet; and where it can be allowed, if it slopes much farther, it will be easier, and less perceptible; as a ditch to the eye, when viewed at a distance. But, if the ground is naturally wet, so as not to admit a deep fosse, then, in order to make a Fence against cattle, if the wall be four feet high, and slight posts of three feet high are placed just behind the wall, with a small chain carried on from post to post, no cattle or deer will ever attempt to jump against it: therefore it will be a secure Fence against them; and, if these are painted green, they will not be discerned at a distance, and at the same time the chain will secure persons walking in the garden from tumbling over.

In such places where there are no good prospects to be obtained from a garden, it is common to make the inclosure of park paleing; which, if well performed, will last many years, and has a much better appearance than a wall: and this pale may be hid from the sight within, by plantations of shrubs and ever-greens; or there may be a quick hedge planted within the pale, which may be trained up, so as to be an excellent Fence by the time the pales begin to decay.

There are some persons who make stuckade Fences round their gardens to keep out cattle, &c. which, when well made, will answer the purpose of Fences; but this being very expensive in the making, and not of very long duration, has occasioned their not being more commonly in use.

As to Fences round parks, they are generally of paling; which, if well made of winter-fallen oak, will last many years; but a principal thing to be observed, in making these pales, is not to make them too heavy; for, when they are so, their own weight will cause them to decay; therefore, the pales should be cleft thin, and the rails should be cut triangular, to prevent the wet lodging upon them; and the posts should be good, and not placed too far asunder. If these things are observed, one of these pales will last, with a little care, upwards of forty years very well. The common way of making these Fences is, to have every other pale nine or ten inches above the intermediate ones; so that the Fence may be six feet and a half high, which is enough for fallow deer; but, where there are red deer, the Fence should be one foot higher, otherwise they will leap over.

Some inclose their parks with brick walls; and, in countries where stone is cheap, the walls are built with this material; some with, and others without mortar.

A kitchen garden, if rightly contrived, will contain walling enough to afford a supply of such fruits as require the assistance of walls, for any family; and this garden, being situated on one side, and quite out of sight of the house, may be surrounded with walls; which will screen the kitchen garden from the sight of persons in the pleasure garden; and, being locked up, the fruit will be much better preserved than it can be in the public garden: and the having too great a quantity of walling is often the occasion that so many scandalous trees are frequently to be seen in large gardens, where there is not due care observed in their management.

The height of garden walls should be twelve feet; which is a moderate proportion; and, if the soil be good, it may in time be well furnished with bearing wood in every part, especially that part planted with pears, notwithstanding the branches being trained horizontally from the bottom of the walls.

I would recommend the white thorn, the holly, the black thorn, and crab, for outward Fences to a good ground: but I do not approve of the intermixing them.

The white thorn is the best quick to plant; because it is the most common, and may be clipped so as to render it the closest and the hardiest Fence of any other tree; and, being very durable, is preferred to all others for outward Fences; or, for the division of fields, where they are exposed to cattle, &c.

The black thorn, and crabs, make very good Fences, and are to be raised as the white thorn: but, if the kernels of apples or crabs be sown, it is best to sow the pommace with them, and they will come up the sooner, i. e. the first year.

If crab stocks be planted, while young, in the same manner as quick, they make excellent hedges; and so will some sorts of plums.

The holly will make an excellent Fence, and is preferable to all the rest; but it is difficult to be made to grow at first, and is a slow grower; but when once it does grow, it makes amends by its height, strength, and thickness. *Miller's Gard. Dict.*

FENCES, in agriculture. — The inclosures of grounds are in some places made by ditches full of water, and others by walls either of stones alone, or of stones and earth. Where these materials are in plenty, they make very good Fences, but in other places, the common method is by quick hedges. To raise them, a ditch is dug and a bank thrown up, and on this young trees are regularly planted. The white thorn is the best of all trees to plant for a Fence, being a tolerable quick grower, and lasting a long time, and making a very handsome Fence. It will succeed on any soil where a ditch and new bank are made, except it be wholly of gravel or sand; and even in this case it will thrive, if there happen a rainy season after the planting of it.

Some raise it by seeds, and others by young plants; the latter is the most expeditious way, for the seeds lie two years in the ground before they shoot, but they grow very fast after two or three years. Some prepare the haws, or fruit of the white thorn, by tying them up in a hair bag, and soaking them all winter; after this, if they are sown in February or March, they will come up the first year, and grow better than any other way.

Where sets are scarce, it is a good way, when the underwoods are felled, or rather the year before, to sow haws and sloes in them, and they will furnish a supply of young plants for hedges, without doing the woods any harm, because they may be drawn before they come to be too large. The white thorn is also of considerable value in some sort of works; its root becomes very beautifully veined, when old, and elegant boxes and combs are made of it. It is used by some also, in the business of inlaying, and would be more so, if its beauty were more known.

The crab and the sloe tree, or black thorn, come next in value to the white thorn, for quicks for Fences. *Mortimer's Husbandry.*

FERMENTATION (*Dict.*)—Fermentation under the hands of the distiller differs from the common, which is used in the making of profitable malt liquors and wines, as being much more violent, tumultuary, active, and combinatory than that. A large quantity of ferment or yeast is here added, the free air is admitted, and every thing contrived to quicken the operation; whence it is sometimes precipitately finished in the space of two or three days.

This great dispatch has its great inconveniences with regard to the spirit, which hence becomes not only fouler, or much more gross and really terrestrial, than if the liquor had been slowly fermented; but also suffers a diminution in its quantity, from the violent and tumultuary admission, conflict, and constant agitation of the free air in the body, and upon the surface of the liquor; especially if not immediately committed to the still, as soon as the Fermentation is fairly slackened or fully ended.

It is a difficult task to render the business of Fermentation at once perfect and advantageous. To ferment in perfection of necessity requires length of time, proper attendance, and close vessels; besides several particular encheireses and contrivances, which one cannot reasonably expect should be received and practised in the large way of business, on account of the charge: unless it could be made appear, as there is some reason to suspect it may, that the increase in the quantity of spirit (not now to mention the improvement of its quality) might be brought to pay the additional expence: but it requires farther experience to reduce the thing to a certainty. In the mean time, it may not be amiss to try how much of the more perfect art of vinous Fermentation is profitably practicable by the distiller, in the present circumstance of things.

The improvements to be made in this affair will principally regard, (1.) 'The preparation or previous disposition of the fermentable liquor. (2.) The additions tending to the general, or some particular end. (3.) The admission or exclusion of the air. (4.) The regulation of the external heat or cold. And (5.) A suitable degree of rest at last'. When proper regard is had to these particulars, the liquor will have its due course of Fermentation, and thence become fit to yield a pure and copious inflammable spirit by distillation.

It has been long known, that the tincture, solution, or liquor, designed for Fermentation and the still, should be made thin, or very considerably aqueous; as this property not only fits it to ferment readily, but also to yield more of a pure vinous spirit in proportion, and part with it easier in distillation, than if it were richer, more glutinous, or clammy: the gross, foul, viscid, and earthy particles of such glutinous liquors being after Fermentation apt to rise with the boiling heat employed to raise the spirit, which thus of course comes over foul and fœtid. There is another advantage attending this thinness of the liquor, viz. that it will the sooner fall fine, by standing, before Fermentation: whence it may be commodiously drawn off from its fæces, or bottom; which must always, in case of corn, malt, or other mealy substances, be kept out, where the purity of the spirit is consulted.

A certain degree of warmth seems requisite, in the northern climates, to all artificial liquors intended for immediate Fermentation, especially in the winter: but the natural juices of vegetables that have never been inspissated, as that of grapes, and other fruits, when fully ripened, will usually ferment as soon as they are expressed, without any external assistance. But as a certain degree of inspissation prevents all tendency to Fermentation in vegetable juices, otherwise strongly disposed to ferment; so a long continuance or increase of the inspissating heat, especially if it acts immediately, through a metalline or solid body, upon the juice, will destroy its fermenting property; and this the more effectually, as the heat employed approaches to that of scorching, or the degree capable of giving an empyreuma. After the same manner, several experiments make it appear, that there is a certain degree of heat; the continuance, or least increase whereof, proves detrimental, or destructive to Fermentation; as there is another that wonderfully encourages and promotes it. These two degrees of heat ought to be carefully noted and settled by the thermometer, or other more certain method, for philosophical and chemical uses; but for common or œconomical occasions, they may be limited to what we usually understand by a tepid and a fervid heat: a fervid heat is the bane of all vinous Fermentation; as a tepid one, or rather an imperceptible warmth, is the great promoter thereof. In this neutral state therefore, with proper contrivances to preserve and continue it, the liquor is to be put into a suitable vessel for Fermentation; at which time, if it work not of itself, it must be quickened by additions; and, in general, by such things as are properly called ferments.

By ferments is here meant any matter, which, put to a rightly disposed fermentable liquor, will cause it to ferment much sooner and faster, than it would of itself; and thus greatly shorten the operation. Those are called ferments in an abusive sense, which, when added to the fermentable liquor, only correct some fault therein, and thereby fit it to ferment the better, yield the more spirit, or give some particular flavour.

The primary use of ferments, therefore, is to save time, and make dispatch in business, whilst they only occasionally and accidentally give a flavour, or increase the quantity of spirit. And, accordingly, all fermentable liquors may, without the least addition, and only by a proper management of heat, be brought to ferment, more perfectly, though more slowly, than with the assistance of ferments.

These ferments, in general, are the flowers and fæces of all fermentable liquors, generated and thrown up, or deposited, either in the Fermentation itself, or after the operation is finished.

There are two of these procurable in large quantities, and at a moderate expence, viz. beer-yeast and wine-lees; a prudent and artificial management, or use whereof, might render the business of distillation much more facile, certain, and advantageous. It has been esteemed a considerable difficulty and discouragement, in this business, to procure a sufficient stock of these materials, and preserve them, at all times, ready for use. Hence, some have been driven to invent artificial ferments, or to form mixtures, or compounds of particular fermentable ingredients, but with no great success: these usually falling short in their effects, even in comparison of bakers leaven. And indeed whoever has any talent at experiment, in this way, will soon find it much easier, cheaper, and better, in all respects, to preserve the usual and natural ferments, or raise nurseries thereof, than to invent artificial compositions, or good serviceable substitutes for them.

That common yeast may be preserved fresh and perfect, for several months, is matter of experience; and necessity has put people

people upon inventing ſeveral expedients for the purpoſe. The foundation of the thing reſts wholly in dextrouſly freeing the matter of its ſuperfluous moiſture, and bringing it out of a ſemi-fluid ſtate, wherein it is always expoſed to a farther Fermentation, or deſtructive alteration; and thus of courſe runs into what is vulgarly called corruption: at which time, it becomes intolerably fœtid and cadaverous. The method of drying it in the air is ſubject to great inconveniencies, and requires the due obſervance of ſeveral circumſtances, and particular encheireſes, to render it perfect and effectual. The beſt way, in all reſpects, is ſlowly and gradually to preſs it, in a thick, cloſe, and ſtrong canvas bag, after the manner of wine-lees, by the tail-preſs, till at length it comes into a kind of cake; which, though ſoft, will eaſily ſnap, or break dry and brittle betwixt the fingers. And in this ſtate, being well packed up, or cloſely ſecured in a tight caſk, it will long keep uncorrupted, fragrant, and fit for the fineſt uſes.

The ſame method is likewiſe practicable to the ſame advantage in the flowers or yeaſt of wine; which may thus be commodiouſly received from abroad. Or, in defect of theſe flowers, others of equal goodneſs may be raiſed from freſh wine-lees barely by mixing, and ſtirring them into a proper warm liquor: whence the lighter, or more moveable and active parts of the lee, will be thrown to the top, and may be taken off, and preſerved, as above-mentioned, in any quantity that ſhall be deſired.

And hence a facile method of raiſing an inexhauſtible fund, or perpetual ſupply, of the moſt uſeful ferments, may be readily formed, in the way of ſucceſſive generation; ſo as to cut off all future occaſion of complaint, for want of them, in the buſineſs of diſtillation.

It muſt be obſerved, that all ferments abound in eſſential oil, much more than the liquors that produce them; whence they very ſtrongly retain the particular ſcent and flavour of the ſubject. It is therefore requiſite, before the ferment is applied, to conſider what flavour ought to be introduced, or what ſpecies of ferment is beſt ſuited to the liquor. The alteration thus cauſed by ferments is ſo conſiderable, as to determine, or bring over any neutral fermentable liquor, to be of the ſame ſpecies with that which yielded the ferment: which is an obſervation of greater moment, than will preſently be conceived; as opening not only a new ſcene in the buſineſs of diſtillation, but alſo ſome other buſineſſes depending upon Fermentation. The benefit of it does not, however, extend to malt, treated in the common way; nor to any other ſubject but what affords a ſpirit tolerably pure and taſteleſs: as it otherwiſe makes not a ſimple, pure and uniform, but a compound, mixed, and unnatural flavour. How far the fine-ſtiller may apply it, well deſerves his conſideration; and whether our native cyder-ſpirit, crab-ſpirit, &c. which have little flavour of their own, may not, by this artifice, or a little farther improvement of it, be brought nearly, or intirely into the ſtate of ſome highly eſteemed foreign brandies, is recommended to experience.

When the proper ferment is thus pitched upon, ſuitable to the deſign; its quantity, quality, and manner of application, are next to be conſidered.

Its quantity muſt be proportioned to that of the liquor, its tenacity, the degree of flavour it is intended to give, and the diſpatch required in the operation; from which conſiderations, every one will form a rule to himſelf: but, till ſuch a rule is obtained, or in order to obtain it, proper trial will ſhew how much ſuffices for the purpoſe; beginning with a little, and obſerving to add more occaſionally; the weight of the whole being noted before-hand. Treacle is found to require a large proportion of ferment, and even ſometimes needs the aſſiſtance of other additions. Indeed, the manner wherein this inſpiſſated juice is obtained, tends greatly to unfit it for Fermentation. The ſtrength, long continuance, and almoſt immediate contact of the fire in ſugar-making and refining, and the frequent uſe of lime, or other alkaline or terreſtrial bodies, ſo condenſe, indurate, and ſcorch the body of this juice, and abſorb its acid, that one would ſcarce expect it ſhould ferment at all, even with the addition of jalap, or other powerful, ſaline, and acid, or acrid ſtimulators, which tend to break the viſcous and aduſt connexion, or ſtrong combination of its particles.

More circumſpection is neceſſary, with regard to the quality of the ferment, if a pure ſpirit be required; for, in caſe of the leaſt muſtineſs, or corruption, which all ferments have a ſtrong and natural tendency to, unleſs carefully cured and preſerved, it may deeply impreſs itſelf, and communicate a finewy or fœtid, nauſeous and cadaverous ſmell and taſte to the whole body of the liquor and ſpirit. Great care is therefore required, that the ferment be perfectly freſh and fragrant, nor in the leaſt inclinable to acidity, or eagerneſs; which might prevent its riſing, or forming a head, and give the liquor an acetous, inſtead of a vinous tendency.

When thus the proper quantity of a good-conditioned and ſuitable ferment is got ready, it muſt be put to the fermentable liquor in the bare tepid, or ſcarce luke-warm ſtate above-mentioned. The beſt manner of bringing them together, for raiſing the Fermentation quick and ſtrong, ſeems to be this: when the ferment is ſolid, it ſhould be broke into ſmall pieces, and gently thinned, with the hand, or otherwiſe, in a little of the luke-warm liquor. But a complete uniform ſolution ſhould not be here endeavoured; becauſe this would, in ſome meaſure, weaken the power of the ferment, or deſtroy its future efficacy. The whole intended quantity, therefore, being thus looſely mixed with a moderate parcel of the liquor, and kept near the fire, or elſewhere, in a tepid ſtate, free from the too rude commerce of the external air; more of the inſenſibly warm liquor ought, at proper intervals, to be added, till, at length, the whole quantity is well ſet at work together. And thus, by dividing the buſineſs into parts, it may be much more ſpeedily and effectually done, than by attempting it all at once: in which caſe, it is very apt to miſcarry, and require a reparation in the method already deſcribed.

When thus the whole is ſet at work, ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external air; it becomes, as it were, the ſole buſineſs of nature to finiſh the proceſs, and render the liquor fit for the ſtill; and thus the general end of the Fermentation would be anſwered. But during the whole courſe of the operation, there are ſeveral other things that may be added, with ſome particular view; as either to improve the vinoſity, increaſe the quantity of the ſpirit, or give a particular flavour. And ſuch additions may require ſome particular alterations in the general method above ſet down. See ADDITIONS. *Shaw's Eſſay on Diſtillation.*

In order to aſcertain the fermentative quality of animal ſubſtances, Dr. Pringle, in the Appendix to his Obſervations on the Diſeaſes of the Army, has made ſeveral curious experiments: bread and water only ſtood ſeveral days, in a furnace, heated, as uſual, to 100 degrees; but, two drachms of freſh meat being added to double the former quantity of bread, and water in proportion, the mixture began to ferment in a few hours, and continued to do ſo about two days. For the moſt part, the Fermentation was ſo ſtrong that, if the corks had not frequently given way, the phials muſt have burſt. The bread and fleſh which at firſt lay at the bottom, ſoon roſe to the top, and conſtantly, as the air elapſed, let fall ſome particles that had been buoyed up by the fluid; thus a ſediment was formed, reſembling lees, whilſt the lighteſt part, or flowers, remained on the ſurface; but, the Fermentation continuing, theſe alſo ſubſided, and the acid taſte and ſmell of the liquors, after the action ceaſed, was a farther proof of the preceding Fermentation. This change was the more extraordinary, as, when the motion began, the mixture was tending to corruption, and, in effect, in a few hours afterwards, became offenſive; but next day the putrid ſmell abated, and went off before the Fermentation ceaſed.

The doctor made ſeveral other experiments, to the ſame purpoſe, and nearly ſimilar effects; from all which, he thinks it probable that moſt animal ſubſtances, tending to putrefaction, are endowed with a power of raiſing a Fermentation in the farinacea, and even of renewing that action in ſuch as have undergone it before.

The effect of Fermentation therefore is to change putrid ſubſtances to a ſtate of acidity, which they not only retain, but grow ſtill more and more acid. It is obſerved, indeed, that the acid ariſing from Fermentation has ſomething of an auſtere and ſaltiſh taſte, but without any offenſive ſmell. Now, conſidering how much air is generated by Fermentation, it may ſeem ſtrange that the ſame materials, uſed as food, ſhould make ſo little diſturbance in the body. And the difficulty would be the greater, did the ſaliva, as ſome ſuppoſe, promote both Fermentation and putrefaction.

From this theory of Fermentation the doctor accounts for the ſourneſs or acidity of the ſtomach, a diſorder to which many people are ſubject; ſince not only a ſtrong but an auſtere acid may be produced from the food of thoſe who live on fleſh, bread, and water only, as often as the ſtomach is relaxed, or any way diſabled from conveying the whole aliment into the inteſtines; for what is left, having time to undergo a complete Fermentation, is thereby changed into a harſh ſort of vinegar.

Spirits, wines, acids, bitters, aromatics, and the hotter antiſcorbutic plants retard alimentary Fermentation, by their power of correcting putrefaction. However, they may have their ſeveral uſes; ſome for checking immoderate Fermentation, when, by reaſon of a putrid effluvia, or a defect of it, the aliment may ferment too violently; and others, again, for bracing the ſtomach, and fitting it for expelling its contents in due time.

All theſe facts correſpond with digeſtion; for the moſt nouriſhing and digeſtable food, to people in health, conſiſts in a due mixture of animal and vegetable ſubſtances with water: ſcorbutic or putrid habits require acids, wine, or other antiſeptics. An acid, abounding in the ſtomach, is corrected by abſorbents, and, in a want of natural heat, and a debility of the ſtomach, wines, bitters, and warm and acid ſubſtances become neceſſary. *See Pringle's Obſerv. on the Diſeaſes of the Army, Append.*

FERMENTED *Liquors.*—All Fermented liquors abound with with an over-proportion of water; and, if a very conſiderable quantity of it were taken away, they would become not only richer, but more durable, provided that ſo much of the aqueous humidity was retained, as was juſt ſufficient to preſerve the vinous conſiſtence, to keep the ſaline part fluid, and to retain the ſlimy and unctuous parts expanded and mixed among

among the reſt. But as an actual and truly ſaline matter abounds in wine and in vinegar, and that of an acid, auſtere, and tartareous kind; when the ſpirituous part is drawn away, the wine becomes ſurpriſingly more auſtere; and, when a large quantity of the watery part is ſeparated, this ſuperabundant ſaline, tartareous matter coagulates into a cryſtalline form, and either falls to the bottom, or ſticks to the ſides of the caſk. For the ſubtile, oily matter, which makes the ſpirituous part in wine, blunts and takes off from a tartareous acidity, in the ſame manner that the addition of ſpirit of wine blunts, ſheathes, and dulcifies the acid, corroſive parts of ſpirit of nitre, in making the ſpiritus nitri dulcis.

But this tartareous ſalt, abounding alſo with an over-proportion of ſo groſs and unctuous matter, cannot be diſſolved or diluted without a very large proportion of water, which being taken away, it preſently converts into dry and ſolid cryſtals, as is the known caſe of cream of tartar. Hence proceeds the effect before obſerved, that the auſterity and roughneſs of wine are the more preſerved, the more the wine is deprived of its ſpirituous parts. This experiment is familiar in our kitchens, where wine, being burnt or boiled into ſauce, is found to have a much greater degree of auſterity, than the ſauce and wine had before it had undergone the action of the fire, and loſt its ſpirituous part.

When the water is, even by diſtillation, plentifully drawn off from wine, not of a terreſtrial and chalky, but of a tartareous nature, a beautiful tartar will be found to cryſtallize, among the remaining maſs, in a conſiderable proportion. But though this ſuperfluous water, that generally dilutes the wine, and weakens its taſte, might be advantageouſly ſpared from it, and it would then become much more rich and noble, and at the ſame time more ſmooth and ſoft, through the loſs of ſome conſiderable portion of its tartar; yet this ſeparation cannot be effected by diſtillation, becauſe that carries away other parts as well as the water, and damages the whole, by taking off what ought to be the moſt carefully preſerved. The ſpirituous part is the life of all fermented liquors; it keeps the whole together, and in a manner embalms and renders them durable, and not ſubject to corruption; it alſo in a great meaſure gives them that aromatic, refreſhing, and reſtorative virtue, and the beſt effects they have on the human body. Nor is this all, but the intimate and ſubtile union of this ſpirituous part with the reſt is perfectly the ſole and entire cauſe of both the former effects; ſo that it by no means ſuffices to have the ſpirit barely preſent among the other parts, for then it might be drawn off and poured back again, without any damage to the wine; but the eſſential union is here diſſolved by taking it away, and can never be reſtored again by a ſimple re-affuſion. It is therefore deſtructive of the end propoſed thus to break and diſſolve the texture of the wine, and this entirely ſubverts and deſtroys its nature. This inevitably proves the caſe, whenever wine is evaporated or diſtilled, which conſtantly requires a degree of heat capable of raiſing water into vapour; and hence the ſpirituous part, being greatly lighter than the aqueous, flies off together with it, or before it, and the wine is left diſſolved in its texture, and without its ſoul. Upon this, the remaining ſaline unctuous maſs is ſo diſturbed, as no longer to remain connected, but it becomes thick and turbid, and afterwards runs impetuouſly into a kind of corruption attended with acidity and ropineſs. All theſe circumſtances ſhew, that, though the condenſing of wines by taking away their ſuperfluous humidity would be a very deſirable thing, yet it is by no means to be done by evaporation. *Shaw's Eſſay on concentrating Wines.*

FERN, *Filix*, in botany. There are great varieties of this plant, in different parts of the world; but we ſhall only mention two ſpecies, the male and the female.

The leaf of the male Fern is compoſed of other leaves, which adhere to a rib in ſuch a manner, as to have lobes on both ſides, cut into the depth of the main fibre: the fruit reſembles that of polypody.

It grows on the ſhady banks of hedges: the part uſed in medicine is the root, which is thick, blackiſh without, but pale within, fibrous, involved and interwoven with multitudes of appendages, and of a bitter and ſomewhat aſtringent taſte.

The virtues are the ſame as thoſe of the female Fern; but it has a peculiar efficacy againſt the rickets, or reckets. It expels worms and the ſtone; relieves thoſe who labour under an increaſe of the ſpleen. Dioſcorides ſays, that the root drank, or made into an ointment with fat, cures wounds inflicted by arrows. Theophraſtus, Pliny, and Dioſcorides agree, that it cauſes barrenneſs and abortion. Tragus aſſures us, from his own experience, that, when a horſe falls down, and you are puzzled to find the nature of his diſorder, if you put a rib of the root of this plant under his tongue, he will immediately excrete both ways, and riſe up. *Dale, Ray.*

The common female Fern, or brakes, has many large leaves divided into ſeveral branches, beſet with long, narrow, ſtiff pinnulæ, which are moſtly ſmooth about the edges, though ſometimes they are a little indented: The back of theſe, about Midſummer, will be covered round the margins with a great number of duſky brown particles, which are the ſeed: the root is long and thick, ſpreading much in the earth, ſending out ſhoots on every ſide, which makes it hard to be eradicated: It grows but too frequently on commons and heaths, being uſed, in want of fuel, by the country people, for heating their ovens, and other uſes.

The roots only are uſed in medicine, and thoſe but rarely, being commended as very good for worms, eſpecially the flat worm: a kind of pot-aſh is made of the ſtalks and leaves burnt. *Miller's Bot. Off.*

The common female Fern is very miſchievous and troubleſome to the farmers, being very difficult to deſtroy, where it has any depth of ground to root in. Its root will often penetrate to eight feet deep, and, ſpreading a great way, they will riſe again to the ſurface, and ſend up new plants at a conſiderable diſtance. In graſs land the beſt way of deſtroying it is mowing the graſs, three times a year in ſpring, in May, and in Auguſt. Dung and aſhes are very good manure for lands which abound with it, but the beſt of all things, for deſtroying it, is urine. Fern cut up, when the ſap is in it, and laid to rot upon the ground, is a very good manure for land, and will mellow it ſo as to prevent its binding. Trees, planted where Fern grows, are obſerved to thrive very much, even though it be upon a hot gravel; the reaſon of this is, that the Fern ſhades the roots and keeps them moiſt and cool. *Mortimer's Huſb.*

The ſeeds of the ſeveral ſpecies of Fern were wholly unknown to the antients. Swammerdam, in his Biblia Naturæ, claims to himſelf the honour of having firſt diſcovered them; but it appears from Hook's works, that Dr. William Cole ſent an account of the ſeeds of ſeveral of the plants of this kind to that author, in 1669, whereas Swammerdam declares his diſcovery of them to have been in 1673; ſo that it is plain that Dr. Cole's was prior to his by ſome years. Swammerdam is an author of that ſtrict probity, that there is no room to doubt but that he ſpoke what he thought to be true; and it is even poſſible that he might have diſcovered them ſooner than the time he mentions; but, however that be, it appears from the later obſervations of the ingenious Dr. Miles, that his accounts are extremely accurate and juſt. The ſeed-veſſels of the common Fern, the Engliſh and foreign maiden-hairs, the wall-rue, hart's-tongue, and the like plants, are all alike in their general form, their only differences being in the ſize, and their arrangement on the plants. The number or quantity of the ſeeds is very different in different plants, but Mr. Miles obſerves, that, the fewer ſeeds there are in any ſpecies, there is always the more in quantity of a ſort of ſpongy or fungous matter, which forms a kind of tubercle, not unaptly reſembling what is called Jew's-ears, which ſeems a ſubſtance intended for the ſheltering the ſeeds.

In the female Fern and Engliſh maiden-hair, the whole ſurface of the leaf, on the under ſide, ſeems covered with a congeries of ſeeds, ſo that they guard one another, and therefore have leſs occaſion for a covering of fungous matter of this kind; yet even on theſe plants, when the ſeeds are fallen off, there are found ſmall membranes, a little curled, looking as if they had been raiſed with the edge of a fine penknife, from the ſkin of the leaf, not unlike the pieces of ſkin that are raiſed off from the hand, in the trying a penknife or other ſharp inſtrument. In the common male Fern, there are found, at the proper ſeaſon, ſeveral brown ſpots placed in a regular manner; theſe are of a pale brown colour, and are principally compoſed of this fungous matter, the ſeed-veſſels being ſmall and inſerted round it. *Phil. Tranſ.* Numb. 461.

Theſe ſeed-veſſels conſiſt of a ſtalk by which they are inſerted into the leaf; this repreſents an elaſtic cord, and is ſurrounded by a great number of annular ribs, reſembling the cartilages of the aſpera arteria; and indeed nothing in nature ſo exactly reſembles this cord or ſtalk, as the wind-pipe of a ſmall bird. This cord incircles the globular membranous pod wherein the ſeed lies, adhering to it, and dividing it into two hemiſpheres.

The pod is compoſed of a fine whitiſh membrane ſomewhat like that which lines the inſide of a pea-ſhell; the ſeeds are irregular in ſhape, and of a reticulated ſurface. The moſt advantageous way of viewing this is to uſe the common microſcope for opake objects, putting on a ſmall magnifier, and laying the ſeeds with their capſules, &c. as taken from the back of the plant, on a piece of poliſhed ivory. The proper time of the year is in the beginning of September; and then, if the plant be newly gathered, the ſeed-veſſels often burſt, while they are under inſpection, and ſhew a very elegant appearance. The manner of this burſting of the pod, which is the method nature has taken for the ſcattering and diſperſing of the ſeed, is this: the cord becomes extended in ſome one part, and ſoon after breaks aſunder; this by expanding burſts the pod into two parts, and, continuing to expand itſelf, as it departs from a curve, and approaches to a right line, it rends itſelf away from the globular pod, till it be at length wholly diſengaged from it; and then, as there can be no farther reſiſtance given to its expanding, it ſuddenly flies off, with a ſort of jerk, and becomes quite ſtraight at once. By this laſt action the capſules are ſhook, and the ſeeds are diſcharged out of them on the plate of ivory, in the ſame manner as the grains of wheat or barley would be thrown out of a bowl placed

ced on a table, by the shaking of the bowl. This is a beautiful phænomenon in the minute seed-vessel of the Fern, and frequently seen when the seeds are fresh gathered, as then the cords and capsules are green and juicy, and the bursting goes on gradually; but, when they are dry and crisp, there is nothing of this seen, for the bursting is instantaneous, and the seeds are tossed so far by it, that none of them fall within the area taken by the lens. When the pod and cord are but just ripened, they sometimes are twenty minutes in bursting, and the whole method of the process is then distinctly and beautifully seen. This whole mechanism would be seen in a much more perfect and beautiful manner, if it were possible to get off the seed-vessels from the leaves without injuring them in doing it; for the common way, in getting them off, is by rubbing the leaves, and this must necessarily burst a great number of them; in this method they are seen to fly off from the leaves, in form of a fine dust or powder, and often get into the pores of the skin, and become as troublesome, as cow-itch. *Phil. Transf.* Numb. 461.

FERN-*ashes.* The ashes of the common female Fern produce a very singular phænomenon, in the common way of treating them and their salt. If a large quantity of these ashes are procured, and the salt to the quantity of several pounds extracted from them in the common way, it will succeed better than in smaller quantities. The greater part of this salt being dried, if the remainder, which is more moist, be exposed to the air to receive some of the vapours of it, this will soon become fluid, or an oil, as it is very improperly called, by deliquium. The rest of the lixivium, which will be heavy, and of a deep blood red, or claret colour, being set by in a glass vessel unstopped for five or six months, there will be found, at the bottom of the liquor, a very large quantity of salt precipitated to the thickness of about two inches of the bottom of the vessel. The lower part of this will have all the foulness, and appear discoloured; but the upper part will be extremely pure and white. From the surface of this part, there will grow up a number of plants, in appearance standing erect, and at small distances from one another. These are only the last crystallizations of the subsiding or separating salt, but they have a regularity that is very surprising; they vary considerably in size and weight, but are all of the same shape, exactly resembling so many plants of the common unbranched Fern, sending out a great number of regular leaves on each side the stem. These ramifications of the salt will remain many weeks in this perfection, if the vessel be not stirred; but they are so tender, that the least motion destroys them, and they, after this, never will form themselves again. *Phil. Transf.* Numb. 105.

FERN-*oil,* in pottery, a name given, by our merchants who have been in China, to a sort of varnish, which the Chinese use in their porcelain manufactories: it is also called lime-oil, and is a thing so easily made, that it would be worth attempting what might be done with it, in our imitations of the porcelain. They make it in this manner: they take a large quantity of Fern well dried, and, spreading a covering of it over a piece of ground sufficient for the quantity of oil they intend to make, they lay upon this a coat of large lime-stone, newly calcined into lime; on these they sprinkle with the hand a small quantity of water just to slake them. They cover this bed of lime with another of Fern, and soon, till they have raised it to eight or ten feet high; they then set fire to the Fern; this burns away in a little time, and leaves a mixture of the lime and its own ashes. This mixture is laid in the same manner between beds of more Fern, and burnt again. This operation is repeated five or six times. *Observ. sur les Coutum. de l'Asie.*

When the last calcination is finished, the mixture of lime and ashes is carefully gathered up and thrown into large vessels of water, and, with every hundred weight of it, they put in one pound weight of kekio; they stir the whole together, and, when the coarser part has subsided to the bottom, they take off the finer which swims at the top in form of a fine cream, and, putting it into another vessel of water, they let it subside to the bottom by long standing; they then pour off the water, and save the residuum in form of a thick oil.

This they mix with the oil of stone, prepared by powdering and washing in the same manner a particular sort of stones, and, with this, they cover all the vessels that they intend to varnish. The Fern-ashes have a very great share in the advantage that this oil has over our common varnish; and the Chinese tells us, that they once instead of Fern used the wood of a tree, called setki; and they suppose that the superiority of the old porcelain over the present is owing to the use of this tree instead of the Fern; but it is now too scarce among them. The new manufacture which we have at Bristol excels every thing that has been done of the like kind, in the beauty of the varnishing; and it is said, they have found their advantage on an imitation of this, and the Chinese oil of stone. These two oils, as they are called, are always mixed together, and they must be carefully preserved of the same degree of thickness, or else all the varnishing will not be even. *Observ. sur les Coutum. de l'Asie.*

FE'RRET, *viverra.* This creature has but one note in her voice, which is a shrill but small whining cry. The female usually brings forth seven or eight young ones at a time: she carries them in her body forty days; the young ones are blind for a long time after they are littered. When they are tamed, they are to be fed with milk, and with barley bread; they will fast a long time; when they walk, they set up their back, which is otherwise so long, that it would be troublesome to drag it on; when they are touched, they smell very disagreeably; they naturally sleep very much. The Ferret is a bold and audacious animal, and is an enemy to almost all others. It does not eat the flesh of the creature it kills, but sucks their blood.

When the warrener has occasion to use the Ferret to catch rabbits, he first makes a noise in the warren to frighten them all into their holes; then he pitches his nets, and, having muzzled the Ferret that he may not bite the rabbits, he turns him into their holes to frighten them out, and then the dogs drive them into the nets that are set for them.

FERRETS, in glass-making, the irons with which the workman tries the melted metal to see if it be fit to work.

It is also used for those irons which make the ring at the neck of bottles. *Neri's Art of Glass.*

FERRE'TTO, in the glass trade, a substance which serves to colour glass. This is made by a simple calcination of copper, but it serves for several colours. There are two ways of making this; the first is this: take thin plates of copper, and lay them on a layer of powdered brimstone, in the bottom of a crucible; over these lay more brimstone, and over that another layer of the plates, and so on alternately, till the pot is full. Cover the pot, lute it well, place it in a wind furnace, and make a strong fire about it for two hours. When it is taken out and cooled, the copper will be found so calcined, that it may be crumbled to pieces between the fingers, like a friable earth; it will be of a reddish, and in some parts a blackish colour. This must be powdered and sifted fine for use.

The other way is less easy, but it makes a more valuable Ferretto. It is this: make a number of stratifications of plates of copper and powdered vitriol alternately in a crucible, which place in the floor of the glass furnace near the eye, and let it stand there three days; then take it out, and make a new stratification with more fresh vitriol, and calcine it again as before; repeat this operation six times, and a most valuable Ferretto is produced. *Neri's Art of Glass.*

FERRI'FIC *Cause,* a term used by some writers to express that principle, to which what they call production or generation of iron in burnt bodies, in which no iron could be discovered before burning, is owing. It is the general opinion of the present philosophers, that this iron thus discovered in the ashes of plants, and the like burnt substances, really existed there before, and only needed the disunion of the concreted body, to the bringing of its parts together. If this be the case, there is evidently no production of iron in the case, and therefore the term Ferrific is a word without a meaning. Becher, however, in his Supplement to his Physica Subterranea, is of a very different opinion, determining, that the iron is really produced in these cases, during the action of the fire, and that by the transmutation of some other matter into iron; and from this he agrees the possibility of gold-making among chemists by transmuting something else into gold, as some other substance is in this case transmuted into iron.

FE'RULA, *fennel giant,* in botany, a genus of plants, whose characters are:

It has a large, succulent, and milky root; the stalks are fungous, full of pitch, and disposed to take fire. The seeds are very large, oval, and thin; they throw off their involucrum, and, for the most part, turn black, when ripe.

It is sometimes cultivated in the gardens of botanists, and flowers in July. The parts in use are the medullary substance of the stalk, the seeds, and the juice or gum, which is the sagapenum of the shops. *Dale.*

The medulla, or pith, of the green Ferula, being drank, is good for spitting of blood, and the cœliac passion. It is prescribed in wine, for the bite of the viper; and, intruded into the nostrils, stops bleeding of the nose. The seed, drank, relieves under the gripes, and, used in unction with oil, provokes sweat. The stalks, taken as food, cause head-ach; they are usually pickled. The Ferula often produces a stalk three cubits long; its leaves resemble those of fennel, but are much larger and thicker. The sagapenum distils from the stalk, wounded near the root. *Dioscorides, Lib.* ii. *cap.* 91.

FEVE, in natural history, a name first given to the chrysalis of the silk-worm, and from thence to all chrysalises of the butterfly kind; in which sense it is now received and used with the most accurate writers, and made a synonymous term with the words chrysalis and aurelia.

Choleric FEVER, in medicine, the name of a Fever, called also by some a bilious Fever, and by others a causus; though the generality of writers distinguish the cholerica febris from the causus. All bilious Fevers are properly species of acute Fevers, and owe their origin to distemperatures of the bile, at times when the aliments are in a state of fermentation in the stomach and intestines.

The causus is distinguished from the cholerica febris, properly so called, by its being ever much more violent and dangerous, and

and by the excretions which attend it: for, in the choleric Fever, the vitiated gall and bilious excretions are always plentifully voided, sometimes upward, sometimes downward, and sometimes both ways. In the causus, the matter is more usually detained in the body, and rarely voided otherwise than by vomiting, and that usually only in small quantities, and in the beginning of the distemper.

Signs of it. The general signs of the cholerica febris and causus are a remarkable anxiety, and frequent complaints about the breast, as of a straitness and painful heat. A violent heat on the inside of the mouth, and insatiable and intolerable thirst, trembling and convulsive motions of the joints, and violent deliriums. Dryness of the mouth and tongue are often so terrible in this disease, that the skin cracks with it; and often the whites of the eyes, sometimes the whole body becomes yellowish. The peculiar and appropriated symptoms of a cholerica febris, strictly so called, are an universal languor and debility of the limbs.

A severe shivering first seizes the patient, and is soon succeeded by a very violent heat, and raging pain in the head; and, after the two first days, there usually are very terrible strainings and reachings to vomit. The matter brought up at these times is caustic, acrid, and bilious, and inflames and even ulcerates the fauces; and, if voided upon a stone floor, effervesces violently. If this vomiting abates, there immediately comes on a diarrhœa attended with a tenesmus, occasioned by the irritation of this sharp matter in the rectum. Faintings also are very frequent in this disease, especially where the vomitings do not bring up a sufficient quantity of the offending matter. The peculiar and appropriated signs of the causus, strictly so called, are these: a violent and insatiable thirst, greater than that in any other Fever. The bowels are always bound, and it is but very seldom that there is any tendency to vomit. The urine is reddish and turbid, and, after standing some time, deposits a red sediment. Often there is a sensible pain and soreness in the præcordia, so that the patient cannot bear the least touch upon the breast; and usually, in the course of the disease, there are faintings and violent convulsions.

Persons most subject to this disease are such as eat largely, and drink heavy and imperfectly fermented liquors after it. The cholerica febris, properly so called, is most frequent with those of a cholerico-sanguineous habit, and such as feed on high-seasoned meats, and drink abundance of wine or other strong liquors; and is often brought on such persons, by their falling into violent passions after a full meal. The causus peculiarly attacks the people of melancholic habits, who are much inclined to passion, but suppress it, and who are naturally costive.

Method of cure. The cure of these diseases consists in the mitigating the violent sharpness of the humour, and promoting its evacuation; and, finally, in abating the burning heat brought on by it. The utmost endeavours are first to be made to correct and alter the morbific matter. To this purpose, the several preparations of nitre, with the testaceous powders and mucilaginous ptisans, with small mixtures of lemon-juice, and frequent draughts of cooling and diluting liquors, are to be given moderately warm. If the costiveness be too violent, clysters of broth must be injected, with the addition of a little oil and salt; and, if necessary, small doses of rhubarb. To quell the febrile heat and emotion of the blood, the mistura simplex may be given with great success; and there is often a sensible good effect from the application of rags, wetted in camphorated spirit of wine, to the pit of the stomach. After the morbific matter is evacuated, the reachings to vomit may be allayed by gentle opiates. All hot medicines change the bilious Fevers into inflammatory ones, and the common sudorifics drive the morbific matter into the blood, and usually bring on almost immediate discolourings of the skin, like those of the jaundice. Bleeding, though performed ever so early in the disease, seldom does any good, except only in remarkable plethoric habits. *Junker's Consp. Med.*

FIBRA'RIÆ, in natural history, the name of a class of fossil bodies, the greatest part of which have been very improperly called, by the writers of fossils, fibrose talcs, they being of a very different substance and structure of parts from the talcs, and having none of their distinguishing characters.

The word is derived from the Latin *fibra*, a fibre, or filament, these bodies being all composed of arrangements of parallel filaments of fibres.

The Fibrariæ, in general, are fossils composed of parallel filaments usually remaining so distinct as to preserve in the whole masses of a thread-like texture, but sometimes uniting so as to form plates or flakes, resembling those of the talcs in external figure. They are bright, and in some degree transparent; not giving fire with steel, nor fermenting with, or soluble in acid menstrua. *Hill's Hist. of Foss.*

FI'BROSE *roots*, those which consist wholly of small fibres, such as the roots of the meadow-grass, pinks, and several other flowers. When a Fibrose root penetrates straight into the ground, it is called perpendicular; when it creeps under the surface, horizontal; when somewhat thick, it is called fleshy; when very thin, capillary; when it runs all the way undivided, simple; when divided, or when it sends off smaller roots, branched; when its surface is covered with extremely short and fine fibres, hairy.

FICOI'DES, in botany, a genus of plants, whose characters are:

The whole plant is succulent, and has the appearance of housleek: the leaves are conjugated, or grow opposite by pairs: the calyx surrounds the extreme margin of the ovary; is of a carneous or fleshy substance, and pentaphyllous or pentaphylloidal: the flower is polypetalous, very minutely divided, and springing from the top of the capsule: the ovary produces five reflected tubes, and becomes first a succulent, afterwards a fungous fruit, divided into five or more cells, like little pods full of numerous minute seeds.

Boerhaave, in his Index alter Plantarum, enumerates fifty-three species of this plant; which, in the Historia Plantarum attributed to him, are said to be of an emollient quality, and to have the other virtues of the sedum or housleek. The fruit is eatable, and a good part of the food of the Hottentots.

FIELD-*book*, in surveying, a book used for setting down angles, distances, and other things, remarkable in taking surveys.

The pages of the Field-book may be conveniently divided into five columns. In the middle column, the angles at the several stations taken by the theodolite are to be entered, with the distances from the stations. The distances taken by the off-set staff, on either side of the station line, are to be entered into the columns on either side of the middle column, according to their position with respect to that line. The names or characters of the objects, with proper remarks, may be entered in the columns on either side of these last mentioned. *Treat. Pract. Geom.*

FIE'LDFARE, in zoology, the English name of a bird of the thrush kind, called by authors turdus pilaris. It is larger than the common thrush, and is of a bluish grey colour on the neck; the head is spotted with black, and the shoulders and back are a yellowish brown, variegated with black; the throat is variegated with black and yellow; the lower part of the belly is white and but a little spotted; and on each side of the neck, and near each eye, it has a large black spot; those on the neck are on its lower part near the insertions of the wings; its wing-feathers are variegated with black, white, and a yellowish brown, and the tail is of a bluish black, with some variegations of black and white.

It is a bird of passage, and visits us in England towards the end of autumn in vast flocks, and leaves us in spring; it is not certainly known where they breed. They feed on berries, particularly those of the holly, and are a well-tasted bird. *Ray's Ornith.*

FIE'LD-FORT.— *Plate* XXXI, *fig.* 6. in the Dictionary, represents an irregular Field-fort; such as are thrown up by an army, when they besiege a place.

FIG (*Dict.*)— *Method of cultivating* FIG-TREES.— These trees are always planted as standards, in all warm countries; but in England they are generally planted against walls, there being but few standard Fig-trees, at present, in the English gardens: however, since the fruit is found to ripen well upon the standards, and the crop of Figs is often greater upon them, than upon those trees against walls, it may in time become the general practice to plant them either in standards or espaliers: the latter, I think, will succeed best in England, if they were managed as in Germany; where they untie the Fig-trees from the espalier, and lay them down, covering them from the frost with straw or litter; which prevents their shoots being injured by the frost; and this covering is taken away gradually in the spring, and not wholly removed until all the danger of frost is over: by which management, they generally have a very great crop of Figs; whereas, in England, where the trees grow against warm walls, if the spring proves warm, the young Figs are pushed out early; and the cold, which frequently returns in April and May, causes the greatest part of the fruit to drop off, so that our crop of Figs is generally more uncertain, than most other sort of fruit; and it frequently happens, that trees which are planted against north and east aspected walls, produce a greater quantity of fruit in England, than those which are planted against south and south-east aspects; which must happen from the latter putting out their fruit so much earlier in the spring than the former: and, if there happen cold frosty nights, after the Figs are come out, which is frequently the case in this country, the forwardest of the Figs are generally so injured as to drop off from the trees soon after. In Italy, and the other warm countries, this first crop of Figs is little regarded, being few in number; for it is the second crop of Figs which are produced from the shoots of the same year, which is their principal crop; but these rarely ripen in England; nor are there above three or four sorts which ever ripen their second crop, let the summer prove ever so good; therefore it is the first crop which we must attend to in England: so that, when these trees are growing against the best aspected walls, it will be a good method to loosen them from the wall in the autumn; and, after having divested the branches of all the latter fruit, to lay the branches down from the wall, fastening them together in small bundles, so that they may be tied to stakes, to keep

keep them from lying upon the ground; the damp whereof, when covered in frosty weather, might cause them to grow mouldy: and hereby they will be secured from being broken by the wind. When they are thus managed in the autumn, if the winter should prove very severe, the branches may be easily covered with peas-haulm, straw, or any other light covering, which will guard the tender fruit-bearing branches from the injury of frost: and, when the weather is mild, the covering must be removed, otherwise the Figs will come out too early; for the intention of this management is to keep them as backward as possible: then in the spring, when the Figs are beginning to push out, the trees may be fastened up to the wall again. By this management, I have seen very good crops of Figs produced in two or three places.

I have also seen great crops of Figs in some particular gardens, after very sharp winters, when they have, in general, failed in other places, by covering up the trees with reeds made into panels, and fixed up against the walls.

In the pruning of Fig-trees, the branches must never be shortened; because the fruit are all produced at the upper part of the shoots; so, if these are cut off, there can be no fruit expected; besides, the branches are very apt to die after the knife: so that, when the branches are too close together, the best way is to cut off all the naked branches quite to the bottom, leaving those which are best furnished with lateral branches at a proper distance from each other; which should not be nearer than a foot; and, when they are well furnished with lateral branches, if they are laid four or five inches farther asunder, it will be better.

The best season for pruning of Fig-trees is in autumn, because, at that time, the branches are not so full of sap; so they will not bleed so much, as when they are pruned in the spring; and, at this season, the branches should be divested of all the autumnal Figs; and, the sooner this is done, when the leaves begin to fall off, the better will the young shoots resist the cold of the winter. There are some seasons so cold and moist that the young shoots of the Fig-trees will not harden, but are soft and full of juice: when this happens, there is little hope of a crop of Figs the succeeding year; for the first frost in the autumn will kill the upper part of these shoots, for a considerable length downwards: whenever this happens, it is the best way to cut off all the decayed part of the shoots, which will prevent the infection from destroying all the lower part of the branches; and, by this method, I have seen a moderate crop of Figs put out from the lower part of the shoots, where, if the shoots had not been injured, there would have been no fruit produced; because it is chiefly from the four or five uppermost joints of the shoots that the fruit comes out: and it is for this reason, that as many of the short lateral branches should be preserved as possible, those being the most productive of fruit; for, where the long straight shoots are fastened up, there will be no fruit, but at their extremities; so that all the lower part of the trees will be naked, if there is not a particular regard had to supply young shoots in every part of the trees.

Those trees which are laid down from the walls or espaliers, should not be fastened up again until the end of March, for the reasons before given; and those against walls may remain for some time longer: and, when the large shoots of these are nailed up, if the small lateral branches are thrust behind these, to keep them close to the wall, it will secure the young Figs from being injured by the morning frosts: and, when this danger is over, they may be brought forward to their natural position again: during the summer-season these trees will require no pruning, but the branches are often blown down by wind; therefore, whenever this happens, they should immediately be fastened up again, otherwise they will be in danger of breaking; for, the leaves of these trees being very large and stiff, the wind has great power on them; so that, where the branches are not well secured, they are frequently torn down.

Those trees which are planted against espaliers, may be protected from the injury of frost in the spring, by placing reeds on each side the espalier, which may be taken down every day, and put up again at night; but this need not be practised in warm weather, but only at such times as there are cold winds and frosty mornings: and, although there is some trouble and expence attending this management, yet the plentiful crop of Figs, which may be this way obtained, will sufficiently recompense for both: the best way of making this covering is, to fasten the reeds with rope-yarn, in such a manner, as that it may be rolled up like a mat; so that the whole may with great facility be put up, or taken down: and, if these reeds are carefully rolled up, after the season for using them is over, and put up in a dry shed, they will last several years.

There are several persons, who of late have planted Fig-trees in standards, which have succeeded very well: this practice was revived, by observing some old standard Fig-trees in some gardens, which had been growing many years, and generally produced a much greater plenty of fruit than any of those trees which were growing against warm walls: indeed, the standard Fig-trees are in much greater danger of having their branches killed by severe frost; but in mild winters they generally do better than those against walls; so that, where these trees can be covered in very hard winters, there will always be plenty of fruit; and these may be covered by fastening as many of the branches together, as can be conveniently brought into a bundle; and winding some hay-bands, straw, peas-haulm, or any such light covering as can be readily procured; which in the spring may be gradually taken off, so as not to expose the shoots all at once to the open air; and, if there is some such light covering laid round the stems, and upon the surface of the ground about their roots, it will more effectually secure them from the danger of frost; but, when this is practised, great care should be taken, that no mice or rats harbour in this covering; for these will eat off the bark from their shoots, and kill them: and I have often observed, those trees which were against walls, have suffered greatly from these vermin, by having many of their largest branches disbarked near the ground, which has absolutely killed them: and it is in the winter that these vermin do this mischief to them; therefore they should be carefully watched at that season.

The common blue and white Figs, which are the sorts that have been the most generally cultivated in England, are not so proper to plant for standards, as some other sorts which have been lately introduced; for they are much tenderer, and are often killed almost to the root, when some of the other sorts, which have been growing in the same situation, have received very little injury from the frost: indeed, the white sort is generally a great bearer, and the fruit is very sweet; but, to those palates which are accustomed to Figs, that sort is not much in esteem, from its want of flavour. *Miller's Gard. Dict.*

FIG *insect*, in natural history, a name given by the English to the creature called by the French, after Mr. Reaumur, the faux puceron, or false puceron, from its very much resembling the puceron in external appearance, but extremely different from it, when nearly examined. These insects are, when at their full growth, of the bigness of the head of a pin of the largest size, but there are usually found among them several that are smaller, down to such as are scarce perceivable to the naked eye. They are found in great plenty on the back or under sides of the leaves of the Fig-tree, but they never are seen in clusters like the pucerons; twenty or thirty being the greatest number usually found on one leaf, and these scattered in different parts of it. These animals, though of the same general figure with the pucerons, yet are of so very different a nature, that they are all of them become at length winged insects, none remaining naked, as great part of the pucerons do; and they are not in a condition to multiply or bring forth young in this state, but must pass first through their transformation into the fly, like that to whose eggs they owed their origin.

FIGURES *on China ware*. There are several very different ways of making the Figures we see on the China ware, and, according to the method used, they have a very different appearance; but none of them are difficult. The common Figures which we see, are traced with a pencil dipped in the colours prepared of stones and earths, washed to fineness by water, and afterwards dried, and then blended with gum-water for use in the common way. The common blue is our smalt, and the finer blue a stone they call leao; the reddish is calcined copperas; and the green a preparation of the scoriæ of copper. These will all mix with gum-water, and spread from the pencil; and the only care to be taken in regard to them is, to make the powder very fine. The miniature paintings, as they are called, on the blue China, are thus done: the vessel is plunged all over into the common blue, made into a soft paste or varnish with water; this gives the whole vessel a coat of blue, and the workman takes a fine needle fitted into a proper handle, and with the point of this, he pricks out his Figures, every touch leaving behind a small white spot, which is owing to the taking off the blue where the point touched it; after this is finished, and the whole is dry, the vessel is varnished over, and the Figures appear painted in miniature under the surface.

The elevated or embossed Figures of beasts and flowers which we see on China, are done in a much easier manner, than would naturally be imagined. The artist carves these first with a burin on the surface of the vessel, while yet soft; after this he cuts away the substance about the Figures, and they appear elevated in any degree that he pleases. These are painted by the common hands employed in this work, and, when dry, are varnished over; and the effect is very elegant, while the means are not at all to be discovered.

The most beautiful of all China, in the judgment of many, is that which is all white, but has Figures within the surface; these appear very neat and distinct, though the surface is perfectly smooth. They are made of a whiter matter than the rest, called boache (which see) and, when these are laid on in this white, and covered with the common varnish, they are seen through it, and are of a different white both from the varnish and the substance of the China. *Observations sur les Coutumes de l'Asie.*

FIGURED *stones*, in natural history, a name given by some writers to those fossil bodies which are found in the shape of shells and other parts of animals. Disputes among the learned have

have never run higher on any subject, than on the origin of these stones; some have declared them to be all of marine origin at first, and that they were brought to the places where we find them in this fossil state, at the time of the universal deluge, and have been since altered in the nature of stones, by long lying in the earth, in the way of waters impregnated with stony particles, which they have deposited in them, after entering their substance in their passage through the earth.

Others are of opinion, that these bodies, though resembling ever so exactly the sea fishes, yet never were in the sea at all: but that the first semina of the sea shells, corals, and other substances, being carried by the sea water through the subterranean passages into all parts of the earth, even into the highest mountains, have been there left in vast numbers, and, growing there among stony matter, have arrived at their true bulk and figure, but in a stony substance.

FILA'GO, *common cudweed*, in botany, a genus of plants whose characters are:

The calyx is squamose, and neither shining nor specious: the floscules are divided or cut in form of a star: the broken parts end in ductile filaments.

The common cudweed grows to be near a foot high, usually with one woolly stalk, having several long, narrow, crumpled, sharp-pointed, whitish leaves, set pretty close to the stalk: on the top of the branches grow round globules or heads, composed of a great number of small naked flowers set together in clusters; and from the middle of these, on both sides, spring smaller branches, over-topping them three or four inches, bearing at the ends the like, but smaller heads of flowers; whence it is called herb impious, from the younger heads over-topping those from whence they had their original. The heads pass away into down, holding very small seed: the root is small, woody, and perishing yearly: it grows in dry barren places, and often in fallow fields.

Cudweed is drying and binding, and accounted good for all sorts of hæmorrhages and fluxes. It is given to cattle that have lost the ruminating faculty, and is therefore called cudweed. It is rarely used. *Miller's Bot. Off.*

FILIPE'NDULA, *dropwort*, in botany, a genus of plants whose characters are:

The root is fibrous and perennial, with glandulous bulbs fastened to it: the leaves are finely jagged, like those of millefoil: the calyx is monophyllous, denticulated, and divided into six or seven segments, which are retroflected, or bent backwards: the flowers are hexapetalous or heptapetalous, loosely disposed in panicles on long stalks, which are almost naked: the stamina are numerous, and situated on the reflected margin of the calyx: the fruit is generally round, and contains many seeds compacted together, each of them furnished with its tube.

The Filipendula is styptic, sweet-smelling, glutinous, of a taste a little saltish, and gives a pretty deep-red tincture to blue paper: the root gives it a pretty strong one: it is styptic, and a little bitter. This plant contains a salt, approaching to that of alum; but it is mixed with a great deal of sulphur; for by chymical analysis we obtain from it a great deal of acid earth and oil. All authors agree that it is very diuretic and aperitive. Tabernæmontanus, after Sylvaticus, Simon Januensis, Bayrus, and Lobel, recommend it for the epilepsy; and Mercator and Prevotius for the dysentery. *Martyn's Tournefort.*

FI'LTRUM, in natural history, the name of a stone much used in the eastern parts of the world, and sometimes with us, for the filtrating water intended for drinking. The Japonese are extremely fond of this stone, and impute their uninterrupted health, and particularly their being always free from the stone and gravel, to their drinking the water thus cleared of all its heterogeneous and mischievous particles. The people of this and many other places, thereabout, have a settled opinion, that most diseases arise from impurities of water, and are well assured, that these impurities are all lodged in this stone filtre, and left behind by the water in its passage.

The manner of using the stone is this: they form a sort of mortars with very thick bottoms, out of the largest pieces of it, and the water is poured into these, and, the stone being of a very lax and spongy texture, it soon makes its way through, and is received into a vessel placed underneath for that purpose. Some say, that the stone itself is a kind of marine fungus; that it is soft, while in the water, and grows to the sides of rocks in some part of the gulf of of Mexico, at the depth of a hundred ells, from whence it is with the utmost difficulty got up; and that it hardens into stone, as soon as it comes into the air.

This seems a fabulous account, however, only propagated to countenance the high price it bears. Whatever be its origin in Mexico, we are well assured, that there are other places where it is to be had on much easier terms, than by fetching it from the deep bottoms of the sea. We are at present acquainted with two kinds of it: the one black, resembling the common black slate, with which we cover houses; and the other grey, and of a tophus structure. We have also stones which may be applied to this purpose, in many parts of Europe; and, in all probability, every species of those which are porous, and of the tophus kind, will do. The osteocolla, used in the shops as a medicine, will perfectly well answer that purpose; and, if one of the tubes of this be stopped at the bottom, and then filled with water, it will be seen immediately making its way through it on all sides. The incrustations on vegetable and other substances, in springs, are all formed of a matter very analogous to the osteocolla, that is, of a coarse terrene spar. And, if a piece of any of these be hollowed at the top, and water put into it, it will be seen to fall out at the bottom in form of a little shower of rain; this might give some countenance to the Mexican story of their Filtrum being formed under water. As the spar is contained in all water, so that of the sea, as well as of rivers and springs, may form itself into a sort of fungous masses, against the sides and edges of the rocks; but it is not probable that it should be found at such depths. On observing the great density and firmness of the sparry concretions in springs, which yet suffer water to pervade their texture so very readily, Dr. Vater, to whom we owe this account, was induced to try the common coarse stone used in building houses to this purpose; and a mortar, being made of this, was found to let the water through, as well as the Mexican stone. The water first passed through this mortar had an earthy taste from some of the loose matter of the stone, which it dislodged in its passing through; but this is also the case in the Mexican, and all other kinds of filtring stones, and it goes off in all, after a few times using. It being found therefore an easy thing for use to have our water filtred in the same manner that the Japonese have, it remains to try, whether it will have those salutary effects, which the people of that part of the world give it; and this seems not to be imagined from reason and analogy. We very well know that water is frequently impregnated with saline particles, and that it also frequently dissolves by this means earthy and other matters, which it otherwise could not do. But we also know, that salts dissolved in water are not to be separated by filtration; and it is equally certain; that earthy, sparry, and other matter, that is suspended in water, when clear, will in like manner pass through the filtre with it. We daily see, that the solid bodies of metals, when perfectly dissolved in proper menstruums, pass through the filtre of paper with those menstruums; and, if afterwards something be added to the solution to weaken the force of the menstruum, so that it can no longer suspend so much of those heavy bodies, then the liquors become turbid, and the disunited particles of the metal will, on a second filtration, be left in the paper. It seems evident fr m this, that it is not the fineness of the filtre, but the state in which heterogeneous substances are suspended in fluids, which is the occasion of their passing through with them, or separating from and remaining behind them. It is in vain to say, that filtres of stone can stop the earthy and sparry particles of water, though filtres of paper cannot; since we every day see in caverns in the earth, that the water which oozes through the hardest rocks, forms stony icicles or stalactitæ, before it falls to the bottom. Upon the whole, we are happy enough to have no occasion for filtring stones, since our springs and rivers afford us waters already pure enough to our hands; and, in places where this is not the case, it is always possible to save rain water, which will keep a long time, with proper management, and is much purer than all the art in the world can make such as has once been foul. *Valentini Musæum Musæorum.*

FI'MBRIATED (*Dict.*)—This figure in heraldry is represented, *Plate* XXV. *fig.* 16, in the Dictionary.

FINE-*stiller*, in the distillery. That branch of the art which is employed on the distilling the spirit from treacle or other preparations or recrements of sugar, is called fine-stilling, by way of distinction from malt-stilling; and the person who exercises this part of the trade is called a Fine-stiller.

The operation in procuring the spirit from sugar is the same with that used in making the malt spirit; a wash of the saccharine matter being made with water from treacle, &c. and fermented with yeast. It is usual to add, in this case, however, a considerable quantity of malt, and sometimes powdered julap, to the fermenting backs. The malt accelerates the fermentation, and makes the spirit come out the cheaper; and the jalap prevents the rise of any musty head on the surface of the fermenting liquor, so as to leave a greater opportunity for the free access of the air, and thus to shorten the work, by turning the foamy, into a hissing fermentation. *Shaw's Lect.*

FI'NERY, in the iron works, is one of the two forges, at which they hammer the sow iron. In order to make the wrought iron, they first hammer a piece of a proper size gently at this forge, and, by degrees, bring it, after it has been hammered into a square bar or bloom, into what they call an anc-ory; which is the same mass hammered smaller in the middle, and there reduced to the shape the whole is to be brought to, at the chosery or other forges. *Ray's English Words.*

Carious FI'NGERS. The Fingers, when carious or affected by a spina ventosa, are to be amputated three ways: 1. By a strong pair of scissars or sharp-edged pincers. 2. By a chissel struck by a leaden mallet, by which they are separated at one blow; or, lastly, by dividing the next found joint with a scalpel, and drawing back a part of the skin to wrap over the stump,

ſtump, that it may heal the ſooner; and this is the beſt method of all, as by this you are in no fear about any ſplinters of the bone being left.

Fractured FINGERS. When one or more of the bones in the Fingers are broke, the ſurgeon's buſineſs is carefully to replace what has been removed, and to roll up the Finger a little way with a narrow bandage, and then to bind it firmly to the next ſound Finger. But it is much more proper, when the Finger is maſhed, ſo as to give no hope of a good cure, to take it off at once.

Luxated FINGERS. The bones of the Fingers and thumbs are liable to luxations of each of their articulations, and that in ſeveral directions; but theſe are accidents not only eaſily diſcovered, but very eaſily remedied alſo; for, the ligaments being not very robuſt, the fat and muſcles thin, and the ſinuſes of the articulations ſhallow, the extenſion is very eaſy, and the reduction of them into their former places not leſs ſo. The beſt method is, to extend ſufficiently the Finger with one hand, and to replace the luxated bone at the ſame time with the other, and to retain it ſo by a proper bandage. *Heiſter's Surgery.*

FI'NING *of wines.* The uſual method of Fining down wines, ſo as to render them expeditiouſly bright, clear, and fit for uſe, is this: take an ounce of iſinglaſs, beat it into thin ſhreds with a hammer, and diſſolve it by boiling, in a pint of water; this, when cold, becomes a ſtiff jelly. Whiſk up ſome of this jelly into a froth with a little of the wine intended to be fined, then ſtir it well among the reſt in the caſk, and bung down tight; by this means the wine will become bright in eight or ten days. *Shaw's Lectures.*

This method, however, is found to be beſt ſuited to the white wine; for the red ones, the wine-coopers commonly uſe the whites of eggs beat up to a froth, and mixed in the ſame manner with their wines. The method by which theſe viſcous bodies act in the operation is this: they entangle themſelves among the flying lee or light fæculencies, that float in the wine, and thus, forming a maſs ſpecifically heavier than the wine, they ſink through the body thereof like a net; carrying down all the foulneſs it meets in the way to the bottom; but, when the wine is extremely rich, ſo that its ſpecific gravity is greater than that of the maſs formed by the ingredients uſed in Fining, and the dregs or lee, this maſs then riſes upward, and floats at the ſurface of the wine, which will in this caſe alſo draw off fine.

FINO'CHIA, in gardening, the name of a plant which has of late years been introduced into the Engliſh gardens, and cultivated as a ſallad herb. It is a ſpecies of fennel, and is called by authors fœniculum dulce Azoricum. The ſweet fennel of the Azores iſlands. It is a high delicacy with ſome in England, though in general it is not liked; it ſeems, however, to be gaining more and more ground among us, and probably will in a little more time be a commonly eſteemed herb. The culture of it is this:

Good ſeeds muſt be firſt procured from Italy, for thoſe of Engliſh ripening are very apt to degenerate. In February ſome of theſe ſhould be ſowed for the firſt crop, on a light dry ſoil, and in a warm ſituation. The manner of ſowing theſe ſeeds is firſt to rake the bed very ſmooth, then draw a ſmall rill along it; and in this ſcatter them pretty thin; for the plants are not to ſtand nearer than ſix inches to one another; cover this with half an inch of earth, and, at the diſtance of ſixteen inches, make another rill, and ſo on throughout the bed. In about a month the plants will come up, and they muſt be then cleared of weeds, and cut up to four inches diſtance; a month after this, they muſt be thinned to ſix or ſeven inches diſtance; the ſtalks will now begin to ſwell to a large bulk juſt above the ground; this part muſt be earthed up in the manner of celeri, about a fortnight before it is uſed, which will make it eat very tender and criſp.

A ſecond crop ſhould be ſown three weeks after the firſt; and in that manner till July; every three weeks or a month a new crop ſhould be ſown, to keep a conſtant ſupply for the table.

The crops ſown in the hotter weather ſhould be watered and ſhaded from the great heats. *Miller's Gard. Dict.*

FIR-*tree, abies,* in botany, a genus of trees whoſe characters are:

It is ever-green, the leaves are ſingle, and for the moſt part produced on every ſide the branches; the male flowers or catkins are placed at remote diſtances from the fruit on the ſame tree; the ſeeds are produced in cones, which are ſquamoſe.

The difference between theſe and the pines is, the latter having two or more leaves produced out of the ſheath or cover.

Theſe trees are all raiſed from ſeeds taken out of their polyſpermous cones. The way to get out the ſeeds is, either by expoſing the cones to a gentle fire, or by ſoaking them all night in water, which will cauſe their ſquamoſe cells to open, and readily emit their ſeeds. The former method is the beſt, provided they are not expoſed to too great heat. But this ought not to be done until you are ready to ſow them; which is beſt performed in the beginning of March.

Theſe plants ſhould be all raiſed in a nurſery, where they may be protected from the birds; otherwiſe they will be in danger of being deſtroyed, when they firſt come up: for, as they bring up the huſk of the ſeed on the top of the plant, the birds in picking off the huſk will break off the plant, whereby a whole bed may be loſt in a few hours, if they are not carefully guarded from them.

The beſt time of ſowing theſe ſeeds is about the latter end of March, or the beginning of April, on a bed of light earth, covering the ſeeds about half an inch deep with the ſame ſort of earth. If this bed is netted over to keep off the birds, it will be a ſecure method to prevent them from deſtroying the young plants at their firſt coming out of the ground; at which time the plants ſhould be ſcreened from the ſun in the middle of the day, by covering the beds with mats; becauſe too much ſun frequently deſtroys theſe plants, when they are young. In this bed the plants ſhould remain until the following ſpring, when there ſhould be a number of beds prepared in the nurſery to receive theſe ſeedling plants; and the beginning of April they ſhould be tranſplanted into the beds, at the diſtance of ſix inches row from row, and at three inches aſunder in the rows. In removing theſe plants, they ſhould be very carefully raiſed up with a trowel, ſo as not to break off the fibres of their roots; and they ſhould be kept as little time out of the ground as poſſible; and, during the time they are out, their roots ſhould be covered, to prevent the wind from drying their fibres: and, in planting, the earth ſhould be preſſed cloſe to the roots of the plants, to prevent the air from penetrating the ground to the roots of the plants. If the ſeaſon ſhould prove dry, it will be proper to water the plants every week once or twice, according to the warmth of the weather; and the beds ſhould be covered with mats, to ſcreen the plants from the ſun, and drying winds, until they have taken good root; after which time they will require no farther care, but to keep them clear from weeds. In theſe beds the plants may remain two years; at the end of which they ſhould be tranſplanted into an open ſpot of ground; for their roots will in that time meet quite over the beds. This ground ſhould be well trenched and cleared from the roots of all bad weeds, and made level to receive the plants, which ſhould be tranſplanted about the beginning of April, juſt before they begin to ſhoot; and, if it ſhould prove moiſt weather, it will be of great advantage to the growing of the plants. In removing them out of the beds, there ſhould be great care taken, not to tear off or injure their roots; nor ſhould too many of the plants be taken up at one time; but rather plant them as faſt as they are taken up, that they may be as little time out of the ground as poſſible; for the drying winds which uſually happen at this ſeaſon, will greatly injure the roots of theſe plants, if they are much expoſed thereto.

The diſtance which theſe plants ſhould be placed in this nurſery, ſhould be four feet row from row, and two feet aſunder in the rows. This diſtance may by ſome perſons be thought too great; but if they conſider how their roots ſpread in the ground, as alſo, that, when they are planted nearer together, it will be very difficult to take up the plants again without cutting and tearing off their roots, eſpecially if they are not all taken up clean at the ſame time; theſe conſiderations will have greater weight than that of the loſs of a little ground, with thoſe perſons who have a regard to the future welfare of the plants. In planting of the plants, it will be the better way to draw a line acroſs the ground, and to dig out a trench of a foot wide thereby, into which the plants may be placed at the diſtance of two feet aſunder; then fill the earth into the trench, covering the roots of the plants with the fineſt part of it, ſcattering it carefully between the roots; and, when the whole trench is filled in, preſs the earth gently down with your feet; but by no means tread it too hard, eſpecially if the ground is ſtrong, or apt to bind too cloſe.

When the plants are planted, if the ſeaſon ſhould prove dry, they ſhould be watered, to ſettle the earth to their roots; and if this is repeated three or four times, if the ſeaſon ſhould continue dry, it will greatly promote their taking new root, and ſecure them from the injuries of the drying winds. In this nurſery the plants may remain two or three years, according to the growth they ſhall have made; and, during this time, the ground between the plants ſhould be conſtantly kept clean from weeds, and dug between the rows every ſpring; in doing of which, care muſt be taken not to cut or injure the roots of the plants: this is all the culture they will require during their continuance in the nurſery. And, when they are tranſplanted into the places where they are to remain, the neceſſary care to be taken is, in taking them up, not to injure or cut off their roots, and let them be as little time out of the ground as poſſible; and, when they are out, to guard their roots from the drying winds. The ſureſt time for removing of theſe trees is about the beginning of April; though they may, and often are removed with ſucceſs at Michaelmas, yet the ſpring is the more ſure ſeaſon, eſpecially in moiſt land.

Moſt of the kinds of Firs may be removed at the height of ſix or ſeven feet; but thoſe of two feet high are much better, and will in a few years get the better of thoſe taller trees: therefore I would not adviſe the tranſplanting of theſe trees, when they are much above two feet high, eſpecially if they have stood long in the nursery unremoved; for then their roots will have extended themselves to a great distance, which will be cut in taking of them out of the ground; and, where great amputation is used either to the roots or branches of these trees, the quantity of turpentine, which commonly issues from these wounds, will greatly weaken the trees. There is also another advantage in planting of these trees small, which is that of not requiring staking to secure them from not being blown down by strong winds, which in tall trees is a great trouble and expence: and whoever will give themselves the pains to observe, how much trees of two feet high exceed in growth those which are removed of much higher growth, will, I am sure, be convinced of the truth of what I have above said.

These trees are chiefly cultivated for ever-green plantations in gardens and parks, where, by their perpetual verdure, they have a singular beauty in winter; and in summer they are not without some beauty, by the contrast there is between them and the other woods, by the different shades of green. But, as neither of the sorts of Firs are equal to the Scotch pine in the goodness of the timber, these are not so profitable for large plantations, which are designed for improvement more than beauty. *Miller's Gard. Dict.*

FIRE (*Dict.*)— The learned and ingenious Dr. Knight has endeavoured to account for the phænomena of heat and Fire, by the vibratory motion of a repellent fluid. See HEAT.

The sparks of Fire which are produced by striking flint against steel, are of the number of those things which custom, by rendering the phænomenon familiar, has diverted our attention from the cause.

The striking Fire in this manner has probably been as old as the knowledge of steel; and, since the microscope has been familiar among us, it has been discovered, that these sparks are so many spherical balls of iron detached by the blow from the mass, and rendered by the heat a sort of scoriæ. Kemp de Kenvyck, a very ingenious chemist, proposed it as a problem worthy the attempts of the curious to solve, and proposed the whole in those words: When a flint and steel are struck together, if the sparks are received on a white paper, they are found to be round masses, which, examined by the microscope, are found to be melted and scorified or vitrified iron, which will no longer answer to the magnet. It is therefore demanded, 1. Which of the two instruments contributes most to this change in the iron? 2. What substance it is that is employed to this purpose? 3. In what manner the operation is performed; and, 4. Why, if iron be used instead of steel, the sparks are very few or none, when with steel they are so many?

These questions have appeared almost unanswerable, because people scarce knew how to conceive, that iron which requires so long continued and so violent a Fire to put it in fusion, could, by means only of a slight blow, be not only melted, but destroyed as it were. The most eminent person of the time declined engaging in the attempt, and Mr. Muschenbroek, from whom a solution was expected by many, at length referred the whole to Mr. de Reaumur, who had some time before published a treatise on iron and steel, and was therefore judged to have most considered the metal in both those states.

This gentleman accepted the task, and attempted the solution of the problem by resolving these questions: 1. By what means the iron is in this act converted into scoriæ? 2. By what method it can be so destroyed? 3. How it comes not only to be reduced to scoriæ, but to be in a state of fusion, and truly rendered liquid; and, 4. Why iron gives less as well as fewer sparks on collision with flint than steel does? The nature of iron is well enough known for us to be assured it contains a large portion of inflammable matter, and that it is never ductile, but while it has a quantity of that inflammable matter in it; and that, when that is wholly taken from it, it becomes friable, and is reduced to a sort of scoriæ, analogous to common vitrified matters.

What much conduces to the explication of the grand problem, is, that this inflammable matter contained in iron is very easily separated, when iron is heated in an open Fire; which is evidently seen, in that it is impossible to heat a bar of iron in a smith's forge so much as to make it ready for working or joining with another bar, without reducing its whole surface to scoriæ, or a friable matter which is all thrown off from the bar by the blows of the hammer.

The smaller and thinner a piece of iron is, the more easily is it reduced to scoriæ; and it is easy to conceive from hence, that, in pieces extremely small, there requires no more than the once thoroughly heating them to reduce the whole to scoriæ; and it is easily proved by experiment, that the flame of a candle, being applied to a fine small piece of filings of steel, will soon make it red-hot, and that, if it be then suffered to cool and laid on a white paper, it will be found much to resemble the sparks thrown off by the flint and steel, and will be reduced to scoriæ, and be friable under the nail, like a piece of charcoal.

It appears then, that there requires but an instant of time to give a red heat to a small particle of iron; and also, that, when that heat has been given, the particle must have lost that inflammable matter which caused its ductility, and consequently must be reduced to scoriæ; and hence it appears not wonderful, that the very small piece or particle of steel which is struck off by the flint, should be divested of its inflammable matter, and, with it, of its ductility, by keeping red-hot in the open air, only so long as it was in falling from the steel to the paper that is placed to receive it. The extreme smallness of the particle gives power to so short a heat to destroy its inflammable matter, in which its ductility consists; and therefore to reduce it to a matter no longer ductile, that is, into scoriæ; and we find, that, if a parcel of fine steel filings be dropped thro' the flame of a lamp driven into a horizontal direction by the blast of a blow-pipe, they will, in the instant of their passing through that flame, sparkle, and become ignited, and, if they are received on a white paper placed underneath, the smallest particles will be found round and friable, reduced to scoriæ, no way differing from the little globules of scorified steel, which are struck off from the flint and steel in giving Fire by their collision. When we have occasion to melt larger parcels of steel or iron, we are obliged to have recourse to such substances to mix with them as will replace with increase that inflammable matter which the Fire drives off: the substances of this kind are common sulphur, orpiment, arsenic, and the like; and by means of these it is soon made to run like lead. *Mem. Acad. Scien. Par.* 1736.

One great proof of the sparks being melted and rendered globular by means of the sulphur of the flint is, that sparks may be struck from steel, in the same manner, by glass as by flint, but in less quantity; these, having been received on a paper, were examined by Mr. Reaumur, and were found to be scoriæ, of an irregular figure, having never been melted, and therefore never reduced to the globular shape of the others. In regard to the great change wrought in iron by this operation, or its being, according to the words of Kemp, destroyed, no longer retaining its great character of being attracted by the load-stone, Mr. Reaumur, willing to try the experiment before he reasoned upon it, found this assertion not to be fact, or at least not a general one.

All the several kinds of sparks which he mentions, those produced by the common collision of flint and steel, those by dropping steel-filings through the flames of a lamp, and even those from the filing of the antimoniated iron, all as readily answer to the load-stone as common filings of iron; so that, if this case sometimes happen, and iron be liable thus to be destroyed, it is however no general fact, but a very rare and extraordinary one. *Mem. Acad Par.* 1736.

Everlasting FIRE, a very extraordinary phænomenon, near Baku, in Persia, before which the Geberrs offer their supplications. See GEBERRS.

This object of devotion to the Geberrs lies about ten English miles N. E. by E. from the city of Baku, on dry rocky land. There are several ancient temples built with stone, supposed to be all dedicated to Fire; most of them are arched vaults not above ten to fifteen feet high. Among others, there is a little temple, in which the Indians now worship: near the altar, about three feet high, is a large hollow cane, from the end of which issues a blue flame, in colour and gentleness not unlike a lamp that burns with spirits, but seemingly more pure. These Indians affirm that this flame has continued ever since the flood, and they believe it will last to the end of the world; that, if it was resisted or suppressed in that place, it would rise in some other. Here are generally 40 or 50 of these poor devotees, who come on pilgrimage from their own country, and subsist upon wild celeri, and a kind of Jerusalem artichokes, which are very good food, with other herbs and roots, found a little to the northward. Their business is to make expiation, not for their own sins only, but for those of others; and they continue the longer time, in proportion to the number of persons for whom they have engaged to pray. They mark their foreheads with saffron, and have a great veneration for a red cow. They wear very little cloathing, and those who are of the most distinguished piety put one of their arms upon their heads, or some other part of the body, in a fixed position, and keep it unalterably in that attitude.

A little way from the temple is a low cliff of a rock, in which there is a horizontal gap, two feet from the ground, near six long, and about three broad, out of which issues a constant flame of the colour and nature already described; when the wind blows, it rises sometimes eight feet high, but much lower in still weather: they do not perceive the flame makes any impression on the rock. This also the Indians worship, and say it cannot be resisted, but it will rise in some other place. About twenty yards on the back of this cliff is a well cut in a rock, twelve or fourteen fathom deep, with exceeding good water.

The earth round this place, for above two miles, has this surprising property, that, by taking up two or three inches of the surface, and applying a live coal, the part which is so uncovered, immediately takes fire, almost before the coal touches the earth: the flame makes the soil hot, but does not consume it, nor affect what is near it with any degree of heat. Any quantity of this earth, carried to another place, does not produce this effect. Not long since, eight horses were consumed fumed by this fire, being under a roof where the surface of the ground was turned up, and by some accident took flame.

If a cane or tube, even of paper, be set about two inches in the ground confined and closed with earth below, and the top of it touched with a live coal, and blow up, immediately a flame issues, without hurting the cane or paper, provided the edges be covered with clay; and this method they use for light in their houses, they having only the earth for their floor: three or four of these lighted canes will boil water in a pot, and thus they dress their victuals. The flame may be extinguished in the same manner as that of spirits of wine. The ground is dry and stony, and, the more stony any particular part is, the stronger and clearer is the flame; it smells sulphureous, like napthæ, but not very offensive.

Lime is burnt to great perfection by means of this phænomenon; the flame communicating itself to any distance where the earth is uncovered to receive it. The stones must be laid on one another, and in three days the lime is compleated.

FIRE-*ball*, a composition of meal powder, sulphur, salt-petre, pitch, &c. about the bigness of a hand granade, coated over with flax, and primed with the slow composition of a fuze. This is to be thrown into the enemies works in the night-time, to discover where they are; or to fire houses, galleries, or blinds of the besiegers; but they are then armed with spikes or hooks of iron, that they may not roll off, but stick or hang where they are desired to have any effect.

FIRE-*pots*, are small earthen pots, into which is put a granade filled with fine powder till the granade be covered; and then the pot is covered with a piece of parchment, and two pieces of match laid across and lighted. This pot, being thrown where it is designed to do execution, breaks and fires the powder, and thereby fires the powder in the granade, which ought to have no fuze, that its operation may be the quicker.

FIRE-*ships*, in the navy, vessels charged with artificial Fire-works; which, having the wind of an enemy's ship, grapple her and set her on Fire.

FISHES, in natural history, make one of the distinct classes of animals, the characters of which are, that they have either a naked or scaly body, that they have no feet, but always fins. *Linnæi Syst. Nat.*

FISHES, *aboard a ship*, are pieces of timber used to strengthen the masts and yards, when they begin to fail in stress of weather. They both nail the Fishes on with iron spikes, and also would them, as they call it, that is, wind ropes hard round about them. There is also a tackle called the Fish, which hangs at the end of the davit by the strap of the block, in which is the runner of the fish-hook, by which means the fluke of the anchor is haled up to the ship's bow or chain-waile. Perhaps this tackle was called a Fish, from that which the ancients called a dolphin, which was a pointed and vastly heavy piece of iron, which they used to heave up by a tackle to a good height, and then, when they came near enough to the enemies ship, let it fall at once, to break or pierce a hole through the bottom of the enemies vessel, and sink her.

FISH-*block*, in a ship, is the block which is hung in a notch at the end of the davit, and serves to hale up the fluke of the anchor to the ship's bow.

FISH-*ponds*, are not only a thing of convenience to great families, but may be made a profitable article with the farmer under due management. Watery and boggy lands are often fit for no other use, and these are then a great improvement on them. Ponds, made in dry grounds in the flat bottoms between hills, will also serve not only to supply the cattle with water, but the profit of the Fish that may be bred in them, is greater than many are aware of, and comes without any labour or expence. The head of a pond must be placed at the lowest part of the ground, and the trench of the flood-gate, or sluice, must have a good fall, that it may not be too long in emptying. The best way of making the head, is by driving three or four rows of stakes about six feet long, and at about four feet distance from one another, the whole length of the pond-head; the first row of these is to be driven in four feet deep, that they may be very firm and secure, and, if the bottom be not good but be of a loose sand, some lime is to be added, which will harden into a sort of stone. The earth dug out of the pond is to be placed between these stakes and rammed hard down. Other rows of stakes must be added behind, and over these, and the spaces filled up, till the whole is as high and thick as is necessary. The face of it must be made even and slanting, and there must be a wash left to carry off the superfluous water in floods, &c. *Mortimer's Husbandry.*

FISTULA *in ano*, in surgery, an abscess, running upon, or into the intestinum rectum; though an abscess in this part, when once ruptured, does generally, if neglected, grow callous in its cavity and edges, and become, at last, what is properly called a Fistula.

That the anus is so often exposed to this malady, in any crisis of the constitution, is chiefly ascribed to the depending situation of the part; but what very much conduce to it likewise, are the great quantities of fat surrounding the rectum, and the pressure the hæmorrhoidal vessels are liable to, which, being sustained upon very loose membranes, will be less able to resist any effort, that nature shall exert, to fling off a surcharge; and from one step to another, that is, from inflammation to suppuration, lead on to the distemper we are treating of.

That the fat is the proper subject of abscesses, may be learned from an inflammation of the skin affecting the membrana adiposa, and producing matter there; in which case, a suppuration runs from cell to cell, and, in a few days, lays bare a great quantity of flesh underneath, without affecting the flesh itself: nay, I think it may be doubted, whether, in those abscesses which are esteemed suppurations of the muscles, the inflammation and matter are not absolutely first formed in this membrane, where it is insinuated between the interstices of their fibres.

The piles, which are little tumors formed about the verge of the anus, immediately within the membrana interna of the rectum, do sometimes suppurate, and become the forerunners of a large abscess; also external injuries here, as in every other part of the body, may produce it; but, from whatever cause the abscess arises, the manner of operating upon it will be according to the nature and direction of its cavity.

If the surgeon has the first management of the abscess, and there appears an external inflammation upon one side of the buttock only; after having waited for the proper maturity, let him, with a knife, make an incision the whole length of it; and, in all probability, even though the bladder be affected, the largeness of the wound, and the proper application of dossils lightly pressed in, will prevent the putrefaction of the intestine, and make the cavity fill up like imposthumations of other parts.

If the sinus is continued to the other buttock, almost surrounding the intestine; the whole course of it must be dilated in like manner; since, in such spongy cavities, a generation of flesh cannot be procured but by large openings; whence also, if the skin is very thin, lying loose and flabby over the sinus, it is absolutely necessary to cut it quite away, or the patient will be apt to sink under the discharge, which, in the circumstance here described, is sometimes excessive. By this method, which cannot be too much recommended, it is amazing how happy the event is likely to be; whereas, from neglecting it, and trusting only to a narrow opening, if the discharge does not destroy the patient, at least, the matter by being confined, corrupts the gut, and, insinuating itself about it, forms many other channels, which, running in various directions, often baffle an operator, and have been the cause of a Fistula being so generally esteemed very difficult of cure.

Here I have considered the imposthumation as possessing a great part of the buttock; but it more frequently happens, that the matter points with a small extent of inflammation on the skin, and the direction of the sinus is even with the gut: in this case, having made a puncture, you may, with a probe, learn if it has penetrated into the intestine, by passing your finger up it, and feeling the probe introduced through the wound into its cavity; though, for the most part, it may be known by a discharge of matter from the anus. When this is the state of the Fistula, there is no hesitation to be made, but, immediately putting one blade of the scissars up the gut, and the other up the wound, snip the whole length of it. This process is as adviseable, when the intestine is not perforated, if the sinus is narrow, and runs upon or very near it; for, if the abscess be tented, which is the only way of dressing it, while the external orifice is small, as I have here supposed, it will almost certainly grow callous; so that the surest means of cure will be opening the gut, that proper applications may be laid to the bottom of the wound. However, it should be well attended to, that some sinuses, pretty near the intestine, neither run into nor upon it, in which case they must be opened, according to the course of their penetration. There are abundance of instances, where the intestine is so much ulcerated as to give free issue to the matter of the abscess by the anus; but I believe there are none where there is not, by the thinness and discolouration of the skin, or an induration to be perceived through the skin, some mark of its direction; which, if discovered, may be opened into with a lancet, and then it becomes the same case as if the matter had fairly pointed.

If the sinuses into, and about the gut, are not complicated with an induration, and you can follow their course; the mere opening with scissars, or a knife guided on a director, will sometimes suffice; but it is generally safer to cut the piece of flesh, surrounded by these incisions, quite away, and, when it is callous it is absolutely necessary, or the callosities must be wasted afterwards by escharotic medicines, which is a tedious and cruel method of cure.

When the Fistula is of long standing, and we have a choice of time for opening it, a dose of rhubarb the day before the operation will be very convenient, as it not only will empty the bowels, but also prove an astringent for a while, and prevent the mischief of removing the dressings in order to go to stool.

It sometimes happens that the orifices are so small, as not to admit the entrance of the scissars, in which case, sponge tents must be employed for their dilatation.

In performing these operations on the anus, I do not think, in general, any instrument so handy as the knife and scissars; almost all the others which have been invented to facilitate the work, are not only difficult to manage, but more painful to the patient; however, in those instances where the Fistula is very

very narrow, and opens into the inteftines, juft within the verge of the anus, the fyringotomy may be ufed with advantage: but, where the opening into the gut is high, it cannot be employed without giving great pain. I do not caution againft cutting the whole length of the fphincter, experience having fhewn it may be done with little danger of an incontinence of excrement; and, in fact, the mufcle is fo fhort, that it muft generally be done in dilatations of the inteftine.

The worft fpecies of Fiftula, is, that communicating with the urethra, and fometimes, through the proftate gland, with the bladder itfelf. This generally takes its rife from a former gonorrhœa, and appears externally firft in peritonæo, and afterwards increafing more towards the anus, and even fometimes into the groin, burfts out in various orifices, through the fkin, which foon becomes callous and rotten; and the urine, paffing partly through thefe orifices, will often excite as much pain, and of the fame kind, as a ftone in the bladder.

This fpecies of Fiftula, taking its rife from ftrictures of the urethra, is only manageable by the bougie: for, fo long as the urethra is obftructed, the cure of the Fiftula will be imperfect; but, if the canal is opened by this application, it is amazing what obftinate indurations and foul finufes will in confequence difappear; though there are fome fo callous and rotten, as to demand the knife and fkilful dreffings, notwithftanding the urethra fhould be dilated by the ufe of bougies. *Sharp's Surgery.*

FITCHES, a name given by our farmers to a fort of pulfe they fow in their fields. Many fuppofe it the fame with the tare, but erroneoufly: it is the chich or chich pea of authors. There are two principal kinds of this in ufe among us, the winter and the fummer Fitch. The one is fown before winter, and abides the extremity of it; the other is fown in fpring. They are propagated in the fame manner as peafe, and they make a very good and nourifhing food for cattle, whether given in the ftraw, or threfhed out. They are fometimes fown only to improve the land. In this cafe, they are to be plowed in, juft as they are beginning to bloffom, and in this manner they finely enrich a tough ftiff clay. *Mortimer's Hufbandry.*

FLAKE, in gardening, a name given by the florifts to a fort of carnations, which are of two colours only, and have very large ftripes, all of them going quite through the leaves. *Miller's Gard. Dict.*

FLA'MMULÆ *auri*, in natural hiftory, a name given by Dr. Woodward, and others, to thofe fmall pieces of gold found among the fands of rivers in fome places. They are fometimes found in roundifh pieces, but more ufually in their fhining flakes, whence the name Flammulæ feems to have been given them, as being very bright and gloffy. This fort of gold is pure and malleable, and lofes fcarce any part of its weight in fufion.

The gold duft, as it is called, which is brought from Guinea, is much of this kind; its particles are ufually very fmall, though, fometimes lumps of the fize of a pea or horfe bean are found, and fometimes maffes of an irregular figure of three or four ounces weight; but thefe lofe the name of Flammulæ, when they become fo thick and folid, and fo large, and are called by the merchants rock gold.

All the Flammulæ of gold, found among the fands in the beds of rivers, are doubtlefs parts of a rich ore, lodged in fome neighbouring hills, and wafhed away by the impetuous rains, which carry them down in the currents they form, and afterwards drop them in the places where the waters of the river they mix themfelves with, run more flowly. This appears plainly from thefe particles of gold being always found towards the heads of the rivers; or near the mountainous countries, where the torrents, caufed by fudden rains, difcharge themfelves into them near their entrances into the fea; and alfo by this, that the people always find the gold moft plentifully after great rains. *Woodw. Cat. Foff.*

FLA'TULENCIES, a relaxation of the periftaltic motion of the guts; but this not extending to the whole canal, but only to fome one part, the tranfpiration of the halituous matter being chiefly in this flaccid part, which it diftends in a manner that it could not do by a part that had its natural tone and motions. And the defect in one part is always attended with an excefs of the periftaltic motion in another, in order to the driving off the caufe; hence proceed alternate conftrictions and relaxations, to which, in a great meafure, the pain is owing; and, in cafes of the commotions of the blood about the vena portæ, the fame conftrictions and relaxations always happen. The material caufes of Flatulencies, are thofe fubftances fwallowed in food, which are of a mucous and tenacious confiftence, and, by their obftinately adhering to the bowels, are capable of giving great trouble. Of this kind are the herbs in ufe in food, which are of a thick tough juice; or the leguminous tribe, as peas, beans, and the like; alfo dried fea fifh, and all animal fats, as that of fheep and calves, efpecially if the perfon drink immediately after eating heartily of them. The drinking fæculent liquors will alfo occafion them very violently; as new malt liquors, or the fame, when the veffels are almoft out; the fummer fruits alfo are to be accufed in this fenfe, and, above all things, honey. To all thefe caufes the habit of the patient greatly concurs, and a general coolnefs of the body and drynefs of the bowels are a frequent occafion of them.

Method of cure.—In this, it is firft to be confidered, whether the Flatulencies have their origin in the bowels, or whether they affect them only by confent, as is often the cafe in difeafes of the neighbouring parts in hypochondraic and hyfteric patients, and in perfons afflicted with hæmorrhoidal and nephritic complaints, and in cafes where women have been ill managed in lying-in, or in mifcarriages: in all thefe cafes the original caufe is to be confidered and treated with its proper remedies. But, in cafes of direct and fimple Flatulencies, the following method will be ufually found effectual. The bowels muft be carefully kept gently open, for, in cafes of coftivenefs, Flatulencies will always be increafed. To this purpofe, the common clyfters muft be given at repeated times, and to thefe, by way of increafing the ftimulus, fome of the leffer centaury is to be added, and fome common falt. After thefe the laxative medicines of the gentler kind are to be given, and, in the intermediate days, the digeftive falts to attenuate the vifcous matter in the bowels; to thefe nitre and a little cinnabar may be added, and thefe always have a much better effect than all the hot carminatives ufually given. After thefe, thofe things are to be given which reftore the tone of the part; fuch are the bitter and aromatic extracts, with fpirit of falt of tartar, fpirit of nitre dulcified, and the volatile urinous falts aromatifed. Externally ftomachic plaifters may be applied to the pit of the ftomach, as may alfo the ftomachic balfams, fuch as the oils of nutmeg, carui, fennel, and the like.

The general method of treating Flatulencies, is, by the hot aromatics, but thefe are to be given with great caution; for, when the commotions of the blood about the vena portæ are in fault, thefe things always irritate, rather than do good; but, beyond all things, the too common method of giving a vomit in thefe cafes is to be avoided, for the difcharge of the Flatulencies upwards is inverted by this means, and then ufually follow exquifite pains and tenfions of the parts, difficulty of breathing, and vertiginous complaints in the head, with noifes in the ears, and many other complaints which are continually increafing, till they are a little abated, for the prefent, by an eructation. The happy way of getting rid of thefe anterior flatufes, is by driving the caufe of them downwards, and the reftoring the loft tone of the parts. Continued exercife is alfo of the utmoft fervice. *Juncker's Confp. Med.*

FLAX, (*Dict.*)—There are feveral forts of this plant, which are preferved in fome curious gardens of plants for variety fake; but, as they are of little ufe or beauty, it would be needlefs to mention them in this place.

The linum fativum, or manured Flax, is that which is cultivated for ufe in divers parts of Europe, and is reckoned an excellent commodity: the right tilling and ordering of which is efteemed a good piece of hufbandry.

This fhould be cultivated upon a rich foil, that has not been plowed for feveral years, upon which Flax always makes the beft improvement: but, as it draws greatly from the foil, it fhould not be fown two years together upon the fame ground. The land muft be well plowed, laid flat and even, upon which the feeds fhould be fown about the middle of March, when the weather is mild and warm. During the fpring, you muft carefully weed it; which if neglected (efpecially in a moift feafon) the weeds will overgrow and deftroy the crop. There are fome people who recommend the feeding of fheep with flax, when it is a good height; and fay, they will eat away the weeds and grafs, and do the flax good; and, if they fhould lie in it, and beat it down, or flatten it, it will rife again the next rain: but this muft not be practifed but in a moift feafon, and upon a rich foil; for, if the ground be poor, or the fpring dry, it will not rife again to any confiderable height.

The beft feed is that which comes from the eaft country, and is known by the name of Riga Flax; for, if the Englifh feed be fown three or four times, it is very apt to degenerate. If the feed be good, two bufhels will be enough to fow an acre; but, if it be but middling, there fhould be a greater allowance. Toward the latter end of Auguft the Flax will begin to ripen, when you muft be careful, that it grow not over ripe: therefore you muft pull it up as foon as the heads begin to change brown, and hang downwards, otherwife the feeds will foon fcatter, and be loft: fo that the pluckers muft be nimble, and tie it up in handfuls; fetting them upright till they be perfectly dry, and then houfe them. If the Flax be pulled, when it firft begins to flower, it will be whiter and ftronger than if it ftand till the feed is ripe; but then the feed will be loft.

This is a plant of the greateft ufe, in feveral of the moft effential parts of life: from the feeds an expreffed oil is drawn, which is of great ufe in medicine, painting, &c. from the bark of the ftalks is made linen, and from the rags of linen is made paper; fo that this plant may be efteemed as one of the moft valuable and neceffary, in many of the principal conveniencies of life. *Miller's Gard. Dict.*

This plant has a more oily tafte than the mallow, and is the chief of the emollient tribe. The feeds afford an excellent medicine, fince from them is expreffed an oil, which is anodyne, demulcent, and extremely adapted to all manner of afperities;

perities; it relaxes, and diffolves acridities, whence it is of extraordinary fervice in the moft defperate cholics. The ftiff and rigid limbs, being anointed with this oil, are relaxed and rendered flexible. This oil, when frefh drawn, and taken at the mouth, is very good in a pleurify, and a cough, to help expectoration; and, injected in clyfters, is very proper in the hæmorrhoids, and indurated fæces, whence proceeds the cholic; mixed with fealed and japan earth, it is a great arcanum in the dyfentery. An emulfion of the feeds is of fervice in the pleurify and peripneumony; the oil is a very good remedy againft the ftone: the feeds reduced to a meal, and boiled and prepared in the form of a cataplafm, are applied to tumors and abfceffes, in order to mollify and ripen them. The feed, boiled in water, makes a mild oily decoction, prefcribed to be drank as an anodyne in inflammations of the fmall inteftines, the diarrhœa, the dyfentery, nephritic pains, and retention of urine. The oil, boiled with honey, clears the face and fkin of fpots, and all cutaneous blemifhes. The leaves are emollient, and the fmell of the flowers is not poifonous, as fome authors have written. To clofe all, we fhall obferve, that whereas cotton can never be ufed about wounds, on account of its denticulated parts, which difpofe to inflammations; linen, the manufactured produce of this plant, is, by its extraordinary foftnefs, fmoothnefs, and flexibility, of all other things, the beft adapted to fuch purpofes. *Hift. Plant. afcript. Boerhaave.*

As it is agreed, that the lighteft loams and the thickeft crop afford the fineft Flax, it may be of ufe to let the farmer know how he may fave fuch crops from lodging, as they generally do. The method is a little expenfive; but, if it anfwers, it will quit coft very well. When the Flax is in the ground, divide your field into equal fquares, the fides of which may be four or five feet long; and at each angle thruft a forked ftick fteady in the ground. When your Flax is fome inches high, lay from ftick to ftick a light crofs pole; and this will fupport the Flax, and hinder it from lodging. Some ufe ropes inftead of poles; but they yield too much, and anfwer but imperfectly.

High winds are fo common in this country, that there is reafon to apprehend, that the Dutch method of laying your Flax loofe upon the ground would be attended with confiderable inconveniency. I believe the method I purfue is fafer. I gently tie each handful as clofe as may be to the heads; and then, fpreading out the ends, fet it upright on the ground. Three or four of thefe, together, make one ftook; and into fuch fmall ftooks I divide all the Flax I have. They dry foon, becaufe the wind has free accefs to the ftalks, as the fun has to the heads, and the rain cannot lodge in any quantity upon them.

Rippling comes next. Two men may work at every inftrument, by fixing it on a bench, that one may fit at either end. Let them take fmall handfuls at a time, and draw the Flax through the ripple without violence. Two women to each bench are neceffary to hand the Flax in bundles to the ripplers, to receive it from them again, to fort it according to their feveral degrees of length, ftrength, ripenefs, and finenefs, and to tie it loofely in little fheaves.

After rippling, the feed muft be carried to the grainary, and the Flax laid down to water. If poffible, difpofe of the whole into your ponds together. The fummer, which draws haftily towards an end, is your fitteft feafon, and fhould be hufbanded with care. However, let nothing tempt you to ufe bog holes and running waters. It is better to delay to the next feafon, than difcolour or damage all your Flax.

Cover your Flax, to keep it down, with your flutch or mire at the bottom of your ponds, or, till that be gathered in fufficient quantities, with clay, rufhes, fern, or timber. From four to twelve or thirteen days is the time requifite for watering. After the fourth, examine your Flax daily, and be particularly careful not to let it lie too long. It is a miftake, on the fafer fide, to draw it off the fooneft.

In graffing, the fhorteft grafs fhould be preferred. Dry fandbanks do well. On either the Flax muft be turned every fecond day, and generally lies from a fortnight to three weeks.

To dry your Flax, heat your oven thoroughly; then let it cool, till a man can ftand in it without uneafinefs; fill it over night, and your Flax will be ready for the break next morning. The dirt and ftraws fcutched out of the Flax, in one day, will heat the oven for the next.

When you break your Flax, take fheaf by fheaf out of the oven, as you ufe it: it comes crifp under the engine, works the better and more eafily. It is an error to lay the Flax, as we do, as far as may be from the joint. The nearer it is placed to the center of motion in the break, the more readily it fplits, and the lefs damage it receives.

In fcutching, chufe the broad round fcutch: the fquare and narrow one, in ufe among us, cuts and deftroys the Flax.

By the time the Flax is fcutched, and about the middle of October, it will be time to threfh the feed.

This may be done by driving horfes backwards and forwards on the bows, or by drawing over them a heavy rolling-ftone upon a fmooth hard floor.

Cleaning it requires more nicety. To do it thoroughly, it muft firft go through the winnow, which feparates it from the bows; through the riddle next, to take out ftraws, ftones, and larger dirt; then fucceffively through two different fieves; the firft bored with oval holes, to let through the feed and nothing elfe of greater bulk; the fecond clofer, to retain the feed, and afford a paffage to all fmaller bodies; and laftly through the fcreen or wire-harp, which frees it from all duft.

When the Flax-dreffer has thus cleaned his feed, he fhould return to his Flax, and put it through the fining-mills. The wheel in thefe turns alternately from right to left, and from left to right, twice each way; and, according to the number of thefe double turns, the Flax comes out the finer, the fmoother, and the fofter. Fourfcore fuch turns is the moft that any Flax requires, and probably as much as it will bear.

N. B. For want of thefe fining-mills in Scotland, beating of Flax is directed.

In hackling, women and children fhould be employed from choice. They work with greater gentlenefs than men, and care and tendernefs are the main excellencies in this bufinefs. For the beft Flax, four fets of hackles will be requifite, each of them of a different finenefs: through thefe it may be drawn fucceffively, and every time with proportionable caution. The laft, whofe teeth is like the fineft needles, requires the utmoft fkill, and fhould be trufted with few hands.

FLINTS, in the glafs trade.—The way of preparing Flints for the niceft operations in the glafs trade is this:

Chufe the hardeft Flints, fuch as are black and will refift the file, and will grow white, when calcined in the fire. Cleanfe thefe of the white cruft that adheres to them, and calcine them in a ftrong fire, and throw them while red-hot into cold water; wafh off the afhes that may adhere to them, and powder them in an iron mortar, and fift them through a very fine fieve; pour upon this powder fome weak aqua fortis, or the phlegm of aqua fortis, to diffolve and take up any particles of iron it may have got from the mortar; ftir this mixture feveral times, then let it reft, and in the morning pour off the liquor, and wafh the powder feveral times with hot water, and afterwards dry it for ufe. You will thus have a powder for making the pureft glafs as perfectly fine and faultlefs, as if you had ufed rock cryftal itfelf. *Cramer's Art of affaying Metals.*

The wafhing off the ferrugineous particles with aqua fortis is not neceffary, when the glafs intended to be made is to be tinged with iron afterwards; but, when meant to be a pure white, this is the method to be fure of fucceeding.

FLOS *Afiæ*, in natural hiftory, a name given by Swenkfeld and fome other writers to that falt which is found on the furface of the earth in fome parts of Afia in form of an efflorefcence, and is called the Smyrna foap earth.

FLOWER (*Dict.*)—Tournefort defines it to be a part of a plant very often remarkable for its peculiar colours, for the moft part adhering to the young fruit, to which it feems to afford the firft nourifhment, in order to explicate its moft tender parts. Which definition is ftill more deficient than the fucceeding, by this uncertain mode of expreffion.

Pontedera, profeffor of botany, at Padua, defines it to be a part of a plant unlike the reft in form and nature, always, when the Flower has a tube, adhering or fixed very near to the embryo, to the ufe of which it is fubfervient; but, if the Flower has no tube, not adhering to the embryo. Which definition is not much clearer, being fcarce intelligible to any perfon who has not ftudied botany a confiderable time, as Mr. John Martyn well obferves; and alfo that it is liable to this objection, that it may include fome parts, which no perfon ever called by the name. For a root, or a ftalk, or a leaf, are parts of a plant unlike the reft in form and nature, having no tube, and fo adhering to no embryo's; and thus, by Pontedera's definition, are Flowers.

Monf. Juffieu, the Paris profeffor, feems not to have fucceeded much better in this affair: he fays, that is properly called Flower, which is compofed of chives and a piftillum, and is of ufe in generation. But this is too defective; for that there are many plants in which the piftillum or ftyle is found a confiderable diftance from the chives; many Flowers that have no piftillum, whether that word be taken to fignify the embryo of the fruit, or its appendix; and many which have no chives. But the late Monf. Vaillant feems to be happier, in forming a clearer idea of this part of a plant. We find in a lecture he read in the regal garden at Paris, that the Flowers, ftrictly fpeaking, ought to be reckoned the organs which conftitute the different fexes in plants, feeing they are fometimes found without any covering, and that the coats, or petals, which immediately encompafs them, are defigned only to cover and defend them: but (fays he) as thefe coats are the moft confpicuous and moft beautiful part of the compofition, which is called by the name of Flower; to thefe coats therefore I give the name of Flower, of whatfoever ftructure or colour they be; whether they encompafs the organs of both fexes, together, or contain only one of them, or only fome part depending on one of them; provided always that they be not of the fame figure of the leaves of the plant.

But, in my opinion, Mr. John Martyn has been happier, in his definition of a Flower, than all thofe abovementioned: he defines

defines a Flower to be the organ of generation of both sexes adhering to a common placenta, together with their common coverings; or of either sex separately, with its proper coverings, if it have any.

The parts of a Flower are, 1. The ovary, which is the rudiment of the fruit, and so is properly the female organ of generation. 2. The style, which is a body accompanying the ovary, either arising from the top of it, or standing as an axis in the middle, with the embryo's of the seeds round it.

3. The summits, or apices, which are those bodies that contain the prolific powder, analogous to the male sperm in animals; and generally hang upon slender threads, which are called the chives.

The petals are those tender fine-coloured leaves, which are generally the most conspicuous parts of a Flower.

The empalement, or calyx, is those tender leaves which cover the other parts of a Flower.

Flowers, according to the number of their petals, are called monopetalous, dipetalous, tripetalous, tetrapetalous, &c.

The structure of Flowers is indeed very various: but, according to Dr. Grew, the generality have these three parts in common, viz. the empalement, the foliation, and the attire. *Miller's Gard. Dict.*

FLOS'CULOUS, in botany, a term used by Mr. Tournefort, and others, to express such Flowers of plants as are composed each of a great number of other smaller Flowers placed close to one another, and inclosed in the same common cup; each of these smaller Flowers consists of one petal, which is slender and hollow, and wider than the bottom, and usually divided into many segments, which sometimes are disposed in the form of a star. Each of these Flowers stands upon an embryo, or young fruit, from which there grows a capillament which reaches beyond the Flowers. These embryo's are lodged in the bottom of the cup, which is called by authors the thalamus of the Flower, and finally become seeds winged with down, or sometimes without that, and sometimes are armed with prickles. Of this sort are the flowers of thistles, knapweed, &c. See *Plate* XXII. *fig*. 5. *Tourn. Inst.*

Preservation of FLOWERS. The method of preserving Flowers in their beauty, through the whole year, has been diligently sought after by many people; some have attempted it, by gathering them when dry, and not too much opened, and burying them in dry sand; but this, though it preserves their figure well, yet takes off from the liveliness of their colour. Muntingius gives a method which he says is preferable to all others; this is as follows: gather roses or other Flowers, when they are not yet thoroughly open, in the middle of a dry day; put them into a good earthen vessel glazed within, fill the vessel up to the top with them, and, when full, sprinkle them over with some good French wine with a little salt in it; then set them by in a cellar, tying the mouth of the pot carefully down. After this, they may be taken out at pleasure, and on setting them in the sun, or within the reach of the fire, they will open as if on the tree, and not only the colour, but the smell will be preserved.

Sir Robert Southwell has communicated to the world a method of drying plants, by which all Flowers may be preserved in their natural shape, and many in their proper colours. To this purpose two plates of iron are to be prepared of the size of a large half-sheet of paper, or larger for particular occasions; these plates must be made so thick as not to have any power of bending, and there must be a hole made near every corner for the receiving a screw to fasten them close together.

When these plates are prepared, lay in readiness several sheets of paper, and then gather the plants with their Flowers, when they are quite perfect; let this always be done in the middle of a dry day; and then lay the plant and its Flowers on one of the sheets of paper doubled in half, spreading out all the leaves and petals, as nicely as can be. If the stalk be thick, it must be pared or cut in half, so that it may lie flat; and, if it be woody, it may be peeled and only the bark left; when the plant is thus expanded, lay, round about it, some loose leaves and petals of the Flower, which may serve to compleat any part that may prove deficient; when all is thus prepared, lay several sheets of paper over the plant, and as many under it; then put the whole into the iron plates, laying the papers smoothly on one, and laying the others evenly over them; then screw them close, and put them into an oven after the bread is drawn, and let them lie there two hours; after this make a mixture of equal parts of aqua fortis and common brandy; shake these well together, and, when the Flowers are taken out of the pressure of the plates, rub them lightly over with a camel's hair pencil dipped in this liquor; then lay them upon fresh brown paper, and, covering them with some other sheets, press them between this and other papers with a handkerchief, till the wet of these liquors is wholly dried away. When the plant is thus far prepared, take the quantity of a nutmeg of gum dragon, put this into a pint of fair water cold, and let it stand four and twenty hours; it will in this time be wholly dissolved; then dip a fine hair pencil in this liquor, and with it daub over the back-sides of the leaves, and lay them carefully down on a half-sheet of white paper fairly expanded, and press them with some more papers over these. When the gum water is fixed, let the pressure and papers be removed, and the whole work is finished. The leaves retain their verdure in this case, and the Flowers usually keep their natural colours. Some care must be taken, that the heat of the oven be not too great. When the Flowers are thick and bulky, some art may be used to pare off their backs, and dispose the petals in a due order; and after this, if any of them are wanting, their places may be supplied with some of the supernumerary ones dried on purpose; and, if any of them are only faded, it will be prudent to take them away and lay down others in their stead; the leaves may be also disposed and mended in the same manner. Another way of keeping both Flowers and fruit the whole year, without spoiling, is delivered by the same author in the following manner: take salt-petre, one pound; bole armeniac, two pounds; clean common sand, three pounds; mix all well together; then gather fruit of any kind, that is not full ripe, with the stalk to each; put these in one by one into a wide-mouthed glass, laying them in good order; tie over the top with a sail-cloth, and carry the glass into a dry cellar, and set the whole upon a bed of this prepared matter of four inches thick in a box; fill up the remainder of the box, with the same preparation, and let it be four inches thick over the top of the glass and round all its sides. Flowers are to be preserved in the same sort of glasses in the same manner, and they may be taken up after a whole year as plump and as fair as when buried.

Sexes of FLOWERS.—The learned and ingenious Mr. Watson, in the 47th volume of the Philosophical Transactions, has given us the following curious observations on this subject:

It is in the Flowers of vegetables only, that the parts subservient to generation are produced. Simple Flowers (I use this term in opposition to the compound Flowers of the botanists) are either male, female, or hermaphrodite. By male Flowers, I would be understood to mean those which are possessed only of those organs of generation, analogous to the male parts of animals; and these are what former botanists have denominated stamina and apices, but are named more properly, by Linnæus since, filamentum and anthera. The female Flower is only endowed with parts like those, which perform the office of generation in females; and these are the pistillum and its appurtenances, which by Linnæus, with his accustomed accuracy, are divided into three parts, viz. the germen, stylus, and stigma. The hermaphrodite Flower, which constitutes the great bulk of the vegetable creation, is possessed of all these parts in itself, and is itself thereby capable of propagating its species without any foreign assistance; which, by many incontestable experiments it has been found neither the male nor female Flower simply is able to do.

Much the greater number of plants, as I have just hinted, have hermaphrodite Flowers; but there are some, which have both the male and female Flowers growing from the same root. Such are mays or Indian corn, nettles, box, elm, birch, oak, walnut, beech, hazel, hornbeam, the plane-tree, pine, fir, cypress, cedar, the larch-tree, melons, cucumers, gourds, and several others. In many of these, though the male and female Flowers are at considerable distances, the farina fœcundans, which providence, on account of its being liable to be spoiled by rain, or dissipated by winds, has provided in great abundance, is conveyed to the female by means of the atmosphere. It is this class of vegetables, and the following, the quantity of the produce of which is much more precarious than those plants which have hermaphrodite flowers; as the impregnation of these last may be performed within their own calyx; whereas the former must necessarily commit their farina to the circumambient air. It is for this reason, that, if during the time of the flowering of these plants, the weather is either very wet or stormy, their produce of fruit will be very inconsiderable, from the spoiling or hasty dissipation of the male farina. Thus, independent of frosts, the fruit of the nut and filberd-tree will be most numerous in those years, in which the months of January and February are the least stormy and wet; as at that time their Flowers are produced. For the same reasons, a stormy or wet May destroys the chesnuts; and the same weather in July prodigiously lessens the crop of mays or Indian corn, as its spikes of male Flowers stand lofty, and at a considerable distance from the female. In like manner a judgment may be formed of the rest of these.

Some of the more skilful modern gardeners put in practice, with regard to melons and cucumers, the very method mentioned by Theophrastus two thousand years ago, in regard to the palm-tree. As these plants, early in the season, are in this climate confined to frames and glasses, the air, in which they grow, is more stagnant than the open air, whereby the distribution of the farina fœcundans, so necessary towards the production of the fruit for the propagation of the species, is much hindered; to obviate which, they collect male Flowers, when fully blown, and, presenting them to the female ones, by a stroke of the finger they scatter the farina fœcundans therein, and this prevents the falling of the fruit immaturely. Besides the vegetables before-mentioned, which bear both male and female Flowers upon the same root, there are others, which produce those necessary organs upon different roots. In the number of those are the palm-tree, hops, the willow-tree, misletoe, spinach, hemp, poplar, French and dog's mercury, the yew-tree, juniper, and several others. Among these the valisneria of Linnæus, as to the manner, in which

which its male Flower impregnates the female, is one of the most singular prodigies in nature. The manner of this operation is figured by Micheli, in his Nova Plantarum Genera, and described by Linnæus, in the Hortus Cliffortianus. As that elaborate and expensive work is in very few hands, in such only as owe it to the munificence of Mr. Clifford of Amsterdam, of which number I with pleasure acknowledge myself one, I will here lay before you a short account thereof: The valisneria grows in rivulets, ditches, and ponds, in many parts of Europe. The male plant, which is continually covered with water, has a short stalk, upon the top of which its Flowers are produced. As this top never reaches the surface of the water, the flowers are thrown off from it, and come unopened to the surface of the water; where, as soon as they arrive, by the action of the air, they expand themselves, and swim round the female Flowers, which are blown at the same time.

These last have a long spiral foot-stalk, by which they attain the surface of the water, and, remaining there in Flower a few days, are impregnated by the male Flowers detached from the stalk at the bottom. This operation seems to be thus directed, as the farina fœcundans could not exert its effects in so dense a medium as water; and we find, that even the hermaphrodite Flowers of water-plants, such as those of potamogiton, ranunculus aquaticus, hottonia, and nymphæa, these, I say, never expand themselves, until they reach the surface of the water.

But to return: it was not possible for me, without premising these things, to make evident what I intended, in relation to the falsely denominating the sexes of plants; as it is to this last class that the wrong application has been made by botanical writers. This error seems to have been first introduced so early as by Dioscorides, and has been continued through a great variety of writers even to our own time. It is most certain, that those plants, which produce the seed, ought to be considered as females; but it happens that, in the French and dog's mercury, the seeds are produced in the female plants by pairs; and these are contained in a capsule, which was thought to resemble the scrotum of animals; and from this testiculated appearance they called these plants males, and the others females.

Discorides, when treating of mercurialis, or what we here call French mercury, says, that 'the seed of the female is produced 'in bunches, and is copious; that of the male grows near the 'leaves; that it is small and round, and is dispofed in pairs 'like testicles'. Dodonæus, Lobel, Delechamp, John and Caspar Bauhin, Morrison, Tournefort, and Boerhaave, in their several works, have in this followed Dioscorides, and have denominated the seed-bearing plant of this kind, the male; and the other, the female. Fuchsius and John Bauhin likewise call the cynocrambe or dog's mercury, which bears fruit, the male; and the spiked one with male flowers only, the female. This mistake is observable in hemp, hops, and spinach.

We observe, that the operations of nature are carried on most usually by certain general laws, from which however she sometimes deviates. Thus almost all plants have either hermaphrodite Flowers, or male and female Flowers, growing from the same root, or male and female Flowers from different roots: but there are a few of another class, which from the same root furnish either male and hermaphrodite Flowers, or female and hermaphrodite Flowers. Of this kind are the mulberry-tree, the mura or plantain-tree, white hellebore, pellitory, arrach, the ash-tree, and a few others. But of this class the empetrum or berry-bearing heath is the most extraordinary; as of this are found some plants with male Flowers only, others with both male and female Flowers separately, and still others with hermaphrodite flowers. *Philos. Transf.* Vol. XLVII.

The learned Dr. Alston, king's botanist in Scotland, has endeavoured to overturn the whole doctrine of the sexes of plants, by shewing that the farina fœcundans, is not necessary to the producing of the fertile seeds. We shall add the following instances which he has brought to support his doctrine:

In the spring 1737, I transplanted three sets of common spinage, long before it could be known, whether they were flowering or seed-bearing plants, from a little bed on which they were raised, into a place of the garden, full eighty yards distant, and almost directly south; there being two haw-thorn, and three holly hedges, all pretty thick and tall, between them and their seed bed; and no other spinage in the garden, nor so near them by far: all the three proved fertile plants, and ripened plenty of seeds. I sowed them, they grew, and prospered as well as any spinage seed possibly could do. This, I own, made me, at first, call in question the sexes of plants, which I formerly too implicitly believed.

The same year, a few plants of the common hemp, which I had raised for a specimen from the seed, being accidentally destroyed when very young; and finding afterwards, about the end of June, a pretty strong but late plant of hemp, growing in the inclosure to the east of Holyrood house, commonly called the bowling green, by itself: I caused great care to be taken of it; there not being that year any hemp raised within a mile of it, that I could find. This plant grew luxuriantly; and, though bad weather in the autumn made me pluck it up a little too soon, yet I got about thirty good seeds from it, which the succeeding spring produced as thriving male and female plants as if the mother hemp had stood surrounded with males. And, In the spring 1741, I carried too young seedling plants of the French mercury, long before there was any in flower, from the city physic garden, the only place where it was then to be found in this country, to the king's garden at the abbey, which are more than 700 yards distant from one another, with many high houses, trees, hedges, and part of a hill between them; and planted one of them in one inclosure, where it was shaded from the sun the greatest part of the day; and the other, in another, twenty-five yards distant, exposed to the south and west. Both plants ripened fertile seeds; and the last shed them so plentifully, that it proved a troublesome weed for several years: though none of the species was to be found in that garden, for more than twenty years preceding.

Hence, the dust of the apices of these species of plants cannot, on any account, be called their genitura. And the same may be said of the lupulus, according to Mr. Tournefort's observation; of the bryonia, as noticed by Mr. Miller; also of Mr. Geoffroy's mays.

One year, observing two strong tulips growing together, in an inclosure surrounded with a tall and thick quick-set haw-thorn hedge; I cut down two or three more tulips, which stood at some distance from them so as to leave none within that inclosure, save the two I mentioned: out of these, gently opening the petala, I plucked all the stamina with their apices still intire. The consequences of this too rude castration, were a considerable extravasation of the juices, in the bottom of the flower, and a sudden decay of the ovarium or fruit, which never increased, but turned yellow, shrunk, and withered. In order to discover whether this abortion was owing to the wounds, or to the want of the dust of the apices; I suffered these two tulips to remain in the place where they were: and next season, with the same precaution that no other tulips should flower within the inclosure, I opened the petala, and took out carefully, not the stamina, only, but all the apices; which prevented any sensible bleeding of the parts. This more gentle castration they bore perfectly well; the ovarium suffered nothing, in either of them, but increased, and came to maturity, quite full of seeds. See the *Essays, Physical and Literary, read before a Society in Edinburgh*, Vol. I.

FLOWER-*root worm*, in natural history, a peculiar species of fly-worm, which makes its habitation only in the bulbous roots of Flowers. The roots of the narcissus, at the time they are taken up out of the earth toward the end of autumn, very frequently are found to contain in each a single worm, which eats and destroys them. Sometimes one root is found to contain two of them; but this is but rarely the case. The roots which have them may easily be known, by having each a round hole in some part, at which the destroyer has entered, while it was small, and which probably serves it now in its larger state for the respiration of the freer air. The interior part of these bulbs is always found rotted and destroyed, and the worm is found in these, lying in a brown sort of dirt made by its own liquid excrements, mixed among the fragments of the coats of the root which it has destroyed. *Reaumur's Hist. Insect.*

FLOWERING *of bulbous plants.* — The best method of managing the whole process is this: place the bulbs at first only on the surface of the water; for thus they will strike out their fibres most strongly. When they have stood thus six weeks, pour in the water so high as to cover them intirely, and keep them at this standard till they have done Flowering.

Sometimes the roots will become mouldy in several parts, while they stand above the water; and the cleaning them of it is to no purpose, for it will eat and spread the farther, and frequently eat through two or three of their coats. In this case, they must be immediately covered with water, and the mould will be stopped, and they will become sound, and flower as well as those which never had any such distemperature. If the roots are suffered to remain in water all the year, they will not decay, but will flower again at their proper season, and that as vigorously as those which are taken out and dried. The old fibres of these roots never rot till they are ready to push out new ones. It is found by experience, that the hyacinth, and many other plants, grow to a greater perfection thus in water, than when in the ground. There is a peculiar species of hyacinth, called Keyser's jewel; this never, or however very rarely, produces seed vessels in the common way of Flowering in the ground, but it often will produce some pods when blown in water. Mr. Miller has intimated, in the Philosophical Transactions, that bulbs, set in water, grow weaker, and should be renewed with fresh ones every other year; but it is found that, when they are managed in this manner, and kept under water, at the time of taking them up, they are as large, and some of them larger and stronger than when planted; and, if these be dried in a proper season, they will flower year after year as well as the fresh ones.

Ranunculus and anemone roots have been found to shoot up their stalks very well in this way, but the flowers are usually blasted, which seems to arise from want of free air. Pinks will flower very well in this manner, and auriculas thrive very well, and may with care be brought to flower, but not strongly. Roses, jessamines and honey-suckles, may also be made to flower this way, and will thrive and send out suckers; the best pieces to plant are suckers cut off about three inches under ground, without any fibres.

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The succulent plants may also be raised this way, for instance an opuntia or Indian fig. If a fragment of a leaf of this plant be cut and laid by to dry for a month, till it is an absolute skin, as soon as it is put in this manner into water, it begins to plump up, and soon sends out fibrous roots, and produces new leaves, at least as quickly as it would do in the ground. *Philos. Transf.* N°. 432.

FLOX, in the colour trade, a very well cleaned wool used to absorb the colours of cochineal, &c. It is prepared in this manner: infuse a pound of the finest sheering of woollen cloth in cold water for one day, then take them up, and press them well together to wash off the unctuosity the wool naturally has. This is the simple Flox, which, when impregnated with a solution of alum, is called alumed Flox; this is done in the following manner: take four ounces of roach alum, and two ounces of crude tartar, both in fine powder; put them into an earthen vessel with three quarts of water, set it over the fire, and, when it begins to boil, then put it into the Flox; let the liquor now boil half an hour over a gentle fire, then take it off, and when all is perfectly cooled, wash the Flox with fair water, letting them stand in it two hours, then press them in the hand and let them dry. *Neri's Art of Glass.*

FLUVIATILES *Cochleæ*, fresh water shell fish, a term used by naturalists to express those kinds of shell fish which never inhabit the sea, but are found in our ponds, rivers, and ditches. These, though greatly less numerous than the species of sea shells, are yet of greater variety and beauty, than is usually supposed.

FLUIDS (*Dict.*) — Under this article in the Dictionary, we have observed that the surface of a Fluid becomes level by its own gravity, when no external force prevents its being so. The demonstration of this is founded upon a supposition, that bodies tend downwards by their gravity in lines parallel to each other; which, though physically true, is not strictly so, their tendency being towards the center of the earth, and consequently in lines which meet in a point: and therefore, if we would be accurate, the Fluid contained in a vessel should be considered, as divided into columns and strata, as represented *plate* XXX. *fig.* 6. in the Dictionary, where A B D is the earth, C its center, E F G H a Fluid contained in a vessel, and divided into columns, which, if continued down to the center of the earth, would there terminate in a point C; and into the concentric strata, *a b*, *c d*, &c. having the center of the earth for the center of their convexity. And then we should find that the particles of the Fluid will not be in æquilibrio with each other, till all the parts of its surface are at equal distances from the center of the earth, forming thereby the surface E F, concentric to that of the earth. For, supposing the Fluid E F G H continued down to C, so as to fill the space E C F; it is evident the columns, into which the Fluid is divided, cannot be of equal lengths, and therefore cannot be of an exact counterpoise to each other, unless the surface E F is a portion of a sphere, whose center is C: but the action of the parts of the Fluid upon each other, at the surface, is the same, whether the lower part G C H be a Fluid, or not. Consequently the surfaces of Fluids are not level or plain, but convex, having the center of the earth for the center of their convexity.

This convexity, by reason of the great distance of the earth's center, approaches so near to a plane, that, in small portions of it, the difference is not sensible, and therefore may be neglected: but at sea it is evident to sense; for, when the mariners put to sea, the shore first disappears, then the lower buildings, afterwards the towers, mountains, &c. in like manner, when they approach a distant ship, the top of its mast and sails appears first, while the ship itself is intercepted from their view, by the convexity of the water between them.

FLY, in natural history. — As weak and contemptible as this creature may appear to us, there is scarce any species of the insect, but what is furnished with five or six advantages that are perpetually serviceable to it in all its necessities. For instance, it has excellent eyes, it has likewise antennæ, or horns, wings, claws, sponges, and a trunk.

Its eyes, as well as those of beetles and dragon flies, are of a peculiar structure: they are two little crescents, or immoveable caps, disposed round the head of the insect, and comprehending a prodigious number of minute eyes, or crystalline humours, ranged like lentils, in lines crossing each other, in the form of lattice work. Under these one may discover a set of fibres, or optic nerves, corresponding in number to the external divisions, or little planes; and curious observers will tell you, they have counted several thousands in each combination. But, whatever their number may be, it is certain that all these planes are a collection of eyes, on which, as on so many mirrors, outward objects are painted. One may see the figure of a lighted taper multiplied almost to infinity, on their surfaces, and shifting its beams into each eye, in proportion to its being varied in its motions by the observer's hand.

The eyes of other creatures are multipled by motion, if I may use that expression; whereas those of a Fly are fixed and immoveable, and can only see what lies directly before them; they are very numerous therefore, and placed on a round surface, some in a high, others in a low situation, to inform the Fly of every thing wherein she can be interested. She has a number of enemies, but, with the aid of these eyes that surround her head, she discovers whatever danger threatens her from above, behind, or on either side, even when she is in full pursuit of a prey directly before her; and the same object is as distinctly perceived by that profusion of eyes, as it by us, who behold it with no more than a couple.

In the microscope, the round edgings, together with the glazed substance and fringe of its wings, appear surprizingly beautiful. There we observe seven or eight articulations, two bending claws, and several minute points, on each of its paws; the double packet of sponges, placed below, at the juncture of its claws, is admirable. Some naturalists suppose, that, when this animal marches over any polished body, on which neither her points nor claws can fasten, she sometimes compresses her sponge, and causes it to evacuate a fluid, which fixes her in such a manner as prevents her falling, without diminishing the facility of her progress. But it is much more probable that sponges correspond with the fleshy balls, which accompany the claws of dogs and cats; and that they enable the Fly to proceed with a softer pace, and contribute to the preservation of its claws, whose pointed extremities would be soon impaired without this prevention. Beside these sponges, her paws are shaded with a growth of hair, which she employs instead of a brush to clean her wings and eyes.

Her trunk is composed of two parts, one of which folds over the other, and both of them are sheathed in her mouth. The extremity of this trunk is sharp like a knife, to enable her to cut what she eats. She likewise forms it into two lips, that she may the better take up proper quantities of food; and, when she sucks up the air it contains, she employs it, as a pump, for drawing up liquors. Several Flies, at the other extremity of their body, are furnished with a piercer, above three twelfths of an inch in length, with which they penetrate wherever they please, and then sheathe it between their scales. This instrument consists of several parts, as particularly one or two saws, finely pointed at the end, and well indented through the whole length; a long case to inclose them; a system of muscles to unsheathe them; and a set of fibres, to bring them back to their socket. Its last piece of furniture is a bag of corroding water, to eat into the cavities that have been first opened by the saws. Those Flies that penetrate the leaves of the oak, are furnished with such a piercer as I have already described.

Those, whose punctures are seen in the bark of rose-trees, have one of a very different structure. It is formed into a long tube, which terminates in a bending point, like a pruning-knife, and is accompanied, through its whole length, with several ranges of teeth. The Fly first traces out, with the sharp part of this instrument, a small furrow on the branch of a rose-tree, after which she places the long indented tube on that furrow, and then, by twining and returning the whole instrument, she opens, on all sides, a number of cells, which appear like ranges of teeth, disposed in pairs, along the extent of a line that separates them.

The same tube likewise enables her to deposit an egg in each cavity, and, when the heat has at last hatched the little worm in the egg, it quits its mansion, to gnaw a leaf of the rose-tree, and gradually increases in growth, like a small caterpillar. The animal, at the end of six weeks, and after it has frequently changed its skin, ceases to eat, and descends to the lower part of the tree, where it spins a covering around its body. The Fly, contained in this worm, endeavours to force itself a passage through the skin of that creature, and accomplishes her purpose by degrees. The skin of the worm cleaves open, and shrinks with the head and intestines, that are now become useless. The fluid in which the Fly swims, and which might possibly contribute to its disengagement from the worm, begins to dry all around the new animal, and is then converted into a kind of bag or shell, which makes the Fly seem in a state of inactivity, and even without any symptoms of life. She either continues but a short space of time in the state of an aurelia, or else passes the whole winter in that situation, according to the degree of heat she then experiences. These few instances will enable us to judge of the instruments with which each species is accommodated, and of the various changes through which they pass.

The common Fly, instead of a piercer qualified for penetrating wood, has only a tube, with which she deposits her eggs, in flesh that has been softened by heat, and likewise in all substances that are succulent or milky, and salted but little; because the sharp particles of salt are more apt to tear the tender organs of her young, than contribute to their preservation. From these eggs proceed a brood of worms, who, afterwards change to aurelia's, and then to Flies; I omit the consequences of their extreme fecundity, and shall only observe, that neither the lion's threat, nor the wolf's teeth, nor all the horns and fangs of wild beasts, in their united rage, are so pernicious to man, as this little piercer, which nature has bestowed on a common Fly, to dig a repository for her eggs. The case is not the same with ichneumon Flies, and several other species; for they are in some measure beneficial to us. The generality of these creatures sustain and shelter themselves in some particular plant, and it is to their sollicitude to lay their eggs there that we owe both the invention and materials of the finest colours, used either in dying or painting, as also the deepest black, common ink, scarlet, and many more.

FLY-*tree*, in natural hiſtory, a name given by the common people of America to a tree, whoſe leaves, they ſay, at a certain time of the year, produce Flies. On examining theſe leaves about the middle of ſummer, the time at which the Flies uſe to be produced, there are found on them a ſort of bags of a tough matter, of about the ſize of a filbert, and of a duſky greeniſh colour; on opening one of theſe bags with a knife, there is uſually found a ſingle full-grown Fly, of the gnat kind, and a number of ſmall worms, which in a day or two more have wings and fly away in the form of their parent. The tree is of the mulberry kind, and its leaves are uſually very largely ſtocked with theſe inſect bags, and the generality of theſe are found to contain the inſects in the worm ſtate; when they become winged, they ſoon make their way out. The bags begin to appear when the leaves are young, and afterwards grow with them; but they never rumple the leaf, or injure its ſhape. They are of the kind of leaf galls, and partake in all reſpects, except ſize, of a ſpecies we have frequent on the large maple, or, as it is called, the ſycamore. *Philoſ. Tranſ.* N°. 431.

The Fly-tree is found in many parts of France, where it grows in great abundance, and is there ſaid to bear fruit, which give origin to vaſt numbers of Flies.

The truth of the matter is this: the tree is a ſpecies of turpentine-tree, and frequently produces or gives origin to certain tubercles, which in the common turpentine-tree are called horns. Theſe are a ſort of long bladders of the length and thickneſs of a finger, which ariſe not from the ſtalks as fruits do, but from the ſurface of the leaves, and are only a kind of an elongation of its outer membranes, occaſioned by the punctures of a number of inſects contained within it, which occaſions a derivation of freſh juices to the part. Theſe inſects are not Flies of the common kind, but are the pucerons ſo well known for feeding on the leaves and tender ſtalks of trees; and ſome few of theſe only are winged, the others being deſtitute of them. The origin of theſe tubercles or bladders is this: the female puceron, as ſoon as produced from the parent, makes a way under the membrane that covers the leaf by means of a hole bored in it with her trunk. The hole ſoon heals up after ſhe is in, and the young ones which ſhe afterwards produces, by their wounding and ſucking the ſides of the lodgement in which they find themſelves placed, occaſion all the ſwelling and growth of the tubercle. *Reaumur's Hiſt. of Inſects.*

FLY, in the ſea language, that part of the mariner's compaſs on which the thirty-two winds are drawn, and to which the needle is faſtened underneath.

FLYING *Fiſh*, a name given by the Engliſh writers to ſeveral ſpecies of fiſh, which by means of their long fins have a method of keeping themſelves out of water for ſome time. The Flying fiſh, moſt properly ſo called, is the exocœtus of the ancient authors, and of Artedi. See *plate* XXII. *fig.* 8. It is called alſo the Adonis, hirundo, and mugil alatus or winged mullet, by others; but they uſe theſe words indeterminately for this and the other kinds.

FOAL, or COLT, the young of the horſe kind. The word colt, ſimply ſpoken, is among the dealers underſtood to mean the male kind; the female, or mare colt, being called a filly.

Colts are uſually foaled in the beginning of ſummer, and it is the cuſtom to let them run with the mare till Michaelmas, when they are to be weaned. This is to be done ſooner or later according as the cold weather comes in. Some are for not having them weaned till the middle of November, and three days before the full of the moon, if it happen near that time. And ſome of the beſt writers on this ſubject are of opinion, that we do not let the Foals ſuck long enough, and that this is the reaſon, why they are ſo very long before they are fit for uſe. Theſe authors are of opinion, that a colt ought always to ſuck the whole winter, and that this would make them fit for ſervice a great deal ſooner than they are at preſent.

When firſt weaned, they muſt be kept in a convenient houſe with a low rack and manger for hay and oats, that they may eat freely and eaſily; and the hay muſt be very ſweet and fine, eſpecially at firſt; a little wheat bran ſhould be mixed with the oats, in order to keep their bodies open, and make them eat and drink freely.

It has been obſerved, that the eating too much oats has rendered colts blind; but the cauſe has been wrongly attributed to the heating quality of the oats. If the oats are bruiſed in a mill before they are given them, though they eat ever ſo much of them, there never happens any miſchief of this kind; but, endeavouring with their teeth to break and chew them, when whole, they are apt to ſtretch and ſwell the veſſels of the head, and occaſion a fulneſs of blood about the eyes, which often terminates in inflammations, and in blindneſs.

The difficulty of chewing oats, and not their heating nature, is therefore the true reaſon of this miſchief; and, if this be obviated by the firſt bruiſing the grain, the colt always grows the better for eating it. His legs do not grow thick, but he becomes broader and better knit, and, as he grows up, will bear fatigue much better than if he had been fed only with bran and hay. Above all things, theſe creatures ſhould be kept from wet and cold, while they are young; for nothing is more tender than a colt, and the miſchiefs he gets at this time are not ſo eaſily got over. Experience ſhews the great advantage of houſing and taking care of colts: for, if the ſame ſtallion covers two mares, both alike in age, beauty, and other particulars, and theſe bring both Foals of the ſame ſex, ſo that there is no room to expect the leaſt difference between them; let one of theſe colts be houſed every winter, and let the other always run abroad, it will be found, as they grow up, that the colt which has been kept abroad, ſhall have large fleſhy ſhoulders, flabby and gouty legs, weak paſterns, and bad hoofs, and ſhall be a dull heavy creature; and that the other which has been houſed and taken care of, ſhall have a fine fore-hand, be well ſhaped, have good legs, and good hoofs, and be of good ſtrength and ſpirit. From this it may be learned, that it is of no conſequence to have a good ſtallion, and a good mare, if the colts are ſpoiled in the breeding up.

FŒNICULUM, *fennel, or finckle*, in natural hiſtory, a genus of plants whoſe characters are:

The root is fibrous; the leaves capillaceous; the petals of the flowers entire, the ſeeds oblong, ſomewhat thick, gibbous, and ſtriated. Our ordinary fennel has pretty large, thick, white roots, which run deep into the earth without much dividing, beſet with ſmall fibres. It has large winged leaves, branched into ſeveral ſegments of long, ſlender, very fine, capillaceous parts, of a dark-green colour, and ſometimes a little reddiſh; the ſtalk grows to be four or five feet high, much divided, and full of whitiſh pith: the flowers grow on the tops of the branches, in flat umbels, of ſmall yellow five-leaved flowers, each of which is ſucceeded by a couple of roundiſh, ſomewhat flat, ſtriated ſeed. The whole plant has a pretty ſtrong but not unpleaſant ſmell. It is generally planted in gardens to be near at hand, but it grows wild in ſeveral places towards the ſea-coaſt; and, at Woolwich and Graveſend, it is frequently met with: it flowers in June. The leaves, root, and ſeed are in uſe; the root being one of the five opening roots, and the ſeed one of the great carminative ſeeds.

Nutrition of the FŒTUS. How the nutrition of the Fœtus is performed, is diſputed among the learned. Mr. Monro is of opinion, that the Fœtus in viviparous animals is nouriſhed by the navel alone. He has given a curious diſſertation on this ſubject in the Medical Eſſays. Where he obſerves, 1. That the Fœtus is capable of receiving its whole nouriſhment by the umbilical vein alone, whereas no Fœtus can ſubſiſt without the umbilical veſſels. 2. That the liquor of the amnios is ill calculated, in its natural ſtate, for the food of a Fœtus, and becomes altogether unfit food in morbid caſes. 3. That it is highly improbable that a creature ſhould furniſh its ſubſtance out of its own body, which muſt be the caſe, if the Fœtus feeds on the liquor of the amnios. 4. That it cannot be inferred, from any reſemblance of the liquor of the ſtomach and amnios, nor from any other appearances, that the liquor of the amnios is ever ſent down into the ſtomach. 5. That no direct proof can be had of the liquor of the amnios being preſſed or ſwallowed down; but, on the contrary, all circumſtances make it probable, that it does not go down. 6. That all the phænomena of a Fœtus can moſt reaſonably be accounted for, without ſuppoſing the liquor of the amnios to be any part of its food; hence, he thinks it reaſonable to exclude the mouth from the office of conveying the aliment of the Fœtuſes of viviparous animals, and to believe that all their nouriſhment is conveyed by the umbilical veſſels. Hippocrates among the ancients was of opinion, that the Fœtus was nouriſhed both by the mouth, and by the umbilical veſſels. He maintains, that the child in the womb with its lips compreſſed together attracts nouriſhment, for which he aſſigns this reaſon, that, unleſs the child had ſucked in utero, it neither could depoſit excrement, nor know how to ſuck, ſo ſoon as it is born. Mr. Gibſon, in the Medical Eſſays of Edinburgh, has lately adopted this opinion, that the Fœtus is nouriſhed by the mouth and by the navel alſo, as moſt probable. Mr. Monro has anſwered him, loc. cit.

St. FOIN. See SAINTFOIN.

FOLDING *of ſheep*, a term uſed by our farmers to expreſs the keeping theſe creatures on their arable lands, within folds made of hurdles, which they remove about, ſo that, when the ſheep have dunged one place, they are ſet upon another. This is a very great advantage to the land; the dung of theſe creatures being a very rich manure. It ought only to be done in ſummer time, and in good weather, for the Folding them in bad weather is apt to give them the rot. Care muſt be taken that they are only driven into theſe folds over night, and let out again in the morning, half an hour after ſun-riſe, into places where there is good food; for, being hungry at this time, they will eat whatever comes next them. Many ſheep are ruined by this practice in moiſt ground, and ſome farmers who think all Folding very bad for ſheep, only ſtick up ſloping ſtakes in ſuch parts of the lands as they would have dunged, and never fold the ſheep at all, but truſt to their coming to theſe ſtakes to rub themſelves for the dunging the ground, as they conſtantly void their dung and urine at that time. *Mortimer's Huſb.*

FOOD *of plants*, that matter, which, being added and united to the firſt ſtamina of plants, cauſes their increaſe.

It is agreed, that all the following materials contribute, in ſome manner, to the increaſe of plants; but it is diſputed which of them is that very increaſe or food.

1. Nitre. 2. Water. 3. Air. 4. Fire. 5. Earth.

Nitre is uſeful to divide and prepare the Food, and may be ſaid to nouriſh vegetables in much the ſame manner as my knife

knife nouriſhes me, by cutting and dividing my meat: but, when nitre is applied to the root of a plant, it will kill it as certainly as a knife miſapplied will kill a man: which proves, that nitre is, in reſpect of nouriſhment, juſt as much the Food of plants, as white arſenic is the Food of rats. And the ſame may be ſaid of ſalts.

Water, from Van-Helmont's experiment, was by ſome great philoſophers thought to be it. But theſe were deceived, in not obſerving that water has always in its intervals a charge of earth, from which no art can free it. This hypotheſis having been fully confuted by Dr. Woodward, no-body has, that I know of, maintained it ſince: and to the doctor's arguments I ſhall add more in the ſequel.

Air, becauſe its ſpring, &c. is as neceſſary to the life of vegetables, as the vehicle of water is; ſome modern virtuoſi have affirmed, from the ſame and worſe arguments, than thoſe of the water-philoſophers, that air is the Food of plants. Mr. Bradley being the chief, if not only author, who has publiſhed this phantaſy, which at preſent ſeems to get ground; it is fit he ſhould be anſwered: and this will be eaſily done, if I can ſhew, that he has anſwered this his own opinion, by ſome or all of his own arguments.

His firſt is that of Helmont, and is thus related in Mr. Bradley's general Treatiſe of Huſbandry and Gardening, Vol. I. 'Who dried two hundred pounds of earth, and planted a willow of five pounds weight in it, which he watered with rain, or diſtilled water; and, to ſecure it from any other earth getting in, he covered it with a perforated tin cover. Five years after, weighing the tree, with all the leaves it had borne in that time, he found it to weigh one hundred ſixty-nine pounds three ounces; but the earth was only diminiſhed about two ounces in its weight.'

On this experiment Mr. Bradley grounds his airy hypotheſis. But let it be but examined fairly, and ſee what may be thence inferred.

The tin cover was to prevent any other earth from getting in. This muſt alſo prevent any earth from getting out, except what entered the roots, and by them paſſed into the tree.

A willow is a very thirſty tree, and muſt have drank in five years time ſeveral tons of water, which muſt neceſſarily carry in its interſtices a great quantity of earth, probably many times more than the tree's weight, which could not get out, but by the roots of the willow.

Therefore the two hundred pounds of earth not being increaſed, proves that ſo much earth as was poured in with the water, did enter the tree.

Whether the earth did enter to nouriſh the tree, or whether only in order to paſs through it (by way of vehicle to the air) and leave the air behind for the augment of the willow, may appear by examining the matter of which the tree did conſiſt. If the matter remaining after the corruption or putrefaction of the tree be earth, will it not be a proof, that the earth remained in it, to nouriſh and augment it? For it could not leave what it did not firſt take, nor be augmented by what paſſed through it. According to Ariſtotle's doctrine, and Mr. Bradley's too, in Vol. I. 'Putrefaction reſolves it again into earth, its firſt principle'.

The weight of the tree, even when green, muſt conſiſt of earth and water. Air could be no part of it, becauſe air, being of no greater ſpecific gravity than the incumbent atmoſphere, could not be of any weight in it; therefore was no part of the one hundred ſixty-nine pounds three ounces.

Nature has directed animals and vegetables to ſeek what is moſt neceſſary to them. At the time when the fœtus has a neceſſity of reſpiration, it is brought forth into the open air, and then the lungs are filled with air. As ſoon as a calf, lamb, &c. is able to ſtand, it applies to the teat for Food, without any teaching. In like manner Mr. Bradley remarks, in his Vol. I. 'That almoſt every ſtem and every root are formed in a bending manner under-ground; and yet all theſe ſtems become ſtraight and upright when they come above-ground, and meet the air; and moſt roots run as directly downwards, and ſhun the air as much as poſſible'.

Can any thing more plainly ſhew the intent of nature, than this his remark does? viz. That the air is moſt neceſſary to the tree above-ground, to purify the ſap by the leaves, as the blood of animals is depurated by their lungs: and that roots ſeek the earth for their Food, and ſhun the air, which would dry up and deſtroy them.

No one truth can poſſibly contradict or interfere with any other truth; but one error may contradict and interfere with another error, viz.

Mr. Bradley, and all authors, I think, are of opinion, that plants of different natures are fed by a different ſort of nouriſhment; from whence they aver, that a crop of wheat takes up all that is peculiar to that grain; then a crop of barley all that is proper to it; next a crop of peaſe, and ſo on, till each has drawn off all thoſe particles which are proper to it; and then no more of theſe grains will grow in that land, till, by fallow, dung, and influences of the heavens, the earth will be again repleniſhed with new nouriſhment, to ſupply the ſame ſorts of corn over again. This, if true (as they all affirm it to be,) would prove, that the air is not the Food of vegetables. For the air, being in itſelf ſo homogeneous as it is, could never afford ſuch different matter as they imagine; neither is it probable, that the air ſhould afford the wheat nouriſhment more one year, than the enſuing year; or that the ſame year it ſhould nouriſh barley in one field, wheat in another, peaſe in a third; but that, if barley were ſown in the third, wheat in the firſt, peaſe in the ſecond, all would fail: therefore this hypotheſis of air for Food interferes with, and contradicts this doctrine of neceſſity of changing ſorts.

I ſuppoſe, by air, they do not mean dry particles of earth, and the effluvia which float in the air: The quantity of theſe is too ſmall to augment vegetables to that bulk they arrive at. By that way of ſpeaking they might more truly affirm this of water, becauſe it muſt be like to carry a greater quantity of earth than air doth, in proportion to the difference of their different ſpecific weight; water, being about 800 times heavier than air, is likewiſe to have 800 times more of that terreſtrial matter in it; and we ſee this is ſufficient to maintain ſome ſort of vegetables, as aquatics; but the air, by its charge of effluvia, &c. is never able to maintain or nouriſh any plant; for, as to the ſedums, aloes, and all others, that are ſuppoſed to grow ſuſpended in the air, it is a mere fallacy; they ſeem to grow, but do not; ſince they conſtantly grow lighter, and though their veſſels may be ſomewhat diſtended by the ferment of their own juices, which they received in the earth, yet, ſuſpended in air, they continually diminiſh in weight (which is the true augment of a plant) until they grow to nothing. So that this inſtance of ſedums, &c. which they pretend to bring for proof of this their hypotheſis, is alone a full confutation of it.

Yet if granted, that air could nouriſh ſome vegetables by the earthy effluvia, &c. which it carried with it, even that would be againſt them, not for them.

They might as well believe, that martins and ſwallows are nouriſhed by the air, becauſe they live on flies and gnats, which they catch therein; this being the ſame Food, which is found in the ſtomach of the chameleon.

If, as they ſay, the earth is of little other uſe to plants, but to keep them fixed and ſteady, there would be little or no difference in the value of rich and poor land, dunged or undunged; for one would ſerve to keep plants fixed and ſteady, very near, if not quite, as well as the other.

If water or air was the Food of plants, I cannot ſee what neceſſity there ſhould be of dung or tillage.

Fire. No plant can live without heat, though different degrees of it be neceſſary to different ſorts of plants. Some are almoſt able to keep company with the ſalamander, and live in the hotteſt expoſures of the hot countries. Others have their abode with fiſhes under water, in cold climates: for the ſun has his influence, though weaker, upon the earth covered with water, at a conſiderable depth; which appears by the effect the viciſſitudes of winter and ſummer have upon ſubterraqueous vegetables.

Though every heat is ſaid to be a different degree of fire, yet we may diſtinguiſh the degrees by their different effects. Heat warms, but fire burns: the firſt helps to cheriſh, the latter deſtroys plants.

Earth. That which nouriſhes and augments a plant, is the true Food of it.

Every plant is earth, and the growth and true increaſe of a plant is the addition of more earth.

Nitre (or other ſalts) prepares the earth, water and air move it, by conveying and fermenting it in the juices; and this motion is called heat.

When this additional earth is aſſimilated to the plant, it becomes an abſolute part of it.

Suppoſe water, air, and heat, could be taken away, would it not remain to be a plant, though a dead one?

But, ſuppoſe the earth of it taken away, what would then become of the plant? Mr. Bradley might look long enough after it, before he found it in the air amongſt his ſpecific or certain qualities.

Beſides, too much nitre (or other ſalts) corrodes a plant; too much water drowns it; too much air dries the roots of it; too much heat (or fire) burns it; but too much earth a plant never can have, unleſs it be therein wholly buried; and, in that caſe, it would be equally miſapplied to the body, as air or nitre would be to the roots.

Too much earth, or too fine, can never poſſibly be given to roots; for they never receive ſo much of it, as to ſurfeit the plant, unleſs it be deprived of leaves, which, as lungs, ſhould purify it. And earth is ſo ſurely the Food of all plants, that with the proper ſhare of the other elements, which each ſpecies of plants requires, I do not find but that any common earth will nouriſh any plant. *Tull's Horſe-hoeing Huſbandry.*

FORCE *of bodies in motion.* It has been a famous diſpute among philoſophers, 'whether the Force of bodies in motion, ſtriking each other, be proportional to the ſimple velocity of the motion, or to the ſquare of the velocity'? The Engliſh and French maintain the former; the Dutch and Germans the latter.

This diſpute firſt commenced between Mr. Huygens and the abbot Catalan, about the Force of oſcillating bodies; it continued ſome time between theſe two gentlemen; at laſt, another ſubject of the ſame kind engaged the ſaid abbot with the famous Leibnitz, who is to be eſteemed the firſt author, that plainly

plainly declared, in expreſs words, 'That the Forces of bodies 'were as their maſſes multiplied by the ſquare of the velocity.' Catalan, and afterwards Mr. Papin, anſwered Leibnitz; he replied again, and ſeveral papers were written on the ſubject. It then became a matter of general enquiry, and the philoſophers of every nation began to conſider which ſide to be of, and whether they ſhould declare for the old or for the new opinion. However, they did here, as they do in religion, go by a whole nation together; the common herd of philoſophers following the dictates of their leaders. Thus Leibnitz, Polenus, S'Graveſande, and Muſchenbroek led the German and Dutch; Papin, Mairan, &c. the French; and Pemberton, Eames, Deſaguliers, Clarke, &c. the Engliſh.

In this controverſy alſo, as in thoſe of religion, the opponents diſputed with very great warmth, wondered at each other's ſlowneſs of apprehenſion, or backwardneſs of belief; and I wiſh I could ſay, that they had always obſerved ſuch an impartial, free, and generous behaviour and ſtile of expreſſion, as the dignity of philoſophy demands. We ſhould then perhaps have found Dr. Deſaguliers better employed than in blaming Dr. Samuel Clarke for uncivil treatment, for rude and impertinent expreſſions, &c. in regard to thoſe who defend the new opinion of the ſquare of the velocity.

As it uſually falls out in other caſes, ſo here, when men find themſelves preſſed with difficulties and abſurdities in their ſchemes and notions, they have recourſe to the ſubtilties of metaphyſical diſtinctions, though ſeldom to any good purpoſe. Thus when it appeared too plainly by all experiments, and even to common ſenſe, that the natural Force of bodies was proportional to the ſimple velocity and maſs of matter conjointly; we were told it was neceſſary to diſtinguiſh the Force of bodies into two kinds, viz. the vis viva or living Force; and the vis mortua, or the dead Force.

By this vis viva, or living Force, we were to apprehend that which reſulted from the viſible action of one body upon another, as that of a falling weight; but the vis mortua or dead Force was to be underſtood of that which was deſtroyed by a contrary agent, as a weight in one ſcale of a balance is kept from deſcending by a counter-poiſe in the other ſcale. But, unluckily for the author of this refinement, both thoſe Forces appear, even by the balance, to be in the ratio of the ſimple velocity into the maſs.

Thus for the living Force, if on the proportional balance you place 4 lb. at the diſtance of ſix inches on one ſide, and 2 lb. at the diſtance of twelve inches on the other ſide, and, if the balance be put into motion, they will each of them have a vis viva, or an active force, becauſe they will keep the beam in motion for ſome time, till, by militating, they murder or kill each other; and then ſurely enough they become vires mortuæ, or dead Forces.

But let us ſee how they exerted their power, while living. One (A) acted againſt the other (B,) with the gravity of every particle in a maſs of 4 lb. and with the velocity in each ſtroke that ſix inches diſtance could give; but, ſince all allow the weight to be as the maſs of matter, and the velocity as the diſtance from the center of motion, therefore all the Force which A exerted was as $4 \times 6 = 24$. In the ſame manner it is ſhewn the whole Force of B acting againſt A was as $2 \times 12 = 24$; that is, in each caſe, the Force was as the velocity into the maſs of matter. And, becauſe they were equal, they deſtroyed each other.

But, had thoſe combatants A and B been armed with Forces proportioned to the ſquares of the velocities, that of A would have been but $4 \times 6 \times 6 = 144$; whilſt B would have had a Force equal to $2 \times 12 \times 12 = 288$; by which he would have demoliſhed A at one ſingle ſtroke, and been the ſurviving conqueror.

Let us now conſider theſe two bodies A and B as dead, and ſee what Forces they exert (verbo detur venia) in that ſtate. In order to this they muſt be hanged upon the arms of the balance, one on each ſide, till they are dead, i. e. motionleſs; but this will not happen till their diſtances from the center of motion become reciprocally proportional to their maſſes of matter; and then it is plain the caſe is the ſame as before; for the dead Force of A will be as $4 \times 6 = 24 = 2 \times 12 =$ dead Force of B. Whereas, if theſe Forces were as the maſſes into the ſquare of the velocities, A of 4 lb. and B of 2 lb. ought to die at the diſtances 6 and 8, 4 inches from the center reſpectively; but, if the experiment be tried there, ſuch ſtrong ſymptoms of life will be found in A, as manifeſt the falſity of this hypotheſis.

Being driven from this ſubterfuge, they ſeek another in a critical diſtinction between Force and preſſure. Preſſure, ſay they, is the power with which bodies act by means of inſtruments; thus a weight in one ſcale acts againſt the weight in another by preſſure; but the power by which bodies act on each other alone, is properly called Force, as when one ſtone ſtrikes another by falling on it, or a hammer ſtrikes an anvil. The former they allow is proportional to the velocity and maſs of matter conjointly; but the latter, they ſay, is as the maſs multiplied by the ſquare of the velocity.

But this Eclairciſſement boots them as little as the former, if they mean a momentary impact or ſtroke, or ſuch whoſe effect is produced in a moment of time. For in ſuch a caſe we ſay,

FOR

the ſtroke is in proportion to the maſs of matter, and alſo to the degree of velocity, and therefore as both conjointly; but we deny there is any other ſource of power from whence a body can derive any Force for producing a momentary effect: nor have any of thoſe gentlemen been able to ſhew there is, though ſome (bewildered in the labyrinth) have attempted it, but in how weak and ridiculous a manner may be ſeen in a piece intitled, De Conſervatione Virium vivarum, &c. And it is worth the reader's while to ſee the jocular confutation of this ludicrous piece by Phileleutherus Londinenſis.

If they ſay, they would not be underſtood of momentaneous effects, but ſuch as are produced in time, then they have no antagoniſts. And, it is plain from their experiments, that this is their meaning, after all. For their experiments which they ſo much inſiſt on, are ſuch as are made by letting bodies fall on ſoft ſubſtances, as clay, butter, &c. or by the action of bodies on yielding ſprings, or ſpringy bodies; in all which caſes, the effect is not produced inſtantaneouſly, but in time; the clay takes time to recede, the ſpring to bend, &c.

If the time be taken into conſideration, then every body muſt know that the effect will be proportional to the intenſity of the cauſe, and the time of its continuance: thus, for example, the effect of gravity on bodies left to themſelves cauſes them to deſcend; their deſcent therefore will be proportionate to the power of gravity upon them, and therefore greater in thoſe which fall freely, than in others which deſcend on inclined planes in a given time, where part of the Force of gravity is deſtroyed by the re-action of the plane. But, ſince the action of gravity is not inſtantaneous, but continual, therefore its effect, i. e. the deſcent of the body, will be greater in proportion to the time of its continuing to act on the body, ſeparately conſidered from its intrinſic Force. But this Force is as the velocity produced by it in a given time; alſo the time is as the velocity, when the Force is given; therefore the effect, viz. the deſcent of the body, is as the ſquare of the velocity.

Or in ſymbols thus: let $E =$ the effect produced by any power $= P$, acting in any ſpace of time $= T$, upon any body $= Q$, moving with any degree of velocity V. Then it is plain, E will be as $Q =$ maſs of matter in the body, when P, T, and V are given; alſo the effect E will be as the intenſity of the power P, when T, Q, and V are given; again, when P, Q, T are given, E muſt be as V; and laſtly, we ſhall have E as T, when P, Q, V are given. Therefore, when neither of theſe are given, $E : Q \times P \times V \times T$; and, in caſe of any different effect, let $e : q \times p \times v \times t$.

Then ſuppoſing the bodies equal, viz. $Q = q$, we have $E : e :: PVT : pvt$. Thus the ſame or two equal bodies, deſcending on two planes unequally inclined, will deſcend through ſpaces, which will be as the different powers of gravity P and p, as the different velocities V and v in any point of time, and as the different times T and t of their deſcent, conjointly.

If not only the bodies Q and q, but alſo the powers P and p which actuate them, be ſuppoſed equal, or $P = p$; then $E : e : TV : tv$. Thus, in equal bodies falling freely by gravity, the effect, or the ſpace which they deſcribe, will be as the time T and t of the falls, the velocities V and v at any point of time in the fall. And becauſe in this caſe the velocity is always proportional to the time, that is, $T : t :: V : v$; if we multiply each ratio by the ſame ratio $V : v$, the analogy will ſtill be the ſame, viz. $TV : tv :: V^2 : v^2$; whence $E : e :: V^2 : v^2$; or the effect of falling bodies, in deſcribing the ſpace, will be as the ſquare of the velocities.

If we ſuppoſe the times given, that is, $T = t$, then (the reſt as before) we have $E : e : V : v$; that is, the Forces or effects of equal bodies, falling in equal times, are proportional to the ſimple velocities.

If $V = v$, or the velocities given; then $E : e :: T : t$. Thus, if two equal bodies, lying on an horizontal plane, receive a ſtroke each from ſprings of equal Force, then will the velocities be equal in every part of the motion, and the effects E and e, in this caſe, being the ſpaces deſcribed, will be as the times of their motion.

Hence we have ſeen every poſſible caſe wherein the Forces of bodies or their effects can be ſuppoſed to vary; and it is plain there is none where the Force is as the ſquare of the velocity but where the time is concerned; or where ſome one of the factors Q, P, V, T, is proportional to the velocity; thus in ſpouting-water, becauſe Q is always as V, therefore, though T be given, E will be as QV, or as V^2; for P alſo in this caſe is given, the power of gravity which gives motion to the particles of the fluid being always conſtant. Nor have they any experiment which ſhews the Force or effects of bodies proportional to the ſquares of the velocities, but where the time in which the effect is produced ought to be conſidered. Thus in their famous experiment of cavities, formed in ſoft clay by falling bodies, it is true, thoſe cavities are the effect of the falling bodies, and proportional to the ſquares of the velocity. But what is this to the purpoſe, unleſs they will ſay, thoſe pits are inſtantaneouſly produced, which I believe none will pretend to do?

It is evident, this cavity muſt be proportional to the quantity of matter put in motion in the clay, by the falling body: but this is proportional to the velocity on two accounts; the firſt is, that every particle which comes in contact with the

ſtriking

ſtriking body, receives a ſtroke proportional to the velocity; therefore alſo the number of particles which each of theſe can move, will be as the Force of the ſtroke, or as the velocity of the falling body. Secondly, among yielding particles, the number which the falling body can apply to in a given time, will be as the velocity; conſequently the whole number of particles which can be moved, both immediately by the body itſelf, and by the motion communicated to the particles, will be as the ſquare of the velocity; and therefore the cavity will be in the ſame ratio alſo.

We hence obſerve, the ſame method of reaſoning may be applied to ſoft and yielding ſubſtances, as has always been uſed in the caſe of unelaſtic fluids; and for this reaſon only, that, in every caſe of yielding particles, the effect of a body in ſtriking them is not deſtroyed momentaneouſly, but in time, which time (cæteris paribus) will be as the velocity; and therefore, E being as T V, and T, in all theſe caſes, being as V, it will be univerſally for all ſoft and yielding ſubſtances E : V^2.

Hence we may obſerve that, as bodies are more or leſs yielding or ſoft, ſo the effect will be more or leſs approaching to the ratio of the ſquare of the velocity. This conſideration is of great uſe in mechanical affairs. Thus a hammer with a double velocity will produce much more than a double effect in driving a nail; the ſame may be ſaid of a rammer driving a pile: hence the reaſon why a ſmall hammer will by its velocity do more execution upon red-hot iron, than the large hammer by its momentum. In ſhort, all theſe things are ſo plain and eaſy to be underſtood, that it is ſurprizing to think how ſuch a diſpute could ſubſiſt ſo long, and occaſion ſo much to be ſaid about it.

The learned Dr. Jurin, in the Philoſophical Tranſactions, number 476, propoſes the following experiment, which he looks upon as ſufficient to put a final end to this controverſy, which has now ſubſiſted above ſixty years.

Upon an horizontal plane, at reſt, but moveable with the leaſt Force, ſuppoſe upon a boat in a ſtagnant water, let there be placed, between two equal bodies, a bent ſpring, by the unbending of which the two bodies may be puſhed contrary ways.

In this caſe it is evident, that the velocities, which the two bodies receive from the ſpring, will be exactly equal, and their moving Forces will alſo be exactly equal; and that the plane they move upon, and alſo the boat upon which it lies, will have no motion given them either way. Let us call the velocity of each body 1, and the moving force alſo 1.

Now, let us ſuppoſe the ſpring to be bent afreſh to the ſame degree as before, and to be again placed between the two bodies lying at reſt; then let the plane, upon which the ſpring and the bodies lie, be carried uniformly forwards, in the direction of the length of the ſpring, with this ſame velocity 1. In this caſe it is manifeſt, that each of the bodies will have the velocity 1, and the moving Force 1, both in the direction of the axis of the ſpring.

During this motion, let the ſpring again unbend, and puſh the two bodies contrary ways, as before, the one forwards, the other backwards: then the ſpring will give to each of theſe bodies the velocity 1, as before, when the plane was at reſt.

By this means the hindmoſt body, or that which is puſhed backwards, will have its velocity 1, which it had before by the motion of the plane, now intirely deſtroyed, and will be abſolutely at reſt.

But the body, which is puſhed forwards, will now have the velocity 2, namely, 1 from the motion of the plane, and 1 from the action of the ſpring.

Thus far every body agrees in what will be the event of this experiment.

But the queſtion is, what will be the moving Force of the foremoſt body, or of that which is puſhed forwards, and which has the velocity 2; viz. 1 from the motion of the plane, and 1 from the action of the ſpring.

By the Leibnitian doctrine, its moving Force muſt be 4: and, if ſo, it muſt have received the moving Force 3 from the action of the ſpring; for it had only the moving Force 1 from the motion of the plane.

Let us examine, whether this be poſſible, or reconcileable to their own doctrine.

Their doctrine is, that equal ſprings, equally bent, will, by unbending themſelves, give equal moving Forces to the bodies they act upon, whatever thoſe bodies are.

We agree to this, not generally indeed; but in the caſe before us, where the bodies are of equal maſſes or weights, we agree to it.

Let us therefore imagine the bent ſpring, which is placed between the two bodies, to be divided tranſverſly into two equal parts. In this caſe it is plain, that the two halves of the ſpring may be conſidered as two intire ſprings, equal, and equally bent, each of which reſts at one end in æquilibrio againſt the other ſpring, and, at the oppoſite end, preſſes againſt the body it is to move.

Conſequently, by the Leibnitian doctrine, to which, in this particular caſe, where the bodies are equal, we alſo agree, the two ſprings will give equal moving Forces to the two bodies.

But the moving Force, received by the hindmoſt body from the hinder ſpring, was undoubtedly the moving Force 1: for, by that Force given it in the direction backwards, the moving Force 1, which it had before from the motion of the plane in the direction forwards, is exactly balanced and deſtroyed, the body remaining, as was obſerved before, in abſolute reſt. Therefore the moving Force, received by the foremoſt body from the foremoſt ſpring, was alſo the moving Force 1. And this, added to the other moving Force 1, which it had before from the motion of the plane, makes the moving Force 2, and not the moving Force 4, as the Leibnitian philoſophers pretend.

Conſequently, that body, which had before the velocity 1, and the moving Force 1, and now has the velocity 2, has alſo the moving Force 2: that is, the moving Forces are proportional to the velocities.

FO'RCING, in the wine trade, a term uſed by the wine-coopers for the fining down wines, and rendering them fit for immediate draught.

The principal inconvenience of the common way of fining down the white wines by iſinglaſs, and the red by whites of eggs, is, the ſlowneſs of the operation; theſe ingredients not performing their office in leſs than a week, or ſometimes a fortnight, according as the weather proves favourable, cloudy, or clear, windy, or calm: this appears to be matter of conſtant obſervation. But the wine merchant frequently requires a method that ſhall, with certainty, make the wines fit for taſting in a few hours. A method of this kind there is, but it is kept in a few hands a valuable ſecret. Perhaps it depends upon a prudent uſe of a tartarized ſpirit of wine and the common Forcing, as occaſion is, along with gypſum, as the principal; all which are to be well ſtirred about in the wine for half an hour before it is ſuffered to reſt. *Shaw's Lect.*

FORCING, among gardeners, is uſed for producing ripe fruits from trees before their natural ſeaſon. The method of doing it is this: a wall ſhould be erected ten feet high; a border muſt be marked out on the ſouth ſide of it, of about four feet wide, and ſome ſtakes muſt be faſtened into the ground all along the edge of the border; theſe ſhould be four inches thick. They are intended to reſt the glaſs lights upon, which are to ſlope backwards to the wall, to ſhelter the fruit, as there ſhall be occaſion; and there muſt be at each end a door to open either way, according as the wind blows. The frame ſhould be made moveable along the wall, that, when a tree has been forced one year, the frame may be removed to another, and ſo on, that the trees may be each of them forced only once in three years, at which rate they will laſt a long time. They muſt be always well grown trees that are choſen for Forcing, for young ones are ſoon deſtroyed, and the fruit that is produced from them, is never ſo well taſted. The fruits moſt proper for this management are the avant, or ſmall white nutmeg, the Albemarle, the early Newington, and the brown nutmeg peaches; Mr. Fairchild's early, and the elrugo and Newington nectarines; the maſculine apricot, and the May-duke and May-cherry. For grapes, the white and black ſweet-water are the propereſt; and, of gooſeberries, the Dutch-white, the Dutch early-green, and the walnut gooſeberry; and the large Dutch-white and large Dutch-red currants.

The dung before it is laid to the wall ſhould be laid together on a heap for five or ſix days, that it may heat uniformly through; and, when thus prepared, it muſt be laid four feet thick at the baſe of the wall, and go ſloping up till it is two feet thick at the top. It muſt be laid at leaſt within three or four inches of the top of the wall, and, when it ſinks, as it will ſink two or three feet, freſh dung muſt be laid; for the firſt heat will do little more, than juſt ſwell the bloſſom buds.

The covering the trees with glaſſes is of great ſervice, but they ſhould be taken off to admit the benefit of gentle ſhowers to the trees, and the doors at the ends ſhould be either left intirely open, or one or both of them opened, and a mat hung before them, at once to let the air circulate and to keep out the froſts.

The dung is never to be applied until toward the end of November, and three changes of it will be ſufficient to ripen the cherries, which will be very fine in February. As to the apricots, grapes, nectarines, peaches, and plums, if the weather be milder, the glaſſes are to be opened to let in ſun-ſhine, or gentle ſhowers. If a row or two of ſcarlet-ſtrawberries be planted at the back of the frame, they will ripen in February, or the beginning of March; the vines will bloſſom in April, and the grapes will be ripe in June.

It ſhould be carefully obſerved not to place early and late ripening fruits together, becauſe the heat, neceſſary to force the late ones, will be of great injury to the early ones, after they have fruited.

The maſculine apricot will be ripe in the beginning of April, and the early nectarines will be ripe about the ſame time, and the forward ſort of plums by the latter end of that month. Gooſeberries will have fruits fit for tarts in January or February, and will ripen in March, and currants will have ripe fruit in April.

The trees need not be planted ſo diſtant at theſe walls as at others, for they do not ſhoot ſo freely as in the open air: nine feet aſunder is ſufficient. They ſhould be pruned about

three

three weeks before the heat is applied. *Miller's Gard. Dict.*

FO'RMICA-*Leo*, the lion pismire, a very remarkable insect, as long as the common palmer, but something thicker; it has a very long head, and the body grows round, as it lengthens towards the tail. The animal is of a dark grey, marked with black spots. Its body is composed of several flat rings, that slide over one another. It has six feet, four of which are inserted in the breast, and two in the neck. Its head is small and flat, and, from the fore part of it, two little horns shoot out: these are smooth and hard, extend two twelfths of an inch in length, and bend like hooks in the extremity. Towards the base of these horns, appear two small eyes, very black and lively, and which are very serviceable to the creature, for he starts from the smallest objects he discovers. Other animals are furnished with wings, or feet at least, to make them expeditious in the pursuit of their prey; but this is only capable of marching backward. He never follows his prey, and would sooner die than advance a step towards it. The prey must come to him, and he is gifted with the secret of making it fall into the ambuscade he has prepared. This is the only method he has for his subsistence, and is all the science he is master of; but however it suffices for his purpose.

He chuses for himself a bed of dry sand, at the foot of a wall, or under some shelter, that the rain may not disconcert his work. He is obliged to make use of sand, and of the driest he can get, because a solid soil, as well as a moist sand, would not prove tractable under his operations. When he intends to hollow the trench where he ensnares his game, he bends the hinder part of his body, which tapers into a point, and then plunges it, like a plough-share, into the sand, which he throws up in his rear, with a backward motion of his body; and thus, by repeating his efforts, and taking several rounds, he at last traces out a circular furrow, whose diameter always equals the depth to which he intends to sink it. Near the edge of the first furrow, he opens a second, and then a third, and several others, which are smaller than the preceding, and sinks himself from time to time, deeper in the sand, which he throws aside with his horns, on the edges of the furrows, and to a much greater distance, always marching backward in a spiral line. The repeated strokes of his head whirl the sand out of the circle, and gradually scoop out a cavity, in which operation he exceeds the best engineers; he describes a perfect circle, and draws out a volute, without the assistance of a pair of compasses. He likewise gives the slope of earth, which he hollows with all possible solidity. In this dexterous and indefatigable manner he compleats his trench, which resembles a cone reversed, or rather the inside of a funnel.

When this creature is newly hatched, he opens a very small furrow, but, when he increases in bulk, he digs one more spacious, the cavity of which may contain two inches or more in diameter, and as many in depth. When the work is compleated, he forms his ambuscade, and conceals himself under the sand, in such a manner, that his horns exactly wind round the point in which the bottom of the funnel terminates. In this situation, he watches for his prey, and woe to the ant, the palmer, or any other insect who is so indiscreet as to play round the edge of this precipice, which descends in a slope, and that too in the sand, to give a downfal to the little animals who are too incautious in their approaches. It is for the female ant that the lion-pismire thus adjusts his kitchen. She is not aided with wings, like the generality of insects, to disengage herself from this cavern; but then she is not the only prey, for other animals are also destroyed by the dexterity of this hunter. When he knows by the fall of some grains of sand, that a prize is near, he shrinks back and moves the sand, which immediately rolls to the bottom with the prey. If this prey has agility enough to be capable of remounting in an instant, and, with this advantage, is likewise assisted with wings; the lion-pismire whirls a quantity of sand into the air, above the height of the flying animal. This is a dreadful shower of stones to such a tender creature as a gnat or an ant. The unfortunate insect, blinded and overwhelmed in this manner, by the tempest that pours down from every quarter, and hurried away by the instability of the sand that rolls from under her feet, falls between the jaws of her enemy, who plunges them into her body, drags her under the sand, and then feasts upon the victim. And, when nothing is left but the carcase drained of all its juices, he is particularly careful to remove it out of sight. The appearance of a dead body would deprive him of future visits, and bring his place of residence under a bad reputation: he therefore extends his horns, and, with a sudden spring, tosses the slain half a foot beyond the trench; and, if this should happen to be disconcerted and filled up, by such an expedition, or if the aperture becomes too large for the depth, and the declivity loses its proper slant, he repairs the whole with all speed; he rounds, he deepens, he clears the cavity, and then watches for a new prey.

An hunter's profession, they say, generally requires patience, and the lion-pismire has as large a share of this quality as he has of craft. He sometimes passes whole weeks and months without motion, and, what is most surprizing, without food itself.

His abstinence, which is very serviceable to him, is so extraordinary, that I have known him live above six months in a box exactly closed up, where he had no other accommodation than sand. I have seen them complete their work as usual, and then change into nymphs like others, whom I have carefully nourished. It is true, those who eat improve both in growth and vigour.

When he has attained a certain age, and would undergo a state of renovation, in order to appear in his last form, he then troubles himself no more with his trench, but begins to work in the sand, where he strikes out a multitude of irregular tracts, and certainly engages in this labour, in order to warm himself into a sweat; after which he plunges into the sand, and the viscous humidity which flows from every part of his body, fixes and unites all the grains he touches. With these sandy particles, and the dried glue that consolidates them, he forms a crust which encompasses his whole body, like a little ball of five or six twelfths of an inch in diameter, in which the animal reserves himself a competent space for motion. He is not satisfied with a bare wall, which would inevitably chill him; but spins out of his own bowels a thread, which, in fineness, infinitely surpasses that of the silk-worm, which we have so much admired. This thread he fastens first to one place, and then extends it to a second, still crossing and interlacing it. By these means he hangs all his apartment with a sattin tinged with the colour of pearls, and perfectly beautiful and delicate. In this work all the propriety and convenience is confined to the inside, for nothing appears without but a little sand, which confounds and incorporates the mansion with the contiguous earth. And now he lies secreted from the pursuit of ill-disposed birds; he rests in oblivion, and lives in perfect tranquillity; whereas he would infallibly be lost, were the outside of his habitation ornamental enough to attract the view of any creature, whose curiosity might prove injurious to him.

In this manner he lives, secluded from the world, six weeks or two months, and sometimes more, and then divests himself of his eyes, his horns, his paws, and skin. His spoils sink to the bottom of the ball, like a heap of rags; all that now remains is a nymph, who hath other eyes and paws, other entrails and wings enfolded with a skin, and laid in a nutrimental liquor that gradually dries around her, in the same manner as is customary with all papilio's, when they divest themselves of their vermicular spoils, to assume the form of aurelias.

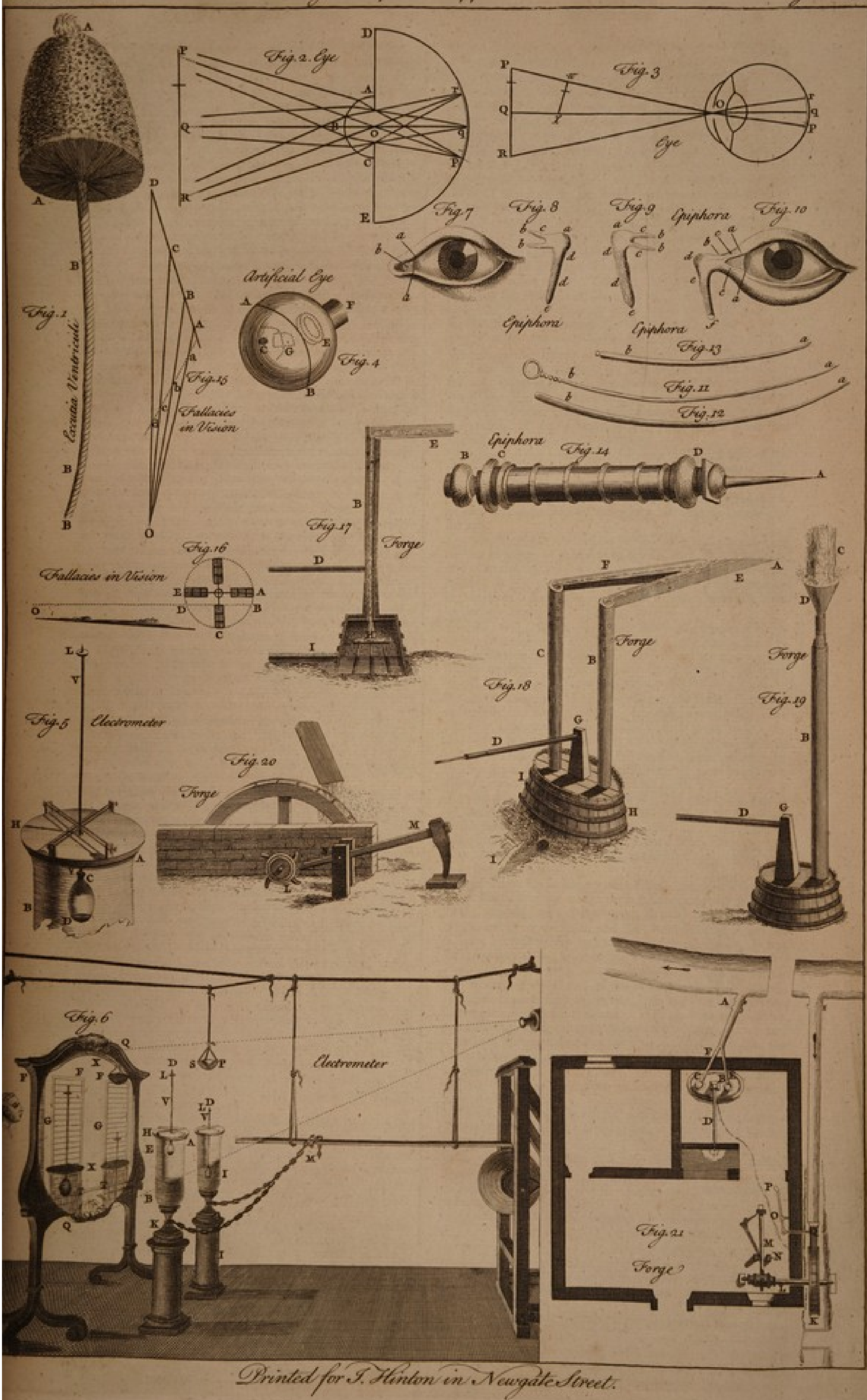
When the limbs of the new animal have acquired their necessary tone and activity, he tears away the tapestry of his apartment, and pierces through the walls; for which purpose, he employs a couple of teeth, like those with which the grasshopper is furnished. And now he makes his efforts, enlarges the opening, thrusts out half his body, and, at last, intirely quits his solitary seat. His long form, that winds like the volute of an Ionic capital, and possesses only three twelfths of an inch in space, begins to unfold and extend itself, and, in an instant, stretches to the length of an inch and three or four twelfths. His four wings, that were contracted in little folds, and whose dimensions did not exceed two twelfths of an inch, in the film that sheathed them begin to be expanded, and, in the space of two minutes, shoot into a greater length than the whole body. In a word, the malignant lion-pismire assumes the form of a large and beautiful dragon-fly, who, after she has for some time continued immoveable and astonished at the glorious prospect of nature, flutters her wings, and enjoys a liberty with which she was unacquainted in the obscurity of her former state; and, as she hath cast off the spoils of her first form, so she is likewise divested of her cumbersome weight, as well as her barbarity and pernicious inclinations. In fine, she appears entirely a new creature, is all gaiety and vigour, graced at the same time, with a noble and majestic air.

Along the edges of standing waters, one may find other animals like this in form, but painted with colours much more radiant and lively, and their original is also very different. The insect that arises from the lion-pismire, lays her eggs in the sand, that her young may be supplied with food, when it forsakes the egg. Sand is no part of its sustenance, but then it facilitates its manner of life. The creature immediately sinks a commodious trench, and in less than an instant becomes completely skilled in hunting and geometry. The other dragon-fly, that flutters along the surface of ponds, plunges the extremity of her body into the water, and there deposits her eggs. The animals that issue from them, inhabit the fluid element for some time, after which they assume a new figure, and live upon earth in form of aurelias.

FORGE, in manual arts, a place where iron is smelted, and formed into different pieces.

The iron ore being taken from the mine, if it be found to be incorporated with a stony substance, it is broke in stamping mills before it is washed and melted: but, if mixed with a coarse sand or earth, it is not stamped, but put immediately into a flat tub ten feet square, and about two feet deep, through which runs a constant stream of water; and the ore kept constantly stirring and pounding in the tub, by which means the earthy particles are carried away by the current, while the metalline particles, by their specific gravity, subside to the bottom.

When the ore is sufficiently purified by stamping and washing, it



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it is taken out and carried to the Forge, where it is melted; and the fire, which muſt be prodigiouſly fierce, is generally blown by means of a fall of water.

The flux-ſtone is preferred by the workmen for this uſe, foraſmuch as it abounds with particles of iron, and therefore increaſes the quantity of metallic matter: it does alſo facilitate the buſineſs of fuſion. The ore conſiſts of metallic, ſandy, and earthy particles; now, the buſineſs is to ſeparate theſe three diſtinct kinds of matter, or elſe to extract the metal from the ſand and the earth. The firſt of theſe offices is performed by lotion in the trough or waſhing-tub, the water carrying off a pretty large quantity of theſe extraneous matters.

The melted metal is nothing but a torrent of liquid fire, which rarefies and keeps in motion the metallic particles, which, upon the extinction of the fire, coaleſce and ſubſide one upon another. The vitrified ſand is alſo a liquid maſs of fire, keeping in a ſtate of agitation the finer grains of ſand, and the ſaline particles, which, after ignition, fix into a conſiſtent body. The calcined earth is a ſubject conſiſting of parts eaſily ſeparable, which, being penetrated by the fire, are reduced to aſhes. The ſand being put into a ſtate of fuſion by the fire, the metallic matter, which is more weighty by nature, diſengages itſelf from it, and ſubſides to the bottom; for theſe two bodies, being of different ſpecific gravities, are eaſily ſeparated by the action of the fire; whereas the earth, which is compoſed of light flaky maſſes, is eaſily entangled in the fuſed metal, the vitrified ſands, and the alkaline or ſpongy ſalts that are mixed with them. The greater the quantity there happens to be of this earth or calcined powder in the metal, the coarſer, more brittle, and imperfect it proves; the leſs of this heterogeneous matter there is in the iron, the more malleable, ductile, and ſolid it is, and approaches nearer to the nature of ſteel, which is only pure unmixed iron. Now, in order to purge and purify the metal as much as poſſible from this powder which infects it, they muſt, at the time of its fuſion, inject into it ſome matter, which may lay hold of as many particles of the calcined earth as poſſible, without imbibing the metal; and this is performed by vitrification. The ſands and ſalts of the flux-ſtone, being ſeparated by the fire, give free liberty to the particles of iron to diſengage themſelves, and at the ſame time abſorb a great part of the earth that was mixed with the ore. For want of flux-ſtone, flints or river ſand may be made uſe of, which, when vitrified, purge the iron from the droſs, in proportion to the quantity of ſcoriæ or calcined earth which they lay hold of. Some maſters of Forges uſe lime, inſtead of flux-ſtone or ſand; but, as this is nothing but calcined earth itſelf, it cannot have any abſorbing power, and ſerves to foul inſtead of purifying the ore. The only reſpect in which lime can be ſerviceable, and ſupply the place of flux-ſtone or ſand, is, by ſerving as a cruſt or covering to reverberate the heat, and to make it act with more force inwardly on the ore which is mixed with the coals.

The ore is no ſooner melted than it runs along the bottom of the furnace, which is made ſloping, to a ſort of flood-gates, which are drawn up for it to pour down in a torrent of liquid fire, into long trenches made in the ſand, or into moulds of different figures, to be caſt for cannons, chimney-backs, bomb-ſhells, granado's, mortar-pieces, pipes for the conveyance of water, caldrons, &c.

After having diffuſed itſelf equally from one end of the trench to the other, it conſolidates into a triangular maſs, which they call a pig of iron, weighing from twelve to eighteen hundred pounds; this they run on wooden rollers to the mouth of the fining furnace, where they gradually melt it, not to a degree of liquefaction, but till it reſolves into a ſoft paſte, which the workmen keep ſtirring with their iron prongs; then they take from it a piece of about ſixty pounds weight, which they beat with a light hammer, till it comes to a conſiſtency; this done, they give it a heating in the fining furnace, and thence carry it on an iron ſledge, and ſubject it to the diſcipline of a monſtrous hammer, weighing upwards of ſix hundred pounds, the noiſe of which may be heard above three miles off. It is made to riſe and fall by the motion of a wheel turned by a running water. They turn the iron under this hammer, till it is beat out into an oblong ſquare.

They tell you that the force of percuſſion inflicted, by this hammer on the iron, is ſo great, that it penetrates the very heart of the maſs, agitates the fineſt particles of the iron, diſſipates the calcined earth with the ſcoriæ and other heterogeneous matter, and makes the whole perfectly malleable, by conſolidating the metallic particles, and uniting them in cloſe contact.

After the maſs of iron has paſſed the operation of the great hammer, it is carried back again to the fining furnace, to be thoroughly purged of its droſs and ſcoriæ; where, while it is perfecting, it facilitates another operation; for it thereby contracts ſo intenſe a heat, as is ſufficient to reſolve the pig iron that is near it. Laſt of all, it is carried to the Forge or nealing furnace to ſoften it, and fit it for the anvil, on which they hammer it into flat triangular pieces for plough-ſhares, into ſquare bars for all ſorts of ſmiths works, or into plates of different dimenſions.

In order to give the reader a better idea of a Forge, we have given a plan, &c. of it, on *Plate* XX. where *fig.* 21. exhibits a plan of the conſtruction of one of theſe Forges, and the ſituation of the bellows with regard to the furnace; this pair of bellows is compoſed of a tub turned upſide down, of an oval figure, repreſented by H I ſeven feet deep, three or four feet over, expreſſed by the figures 18, 19; its extremities are buried five or ſix inches to prevent the intromiſſion of external air; on the bottom of this tub are faſtened two wooden pipes B, C ten or twelve feet high, between which is fixed on the tub a kind of pyramid G made of planks, which has a third tube near its top at D, which carries the wind to the Forge; all theſe tubes are well joined and caulked, ſo as to exclude all air.

A ſmall canal one foot broad, about ſeven or eight inches deep, and which divides itſelf into two branches E F, conducts the water into the pipes B C in greater or leſſer quantities, as you would increaſe or decreaſe the action of the wind; which thoſe that work at the Forge regulate by a little flood-gate placed at the entrance of the canal A, as the pipes B C are perforated towards the top, with ſeveral holes inclining on the inſide, through which the air introduces itſelf, a great deal of which the water carries with it into the tub; which, being compreſſed, ſeeks to dilate itſelf, and, having no other vent but through the pipe D, which grows leſſer towards the end, it comes out with impetuoſity, and blows the fire of the Forge with ſo much ſtrength, that they are ſometimes forced to mitigate the blaſt by opening a little hole made on the pyramid G, not permitting it to act at its full power but when there are large pieces to Forge.

Under each of the pipes B, C in the tub is placed a kind of little ſtool H, *fig.* 17. that the air may ſeparate itſelf more eaſily from the waters, by ſpouting upon them, after which the water goes off by a trench which is always ſtopped with it, that the air may not eſcape through the opening neceſſary to be made in the tub.

Fig. 20. repreſents a wheel by the ſide of a mill, turned by a current of water, as exhibited in *fig.* 21, at K Q. The arbor of this weel L moves the hammer M, the handle of which is faſtened at N; and the motion of the wheel is regulated by the means of a flood-gate at Q which is drawn up or put down by the help of the lever Q P, *fig.* 21.

FO'REST-*trees*. Many are wholly averſe to pruning Foreſt-trees; but, though it is to be done with care, and under proper regulations (ſee LOPPING) yet, it is by no means to be wholly omitted. It may be obſerved in Foreſts and large woods, that, for one tree which thrives well, there are twenty that grow faulty, and all this is owing to the want of pruning or lopping in a proper manner; for this, when wiſely executed, is a renewal of their age, and of their growth too; the want of it being what occaſions trees to run out into ſuckers, and to load themſelves with uſeleſs boughs, which draw away the ſap from the upper part, and make it grow knotty and diſtempered, and uſually covered with moſs.

If a tree grow crooked, the buſineſs of the owner is to cut it off ſloping at the crooked place, and nurſe up ſome young bough that grows upright from that part, and it will make it a ſtraight body. This is not to be done when trees are very large, but the careful owner will not ſuffer them to grow very large without doing it.

The beſt time for pruning young Foreſt-trees is in February; and it ſhould be done where there is occaſion every year, or, at the utmoſt, every ſecond year, ſo that the tree may be able to overgrow the knot, and the place not liable to put out ſuckers, becauſe the ſap has had no great recourſe to it. When it is neceſſary to cut off a bough of any bigneſs, there muſt always be given a chop or two underneath, oppoſite to the part where it is cut above, otherwiſe the weight of the bough, in its fall, is apt to ſtrip off the bark from the remaining ſtump, to the great detriment of the tree. When trees are kept for pollards, they muſt be regularly lopped every two years; for, if the branches are ſuffered to grow longer than that, they are apt to be faulty at the wound when cut off, and to let in water, the conſequence of which will be the decay of the tree, and it can no more bear any great quantity of branches or lop. *Mortimer's Huſbandry.*

FO'RTRESS, in military affairs, a caſtle or fortified town.— The method of fortifying a town, &c. may be ſeen in the following problems.

Prob. 1. The maſter line of a Fortreſs being given, to draw the plan of the rampart.

1. Draw the lines ag (*Plate* VI, *fig.* 29.) perpendicular to each face, flank, and curtin.

2. In each of the lines ag take $ag = 24$ yards.
$ab = 20$ yards.
$ac = 8$ yards.
$ad = 6$ yards.

3. Through the points d, c, b, g, draw lines parallel to the maſter line; that is, to each face, flank, and curtin, interſecting one another.

		yds.
Then the breadth of the rampart is repreſented	by $ag =$	24
of the parapet	by $ad =$	6
of the foot-bank	by $dc =$	2
of the walk of the rampart	by $cb =$	12
And of the ſlope of the rampart	by $bg =$	4

The

The breadths of theſe parts of the rampart are ſometimes different, according to the quality of the earth, or other materials the work is to be built with.

Sometimes the baſtions are made ſolid; that is, the rampart fills up the whole ſpace contained within the faces, flanks, and neck: the plans of ſuch are repreſented by continuing the pair of lines *b g*, forming the inner ſlope of the rampart, againſt the adjacent curtins, till they meet the capital in the breaſt of the baſtion, as at R: but then this pair of lines is to be omitted againſt the flanks and faces of ſuch baſtions.

In plans drawn from a large ſcale, it is uſual to expreſs the outſide ſlope of the rampart by a pair of lines; that is, by drawing a parallel to the maſter line at about five or ſix feet diſtant from it on the outſide.

The maſter line is to be drawn the thickeſt; the inſide of the parapet ſomething finer; and the other lines as fine as they can be drawn.

Before any of the lines are drawn in ink, for it ſhould be remarked that every thing is firſt to be drawn in black lead pencil, let the ramps be put in the inner ſlope of the rampart; the embraſures in the parapets of the flanks; the barbets in the ſaliant angles of the baſtions, *fig.* 16. with their ramps; and the cavaliers, if any are to be, in the ſolid baſtions, *fig.* 23, with their ramps and embraſures.

All theſe ſeveral parts being laid down with black lead pencil, let the lines be neatly drawn with Indian ink, taking care not to draw them beyond their proper terminations; for, wherever ſuperfluous ink lines are ſcraped off, thoſe plans will never look well, when they come to be waſhed with any colour.

When the plan is to be waſhed, that is, coloured, either with tints of Indian ink or other colours, leave the lower line of the inner ſlope of the rampart in lead pencil, which will make it appear ſofter, when the drawing is cleaned off.

In the middle of baſtions, *fig.* 26, it is uſual to build magazines for the ſtores of powder, bombs, and other fireworks, and alſo to contain the proviſion for the troops: for in theſe places they are not only more out of the way of doing damage to the town on an accident of blowing up, but they are alſo nearer at hand to be tranſported to the ſeveral works where they may be wanted.

Prob. 2.—The maſter line of a Fortreſs being given, to draw the plan of the foſs and eſplanade.

1. On the flanked angle B (*fig.* 12.) of each baſtion, with the radius B C equal to the breadth of the foſs, deſcribe an arc C C.

2. Lay a ruler to touch each arc at C, and the angle E of the neareſt ſhoulder of the next baſtion, and in that direction draw the lines C *p*, meeting one another in *p*.

3. From the flanked angle of each baſtion, draw lines B *q* at right angles to C *p*.

4. In each of the lines B *q*, take C *a* = 10 yards,
C *o* = 12 yards,
and C *q* = 60 yards.

5. Through the points *a*, *o*, *q*, draw lines parallel to C *p*, meeting before the middles of the curtins at C and *s*, *fig.* 13, and before the flanked angles of the baſtions in *v*, *x*, *y*.

Then will B C repreſent the breadth of the foſs.
C *q* of the eſplanade.
C *o* of the covered-way.
a o of the foot-bank.
o q of the glacis.

The arcs C C repreſent the roundings of the foſs.

The lines C *p*	the counterſcarp.	
x C	the head	of the glacis.
x y	the ridges	
s t	the vallies	
And *y t*	the foot	

The head of the glacis is to be drawn ſtrong, and all the other lines are to be fine.

When the plan is to be waſhed, if the foot of the glacis be drawn in lead pencil only, the termination of the glacis, or its concourſe with the adjoining lands, will appear more ſoft and neat.

In the colouring of the glacis, it is uſual firſt to lay a very light tint of colour over every plane, and then to ſtrengthen the colour on every ſecond plane, beginning at any ſaliant angle; the ſtrongeſt tint to be next the head of the glacis, and to be waſhed gradually off; ſo that the limits of the lighteſt ſhade ſhall lie in a diagonal line from the foot of the glacis at a ridge, to the head of the valley, as from *y* to *s*.

Give a light touch of the pencil or bruſh, with a middling tint of Indian ink along the inſide of the line, denoting the foot-bank.

Waſh the borders of the ditch near the ſcarp and counterſcarp, ſoftening the edge of the colour with a bruſh wet with fair water: in wet ditches the colour uſed is diſtilled verdigreaſe; but in dry ditches uſe biſter.

The parapet is generally coloured with a middling tint of Indian ink.

By this method of drawing the counterſcarp, all the foſs is ſeen from the flanks, and conſequently is defended by them, and muſt be more advantageous than if the counterſcarp was directed to any other part of the flank, the intercepted part next the ſhoulder being thereby rendered uſeleſs for the defence of the ditch; nevertheleſs, if it was on any account neceſſary, the direction of the wall of the ditch may point within the ſhoulder by the thickneſs of the parapet of the face, and ſtill the foſs would have the whole defence of the flank.

Fortifications in general would be very defective without foſſes; for the wall or rampart need not be raiſed ſo high when there is a ditch, as they muſt be without one, to ſecure the place from ſurprizes by ſcaling, &c. Neither is a low wall ſo much expoſed as a high one is in the modern methods of attack: beſides, a place is not ſo liable to the attempts of a ſurprize with a foſs as it would be without one; for the enemy, if diſcovered, may eaſily retreat while he is on a level with the country, which he would find ſome difficulty in doing from the bottom of a deep foſs bounded by walls or banks nearly upright: add to theſe, that the earth taken out of the ditch ſerves to make the ramparts, parapets, glacis, &c.

It may appear to ſome perſons, that, the broader and deeper a foſs is, the better, as it would throw more difficulties in the way of the beſiegers, when they wanted to paſs it: but it muſt be obſerved that ſome advantages are beſt waved, when, by taking them, greater diſadvantages would enſue. For, beſide the great expence that the digging and removing of ſo much earth would occaſion, the enemy might ſee the foot of the wall at a greater diſtance in a broad ditch; and, in a deep one, the cannon of the flanks could not dip low enough to defend the bottom. And on the whole, if the foſs by its magnitude furniſhed more earth than was wanted, ſome inconvenience might ariſe in the diſpoſing of the overplus.

Thoſe foſſes are beſt which can be filled with water and drained at pleaſure by the help of ſluices or flood-gates; becauſe all the advantages that may be reaped either from a wet or dry foſs, are by theſe means obtained: but, as theſe cannot be had every-where, the ditch muſt be adapted to the ſituation of the place.

In dry foſſes, a row of paliſades is ſometimes planted along the middle, either upright, or ſloping towards the counterſcarp 20 or 30 degrees from the upright.

In ſome dry foſſes, where water can be had, a trench called cuvette *n n*, *fig.* 30, is dug along the middle, of about 15 feet wide and 9 feet deep, for the water to run in.

The breadth of the foſs, although unequal in itſelf, is reckoned from the flanked angles, before which it is always rounded; the depth here may be from 15 to 20 feet, and thence riſe gradually to the middle of the curtin, where the depth is 4 or 5 feet leſs.

To draw a bridge in the plan of a Fortress.— Before the gates draw four lines acroſs the ditch, making three intervals or ſpaces, the middle one being 10 feet broad, and the ſpace, on each ſide, three feet.

Divide the length of the bridge into parts of about 16 feet long each, to expreſs the diſtance between pier and pier, or the bays of building; and againſt each diviſion, on the outſide of the lines, make a ſquare of a foot, to expreſs the ends of the piers ſupporting the bridge.

Allow the bay next the gate for a draw-bridge; and, if the length of the bridge exceeds 40 yards, allow the middle bay for another draw-bridge: theſe are to be diſtinguiſhed by drawing two diagonals acroſs the middle interval of theſe bays; that of the other bays having lines drawn acroſs them at a foot diſtance from one another, and the ſpace on each ſide left white for the footway; which are to be broke off at each draw-bridge. See *fig.* 17, 21.

To conſtruct the orillon and retired flank.— 1. As right angles to the face A S, *fig.* 14, draw from the angle of the ſhoulder the line S *b* equal to 8 or 9 yards, and make *b* the center of the arc, S *a* forming the orillon.

2. From a point *z* in the face of the next baſtion, *fig.* 16, about 15 yards from the point A, draw through *a* a line *z m*; in which, and alſo in the line of defence A *r* produced, take the briſures or breaks *a m* and *r n*, each 10 yards.

3. From *m* and *n*, with the radius *m n*, deſcribe arcs cutting in *d*, which make the center of the arc *m n*, or concave flank.

4. In *d m* produced lay the ſeveral breadths of the parts of the rampart; as the parapet = 6 yards, foot-bank = 2 yards, walk 12 yards, and the ſlope = 4 yards; then from the center *d*, through thoſe points, deſcribe arcs, meeting in the continuation of the correſponding lines from the face of the next baſtion.

The parapet of the orillon is drawn parallel to S *a* at 6 yards diſtance.

The axis or middle line of each embraſure ſhould tend towards a point about the middle of the foſs oppoſite the flanked angle of the next baſtion.

The wall in the upper briſure *a m*, as it cannot be battered, need not be above 2 or 3 feet thick to ſupport the earth behind it.

Through this wall there ſhould be a ſally port coming out at the bottom of the foſs, if a dry one, or a little above the water-line in a wet foſs: the deſcent to this port is by a paſſage under the rampart of the flank; but, in ſtraight flanks, the ſally port is in the curtin next the angle of the flank, the paſſage to it being under the rampart of the curtin.

As the progreſs of the works of the beſiegers generally depends on their having a greater army than is in the town beſieged, and on forming a greater fire on the town than they can return; therefore ſome engineers have endeavoured to hinder the progreſs of the beſiegers batteries, by furniſhing the town with an equivalent, or rather a ſuperior fire; and this has been propoſed to be effected, by making ſecond and third flanks one behind another, gradually more elevated than thoſe before: For as it is found convenient to ſilence the fire of the flanks, before the beſiegers can avail themſelves of the breach they make in the face of the baſtion; therefore batteries to ruin the flanks are made, and play at the ſame times as thoſe for the breaches in the faces. Now, the batteries for the ruin of the flanks can be conveniently made only within about 10 yards of the head of the glacis, and their length not greater than about 40 yards, containing at moſt about 6 or 7 cannon: but if the beſieged can by any artifice preſerve the cannon in the oppoſite flank, and have a greater number there than are in the battery oppoſed, conſequently their fire will be ſuperior, and ruin the battery intended to offend them; and this was expected to be accompliſhed by double, or cazemated flanks. In ſome places two or three tier of cannon were placed one above the other, the upper ones being ſupported by vaulted work, as in the Tower of London; but, ſuch having been found very inconvenient, on account of the great ſmother contained in the vaults, they have been generally conſtructed open.

The cazemated flanks have been condemned by many writers, becauſe they may be rendered uſeleſs by the enemy's bombs; was this objection juſt, it would hold againſt any ſmall work; for, the beſiegers having once got the length to any place, they may be ſuppoſed to render that place alſo uſeleſs to the beſieged; and it would thence follow, that it were beſt not to have any places of defence: but, as the utility of ſuch works have been commended by ſome of the moſt eminent engineers, it was judged proper here to mention how theſe flanks may be conſtructed. For the reſt of the works uſually conſtructed: See OUTWORKS.

FO'UNDERY *of cannon* (*Dict.*)— Braſs cannon, as they are commonly called, are not made of pure braſs. They cannot be made either of pure braſs or pure copper, but it is always found neceſſary to mix with theſe metals ſome coarſer ones, in order to make the whole run cloſer and ſounder: ſuch are lead, and what the founders call pot-metal, which is a compoſition of copper and lead. About twenty pounds of lead is uſually put to an hundred weight of pot-metal, but about ſix pounds is ſufficient for an hundred weight of gun-metal, and is of vaſt ſervice.

The method of caſting iron differs very little from that of braſs. That the iron ore may melt the more eaſily, it was formerly a common practice to mix it with a ſulphureous ſtone, which vitrifies a great part of the groſs earth adhering to the native iron ore; but this practice is now diſcontinued, the cannon caſt of iron ſmelted in that manner being found to be brittle, and incapable of ſtanding proof.

FOUNDERY *of bells.*— Theſe are in moulds of ſand, into which the melted metal is conveyed by a canal from the furnace.

FOU'NTAIN (*Dict.*)— *Plate* XXXVII. *fig.* 7, in the Dictionary, is a perſpective view of a Fountain in a garden.

FRA'GARIA, *ſtrawberry*, in botany, a genus of plants, whoſe characters are:

It hath a perennial fibroſe root: the leaves are veined, growing three upon each footſtalk: the ſtalks trail upon the ground: the cup of the flower conſiſts of one leaf, which is divided into ten equal parts, and expands in form of a ſtar: the flower conſiſts, for the moſt part, of five leaves, which expand in form of a roſe, and have many ſtamina in the middle, round the baſe of the ovary: the fruit is globoſe or oval, and conſiſts of a fleſhy eatable pulp, full of protuberances.

Theſe ſpecies are, 1. The common or wood ſtrawberry. 2. The common ſtrawberry, with white fruit. 3. The hautboy ſtrawberry. 4. The Virginian ſtrawberry, with ſcarlet fruit, commonly called ſcarlet fruit. 5. The large Chili ſtrawberry. 6. The globe-hautboy ſtrawberry. 7. The ſtrawberry with a ſmall greeniſh white fruit.

The firſt and ſecond ſorts of ſtrawberry are found wild in the woods in divers parts of England, from whence the plants are taken, and tranſplanted into gardens, by which the fruit is improved. The beſt ſeaſon for this work is in September, that the plants may be rooted in their new quarters before the froſt begins; which is very apt to looſen the earth ſo much about their roots, that, when the froſt goes off, the plants are apt to be turned out of the ground. They may alſo be tranſplanted in February; but then, if the ſpring ſhould prove dry, they will require a great expence of water to keep them alive.

The ſoil which is moſt proper for theſe plants, is a freſh hazelly loam, not over rich, which would cauſe the plants to ſpread and flouriſh; but they would not be ſo fruitful as upon a moderate ſoil. The ground ſhould be well dug, and cleared from the roots of all noxious weeds; and, after it is levelled even, you muſt mark it out into beds about three feet and an half wide; leaving a path between each bed two feet broad, for the conveniency of walking between them to water and clean them, as alſo to gather the fruit. In theſe beds may be planted four rows of plants, whereby they will be about a foot aſunder row from row; and, in the rows, they ſhould be planted at leaſt eight inches diſtant plant from plant; for, if they are planted nearer, they will in one year's time be ſo thick, that they will not have room to thrive.

Note, The diſtance here deſigned being for the wood ſtrawberry, which is of the leaſt growth, the other large-growing kinds muſt have a greater ſhare of room, according to their different degrees of growth; as for example, the ſcarlet ſtrawberry ſhould be planted a foot ſquare plant from plant; and the hautboy ſixteen or eighteen inches diſtance each way, and the Chili ſtrawberry twenty inches, or two feet.

In the ſpring of the year, when the ſtrawberries begin to flower, if the ſeaſon be dry, you muſt obſerve to water them plentifully, otherwiſe the flowers will fall away without producing any fruit. You muſt alſo carefully clean your beds of ſtrawberries from weeds from time to time, as they ſhall require; for, if they are once ſuffered to overbear the plants, they will decay in large patches, and alſo greatly weaken all thoſe that may continue alive. About Michaelmas, you ſhould clear off all the weeds from the beds, as alſo cut off all the ſtrings or runners from the roots, pulling out all weak plants where they are too cloſe; then dig up the walks between the beds, burying the ſeeds that came off in the bottom, and throw a little fine earth over the beds between the plants; being very careful not to lay it ſo thick as to bury the plants: this will greatly ſtrengthen them, and cauſe their fruit to be larger, and in greater quantities, than they would be, if left undreſſed.

Theſe few rules will be ſufficient, if duly regarded for cultivating theſe plants. I would only farther obſerve, that theſe beds will not continue bearing well more than three years; therefore, in order to have a conſtant ſupply, you ſhould plant a freſh plat of ground a year before you deſtroy the old beds; otherwiſe, your young plantation producing few or no fruit the firſt year, you will be deſtitute a whole ſeaſon.

The wood ſtrawberry is by many people preferred for the firmneſs of its fruit, and delicacy of its flavour: others greatly admire the ſcarlet ſort for its goodneſs; and the hautboy is eſteemed for the largeneſs of its fruit: but the ſort with white fruit is by far the beſt-flavoured of all the kinds, though it is a bad bearer.

The ſcarlet ſtrawberry is a native of America, and was firſt brought into England from Virginia; but this is now become ſo common in the gardens, as to be thought, by many, a native of this country. This is the earlieſt ſort, always coming a fortnight ſooner than either the wood or hautboy ſtrawberries; and is an excellent well-flavoured fruit; ſo is generally eſteemed.

The hautboy is alſo a firm well-flavoured fruit; and the globe hautboy, as it is generally called, is a very good bearer, and a large fruit.

The wood ſtrawberry, both the red and white, will bear in greater plenty, when they are planted in a ſtrong moiſt ſoil, than when they are on a dry light ground; where, if they are not well ſupplied with water in dry ſeaſons, they will produce very little fruit.

The green ſtrawberry is the lateſt of all the ſorts; this produces its fruit in large bunches upon long footſtalks; ſo requires to have ſome ſupport, eſpecially in wet ſeaſons; otherwiſe the fruit will lie upon the ground, and the earth will be waſhed over them. This ſort ſeldom produces much fruit in warm dry land; but upon ſtrong ſtiff ground bears plentifully, and is the richeſt fruit of all the kinds yet known; being very firm, and of a remarkable quickneſs in its flavour. This ſort is by ſome perſons ſtiled the pine-apple ſtrawberry, from an affinity, as they ſuppoſe, between the flavour of this fruit and that of the pine-apple; and ſome others have given it the name of Drayton ſtrawberry, from its having been much cultivated there.

The Chili ſtrawberry was brought firſt into Europe by Monſieur Frezier, engineer to the late French king, and given to Monſieur de Juſſieu, profeſſor of botany to the royal garden at Paris; who hath ſpread it into divers parts of Europe. This plant, Monſieur Frezier ſays, is cultivated in the fields near Chili in great plenty; and that it differs from the European kinds, in having larger, thicker, and more hairy leaves: the fruit is generally as large as a walnut, and ſometimes as big as an hen-egg, of a whitiſh red colour, and ſomewhat leſs delicious in taſte than our wood ſtrawberries. This has produced fruit ſeveral years in the royal garden at Paris, where Monſieur Juſſieu aſſured me it was commonly as large as a ſmall apple. I brought ſome of the plants from Holland, anno 1727, which thrive and increaſe exceedingly; but theſe bear very indifferently, and, the fruit being leſs delicate than the hautboys, few perſons care to propagate this ſort in England. Theſe plants have been placed in the ſun, and cultivated with care; but have never ſucceeded where they have been thus treated. I have obſerved, they have ſucceeded beſt where they have grown under the ſhade of trees, in a loamy ſoil, and little more care taken of them than to keep them clear from weeds, and to diveſt them of their runners every autumn; for they are the old plants only which produce fruit, and thoſe ſeldom, except in very ſtrong land, for in the clays I have ſeen plenty of this fruit. *Miller's Gard. Dict.*

Fragria has the fame virtues as cinquefoil: the decoction of the herb, and the immature fruit, are ftrengthening and aftringent: the fruit is emollient, nutritive, relaxing, cooling, diuretic, aperitive, and corrects acrimony; hence it becomes proper in the higheft burning fevers, and under the greateft degree of an inflammation, when the thirft is extremely urgent. The fruit eaten cures a gonorrhoea. A very good drink in fevers is thus prepared: take of the juice of ftrawberries and lemons, and of fpring water, an equal quantity; of fugar, enough to render it grateful; mix them together. The pulp, applied in a cataplafm, is good for all external inflammations; and I have frequently experienced its virtue in a relaxation of the veffels of the uterus. In tertian and quartan fevers, it does the fervice of the Peruvian bark: it is, alfo, a lithontriptic. Take the ripe berries, and put them in water; then fhake the veffel, and the feeds will fall to the bottom: thefe dried, and taken to the weight of one or two drachms in white wine, in the morning, fafting, are an excellent and ufual remedy with lithotomifts, to prevent the regeneration of the ftone in thofe who have been cut for the fame. The berries gathered in watery and marfhy places, though larger, are of lefs virtue than the mountain ftrawberries, as Gefner obferves. This ufeful plant has one inconvenience, in that it has always toads concealed under it; which, as we are affured by authors, have rendered it mortal to many who have eaten of the fruit; for which reafon, fome will never eat ftrawberries before they are wafhed. In Italy they bruife the pulp in rofe water, and make it into a conferve with juice of citrons, for the purpofes before mentioned. *Hift. Plants, afcribed to Boerhaave.*

FRANCINI's *Engine*, a particular kind of machine, or joint-pump contrived by M. Francini.

This ingenious machine was contrived and put in execution by Mr. Francini, in the year 1668, by Mr. Colbert's orders, in the garden of the king's old library. To judge of it well, you muft know that near the houfe there is a natural fpring, which ufed formerly to difcharge its water in a bafon fituated in the middle of the garden, and that the wafte water ufed to run along a canal into a well, where it was loft. Mr. Francini, taking advantage of the wafte water, and the depth of the well, raifed an artificial jet in the middle of the garden, which produced a fine effect.

The firft and fecond figures of *Plate* XXIII. reprefent the profile and elevation of this machine, compofed of a couple of double endlefs chains made of fmall iron bars joined together by joints or hinges: to thefe are faftened buckets making two joint-pumps of unequal height, which turn upon a rag-wheel FEDG, that has notches where the chains go, to hold them always in the fame direction; and the intervals of the bars of this wheel are equal to the length of one of the links of the chain, that, the great joint-pump turning with the rag-wheel, the other joint-pump may be forced to turn along with it.

The axis of the rag-wheel is fuftained by two pofts P framed into cills on the curb at top of the well, and fo brought up to their height, and kept faft by two crofs pieces Q R, the loweft of which fuftains the ciftern A, which the wafte water of the bafon runs into.

The buckets B of the great joint-pump are made of plates of brafs, making a veffel wider at top than bottom, the better to receive the water from the ciftern A, which runs continually through the trough X; this figure is fo much the more convenient for thefe buckets, that, when one of them is full, the furplus of the water that runs along its furface, runs naturally into the next bucket below, and from that into the third, and fo on, fo that no water can be loft by fpilling over.

The buckets C and S of the leffer joint-pump, *fig.* 2, have the fame figure as the others, with this difference, viz. that they are clofed all round, except at the place S, where they have a little neck towards the bottom, where the bucket is leaft, which neck is upwards when the buckets rife full of water to difcharge it into the upper ciftern M I. To make the thing plainer, we have drawn by themfelves, between *fig.* 1. and *fig.* 2, one bucket of the great joint-pump, and one of the fmall one, which fhews the fituation in which they are, when, being full of water, thofe of the great pump defcend into the well, and thofe of the fmall one rife to empty themfelves into the upper ciftern.

Though the firft figure reprefents only one joint-pump feen fide-wife, it may ferve to fhew the working of each in particular. For example, you may confider the buckets B, as thofe of the great pump, when they go down into the well, and the others H of the fame, when they rife empty. If on the contrary we confider the fmall pump, you may judge of the fituation of its buckets H, when they rife full of water, and of the fituation they have at B, when they come down empty. A wheel with teeth O has been fixed to the axis of the rag-wheel, whofe teeth take a pinion or lantern N, *fig.* 1. and *fig.* 2. that has a fly to keep the uniformity of the motion of the machine, that it may not go by jerks, and not feel the fmall alterations that may be caufed by obftacles met with in the way, *fig.* 1.

As the great joint-pump is fuppofed to go down into the well to a depth fomething greater than the height to which the water is to be raifed above the level of the ground, there will always be a greater number of its buckets that will go down full of water, than there will be of the little pump that will carry up theirs full to the rag-wheel; confequently, the weight of the water that defcends being fuperior to that which rifes, the great pump will neceffarily make the little one turn, whofe buckets will fill themfelves, as they go through the ciftern A, which upon that account muft have a certain depth, that the water may have time to fill them.

As to velocity proper for this machine, it can only be determined by experience, by increafing or diminifhing the number of the buckets of the great pump, to know how much the power muft be fuperior to the weight; which muft alfo depend upon the quantity of water the fpring is able to give.

When the buckets of the great pump are of the fame bignefs as thofe of the fmall one, and the firft chain of buckets is fomething more than double the length of the fecond, fomething lefs water will rife in the upper ciftern than is loft in the well; that is, there will be raifed fomething lefs than half of what the fpring affords. If you would have more than half raifed, but to an height lefs than the fall, you muft then make the contents of the buckets of the fmall pump greater than the buckets of the other, in a reciprocal ratio of the fall of the water to the height to which it is raifed: and on the contrary, when you would raife the water to a greater height than the fall, you muft make the buckets of the fmall pump lefs than thofe of the great one, again in the reciprocal ratio of the defcent and the rife of the water; then there will rife lefs than what is loft in the well, in the reciprocal ratio of the fame terms.

You fee that in the cafe where Francini made ufe of this machine, after the water had been raifed into the upper ciftern M I, it came down by a conduit-pipe, and went and played a jet in the bafon of the garden, whence it came back into the ciftern A, and united again with that of the fpring, to help to play the two joint-pumps, fo that, by means of this circulation, a fpring, affording but little water, raifed without interruption fo great a quantity of water, that one might borrow a part for other ufes.

The chief difficulty here is to have a well deeper than the fall, in a foil where the water can be loft; unlefs you can find a lower place to conduct the water to from the bottom of the well.

FREE-*ftone.*—The qualities of the feveral kinds of Free-ftone in common ufe in the feveral parts of Europe are very different. They all agree in this general property indeed, that they are fofter while in the quarry, than when they have been fome time expofed to the air: but even this general property differs greatly in degree. They have a fort of grey Free-ftone in ufe at Paris, of which we do not feem yet to have met with any quarries in England, though probably enough there are fuch, which has this property in fo eminent a degree, that the expence of working it is in a great meafure faved.

This ftone lies every-where on the fouth fide of the river Seine, and is of a coarfe and large grit. It is fo foft, when newly taken out of the ftrata, that they cut it very conveniently with a fort of broad axe, and fafhion as many ftones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ftone is as foft as dry clay, when firft taken up, it is found to harden fo confiderably in the air, that it becomes more than equal to our ordinary Free-ftone.

Our Portland ftone of the fineft kind, which is white, and of a clofe grit, is very fit for hewing or carving; but it will neither refift water nor fire, which is a very fingular circumftance in fo denfe a ftone; while the Free-ftone of Kent, which is lefs beautiful to the eye, and is of a greyifh colour, and confiderably clofe, though of a larger grain, refifts the air and water very well.

The Free-ftone of Derbyfhire, on the other hand, is fo brittle as to be unfit for any fine working, and fo coarfe and open in its texture that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c. *Phil. Tranf.* Numb. 93.

FREEZING *of wines*, a method propofed by Dr. Shaw, for depriving wines of their aqueous parts, by the means of cold. In the Freezing of wines and the like liquors, the aqueous parts freeze firft, and are by this means feparated from the truly vinous; an obfervation which may be made of great ufe, in the wine trade. The experiment may be made by art, at any time: take a quart of common red port, put into a Florence wine flafk, and bury it in a mixture of one part of common falt, and two parts fnow or beaten ice, the confequence will be, that the aqueous part of the wine foon turns to ice, and the rich thick remainder of the true vinous parts may be poured off by inclination. Natural cold, however, in Freezing wines, performs this experiment much better. By this means, wines, vinegars, and malt liquors may be all reduced to a fourth part of their quantity for exportation, without any confiderable lofs of their effential parts, little more than the mere water freezing, and the effential part of the wine remaining thus admirably cured, and capable of keeping feveral years. It is eafy to fee, that a great ufe may be made of this in the wine trade, as large quantities of the pooreft wines might thus be converted into rich ones, and the quinteffence of the richer

richer wines might be procured for the amending the poor ones; and vast advantages might be reaped from this in wine countries.

Wines and vinegars concentrated by Freezing, though they keep unaltered for several years, yet are liable to some accidents, in process of time.

Thus wines, on being concentrated, seem to acquire a more austere taste than they had originally; and this is not wonderful, as the condensation brings the saline and rough matter into a third or a fourth part of the compass that it originally lay in; so that this is properly no addition or increase of the rough taste, but probably, on the contrary, some mitigation of it, in regard to the closeness to which this rough matter is brought, which of itself ought rather to multiply the effect in a greater proportion.

The change may be conceived owing to this, that all wines are observed to grow mild and soft by lying long; which effect is greatly promoted in them by a successive separation of their tartar, and a gentle evaporation of some part of their water occasioning that necessity which is frequently found in the summer months of filling up the casks: but in our concentrated wine, though the same tartar be successively separated, yet there is found no concurrent slow evaporation, for the concentrated wine grows soft and mellow in a well stopped glass, where no diminution of the quantity is perceived; the effect in this case proceeds principally from a closer and more intimate combination of the spirituous with the grosser and more terrestrial part. *Stahl de Concentrat.*

Beside this, there seems another remarkable change incident to the concentrated wine, not only in the taste, but more abundantly in the smell. For, if an austere and rough wine, and of the usual smell of such wines, be put up in bottles, its taste, after two or three years, not only becomes more mellow and smooth, but its smell, at this time, perfectly resembles sack or canary. This is a high degree of melioration, and will give a poor austere German wine, for such were those on which Stahl made the experiments, the flavour of so rich a wine as canary, and that so perfectly, that very good judges may not find out the difference by their smell, though the taste is abundantly different. Whatever advantage the dealer in wines may foresee from the success of these experiments, there is this farther inducement to his bringing them into practice in the large way, that every thing will answer better, and not worse, than the experiments in the smaller quantities. All these experiments have been made with little portions, which are very well known not to keep so well as larger; and it is evident both from reason and experience that great bulks of liquor are much less subject to changes and alterations from the external effects of air and heat, which are the two great incentives to fermentative motions; and that, if such small parcels suffered no change for the worse, much less need it be apprehended that any larger would. *Shaw's Comm. Essay on concentrating Wines.*

FREEZING *rains.*—Our own annals give us many accounts of the damage done to our trees by rains Freezing, as they fall, and consequently forming cakes of ice about all the branches, which by degrees increase to a weight that the branch is unable to support. In the year 1672, there fell such a rain as this at Bristol, and over all the country thereabouts. Most of the orchards, exposed to the north-east, were destroyed by it, and, had it continued longer, and been attended with gusts of wind, scarce any thing could have stood before it. A piece of an ash-tree of just three quarters of a pound weight was weighed, with its coat of ice upon it occasioned by this rain; the ice weighed sixteen pounds, besides what was melted off by the person's hands who brought it. The stalks of grass were surrounded with coats of ice, some of which were five inches round by measure. All the time that the orchards and hedges were thus breaking under the loads of ice, the waters were all free, and not so much as a puddle frozen over. The roads were rendered impassable by the parts of trees every-where fallen across them, and the noise of the icy boughs rattling against one another, as shook by the wind, was very terrible. Where this rain fell upon the snow, it immediately became ice as on the trees.

It is remarkable that men who were out on the road, complained of the most excessive colds, and were in agonies on coming into a warm room; though all the while, in some places, there only fell a kind of sleet, which was wet under the feet, and gave no appearance of frost upon the ground.

This sort of temper in the air preceded also the Freezing rains, in the very places where they happened. Though this severe weather happened in December, as soon as it was over, which was in a few days, there was a sudden change, into not only a mild, but a hot season. People complained of excessive sweating, both by night and day, and the trees and hedge-bushes put forth their buds for leaves and blossoms, as if it had been April; some of the apple-trees flowered before Christmas, and had the young fruit before New-year's day. *Phil. Transf.* Numb. 90.

FREIGHT (*Dict.*)—The laws of England relating to Freight are as follows.

1. Respect is always had herein to the ship itself, or a certain part of it. Again, merchants freight either by the month, the voyage, or the ton; for to freight a ship, or take certain tonnage to Freight, are different things, as are also to be a cap-merchant, or an under freighter.

2. There was of old another way of freighting, the merchant agreeing with the master, for a sum, to convey his goods insured against all peril, being responsible for any loss; but it is now out of use.

3. Freight is governed generally by the written agreement called a charter-party, executed between the owners or master and merchants, or else by parole.

The master or owners generally covenant to provide a pilot, and all necessaries for the voyage, and for lading and delivering. If there be agreement and earnest, but no writing, the merchant breaking off loseth his earnest, but the owners or master double the earnest.

But, by the common law of England, the party oppressed may bring his action, and recover all damages on the agreement. If a time be appointed by charter-party, and either the ship be not ready to take in, or the merchant to put on board, the parties are at liberty, with remedy by action for the detriment. If part be on board, and some misfortune prevent the merchant's sending the whole in time, the master may contract with another, and have Freight as damage for the time they were on board longer than limited. And, though it be not prudent for every merchant or master to break the contract, though the agreement as to lading be not according to promise (seldom or ever done, if part be aboard) yet it is the highest justice, that ships and masters be unfettered and free: as, by the bare lading of a cask or bale, they may lose the passage or season of the year.

So on the other hand, if the vessel is not ready, the merchant may ship the remainder of his goods on board another, and recover damages against the first master, or owners. This is grounded on the like reason.

Therefore, by the law marine, chance, or other notorious necessity, will excuse the master, but he loses his Freight till he breaks ground.

But, if the merchant be in fault, he must answer the damage, or be liable to maintain the crew ten days; but, if after that, the full Freight; if damage afterwards, it is the merchant's risque. But, by the common law, while the goods are on board, the master must see them forth-coming.

4. Charter-parties have always, by the common law, had a genuine construction as near as may be, not according to the literal sense of traders, yet must be regularly pleaded.

5. If goods are fully laded, and the ship hath broke ground, the merchant afterwards declines the adventure, and will unlade again; by the law marine the Freight is due. And if the ship on her voyage become unable without the master's fault, or he be arrested by some prince or state in her voyage, he may either mend his ship or freight another. But, if the merchant will not agree to it, the Freight becomes due for what the ship has earned, otherwise the master is liable for all damages that shall happen. If therefore the ship to which the goods were passed perished, the master shall answer; but, if both perish, he is discharged. But if there be extreme necessity, as the ship a sinking, and an empty ship pass by, or at hand, he may translate the goods; and, if that ship perish, he is excused: but it must appear the ship seemed probable and sufficient.

6. If a set time be agreed on, between the merchant and master, to begin and end the voyage, it may be altered by the supercargo without special commission.

If a master shall fail on his voyage after the time agreed on for his departure, if damage happens afterwards, he shall make it good. Yet, if a charter-party is made, that the plaintiff shall sail from London to Lisbon with the first opportunity, &c. in consideration of which the merchant covenanted for so much Freight; the ship departs not with the first wind, yet afterwards breaks ground, and arrives at her port, the Freight here is due; for nothing can debar the ship of it but the not departure, which only is in law traversable, being material to avoid payment of Freight.

7. If the ship be freighted from one port to another, thence to a third, &c. and so home to the port whence she first sailed (commonly called a trading voyage) it is all but one and the same voyage, if in conformity to the charter-party.

8. If a ship freighted by the ton be full laden according to the charter-party, the Freight is payable for the whole, otherwise for the amount of the tons only.

9. If the ship, by any fault of the freighter, as lading aboard prohibited goods, be detained, he shall answer the Freight contracted.

If a ship be freighted out and in, no Freight is due till the voyage be performed: if, therefore, the ship perish coming home, the whole Freight is lost.

10. A master freighting his ship, and afterwards secretly taking in other goods, loses his Freight; and, if any of the freighter's goods should, for the ship's safety, be cast overboard, the rest shall not be subject to average, but the master must make it good; but, if the goods are shipped unknown to him, it is otherwise, and they are subject to what Freight the master thinks fit. The ship putting into any other port than she is freighted to, the master shall answer damage to the merchant;

merchant; but, if forced in by ftorm, enemy, or pirates, he then muft fail to the port conditioned at his own cofts.

Generally, the touching at feveral ports by agreement imports not a diverfity, but a voyage entire.

11. If paffengers having goods die on fhip-board, the mafter is to inventory their concerns, which if none claim within a year, he becomes proprietor defeafible: but the bedding and furniture becomes the mafter's and his mates, and the cloathing muft be brought to the maft-head, and there appraifed and diftributed amongft the crew, as a reward for their feeing the body put into the fea.

If the captain die leaving money on board, the mate becomes captain, and if he improves the money; he fhall, on allowance for his care, account both for intereft and profits.

12. The fhip's lading, in conftruction of law, is tacitly obliged for the Freight, it being, in point of payment, preferred before any other debts to which the goods laden are liable, though fuch were precedent to the Freight, for the goods remain as it were bailed for the fame: nor can they be attached in the mafter's hands, though it is vulgarly conceived otherwife. Ships deferve wages, like a labourer; and, therefore in the eye of the law, actions touching them, are generally conftrued favourably, for the fhip and owners: and, therefore, if four part-owners of five account with freighters, and receive their proportions, yet the fifth may fue fingly both by common and marine law.

FRITILLA'RIA, *fritillary, or chequered tulip*, in botany, a genus of flowers whofe characters are:

The flower confifts of fix leaves, and is of the bell-fhaped lily-flowers, pendulous, naked, and, for the moft part, chequered; the ftyle of the flower becomes an oblong fruit, which is divided into three cells, and filled with flat feeds, lying in a double row: the root confifts of two flefhy knobs, which are, for the moft part, femiglobular, betwixt which arifes the flower ftalk.

Thefe plants are propagated either by feeds, or off-fets from the old roots: by the firft of which methods new flowers will be obtained, as alfo a larger ftock of roots in three years, than can be obtained in twenty or thirty years in the latter method: I fhall therefore only treat of their propagation by feeds.

Having provided yourfelf with fome good feed, faved from the faireft flowers, you muft procure fome fhallow pans or boxes, which muft have fome holes in their bottoms to let out the moifture: thefe you fhould fill with light frefh earth, laying a few potfherds over the holes, to prevent the earth from ftopping them: then having laid the earth very level in the boxes, &c. you muft fow their feeds thereon pretty thick, covering it with fine fifted earth a quarter of an inch thick. The time for fowing the feeds is about the beginning of Auguft; for, if it be kept much longer out of the ground, it will not grow: then place the boxes or pans where they may have the morning fun until 11 o'clock, obferving, if the feafon proves dry, to water them gently, as alfo to pull up all weeds, as foon as they appear; for, if they are fuffered to remain until they have taken deep root into the earth, they would draw feeds out of the ground, whenever they are pulled up. Towards the latter end of September you fhould remove the boxes, &c. into a warmer fituation, placing them under an hedge or wall expofed to the fouth; in which place they may remain until the middle of March; by which time the plants will be come up an inch high: you muft therefore remove the boxes, as the weather increafes hot, into a more fhady fituation; for, while the plants are young, they are liable to fuffer by being too much expofed to the fun: and, in this fhady fituation, they may remain during the heat of the fummer, obferving to keep them clear from the weeds, and to refrefh them now and then with a little moifture; but be careful not to give them much water after their leaves are decayed, which would rot the roots. About the beginning of Auguft, if the roots are very thick in the boxes, you fhould prepare a bed of good light frefh earth, which muft be levelled very even, upon which you fhould fpread the earth in the boxes in which the fmall roots are contained, equally covering it about one fourth of an inch thick with the fame frefh earth: this bed fhould be fituated in a warm pofition, but not too clofe to hedges, walls, or pales, which would caufe their leaves to be long and flender, and make the roots weaker than if placed in a more open expofure.

In this bed they may remain until they flower, which is generally the third year from fowing; at which time you fhould put down a mark to the roots of all fuch as produce fair flowers, that, at the time of taking them out of the ground (which ought to be foon after their green leaves are decayed) they may be felected into a bed amongft your old roots of this flower, which for their beauty, are preferved in the beft gardens; but the other lefs valuable flowers may be planted in the borders of the parterre garden for their variety, where, being intermixed with other flowers of different feafons, they will make a good appearance. *Miller's Gard. Dict.*

FRITT, or FRIT, in glafs-making, the calcined matter to be run into glafs. To make this for cryftal glafs, take of the fineft tarfo, powdered fine and fifted, two hundred pounds; of the falt of polverine, an hundred and thirty pounds; mix them well together, and put them into the calcar, or calcining furnace, which muft be thoroughly heated firft, otherwife the operation will be very difficult; a moderate fire is to be kept up for an hour, and the matter continually ftirred together with a rake, and then the firft muft be made very violent, and kept up for five hours. After this, take it out and cover it from duft, it will be white as fnow. It muft be kept in this ftate, three or four months, and is then ready to make the fineft cryftal glafs. *Neri's Art of Glafs.*

FROTH *Spit*, or *cuckow fpit*, a name given to a fort of white Froth or fpume very common in the fpring, and firft months of the fummer, on the leaves of certain plants, particularly on thofe of the common white field lychnis, or catch-fly, thence called by fome fpattling poppy. All writers on vegetables have taken notice of this Froth, though few have underftood the caufe or origin of it, till of late. Many imagined it an exhalation of the earth, fome have efteemed it, as its name expreffes, the faliva of the cuckow, others the extravafated juices of the plant, and fome a hardened dew. But all thefe are erroneous opinions, and the true account of it is that it owes its origin to a fmall infect.

There are very frequently to be feen in the fummer months a fort of fmall leaping animals, called by fome the flea grafhoppers, becaufe they are very fmall, and leap like a flea; thefe little creatures have each a pointed probofcis, by means of which they fuck the juice of the plants, they are found upon. Thefe animals lay their eggs in autumn, from which in the fpring following the young ones are hatched; and thefe are at firft tenderly fheltered from injuries by a delicate and thin membrane, which makes a fort of nymph, having the lineaments of all the parts of the animal, which is to iffue from it. When it is firft hatched from the egg, it is a fmall white point on the leaf, not larger than the point of a needle; a few days after, it is greenifh, its colour changing with the juices of the plant on which it feeds: in this ftate it not unaptly refembles that fmall fpecies of frog, called the tree-frog, which is common on the branches of trees in many places; it moves about very fwiftly in this ftate, though ftill covered with its membrane; but, till it gets rid of that, it can neither leap nor fly.

The manner in which the little creature forms this Froth upon the plant is this: it applies its anus clofe to the leaf, and difcharges upon it a fmall drop of a white vifcous fluid, which, containing fome air in it, is foon elevated into a fmall bubble; before this is well formed, it depofits fuch another drop, and fo on, till it is every way overwhelmed with a quantity of thefe bubbles, which form the white Froth which we fee. It adds to this upon occafion, but never moves from under it, till it has got rid of its enveloping membrane, or arrived from the nymph ftate to that of the perfect animals. It throws out thefe globules of vifcous humor, by a fort of dilatation, and contraction of its belly; and, as they fucceed one another, it difpofes them every way round it with its feet. A proof, that, while thefe animals are in this imperfect ftate, and covered with Froth, they yet feed on the juices of the plant, is, that, if one of them be placed on a leaf of mint, or any other fuch plant, the leaf on which they live will never grow beyond the fize it was of, when the animal was placed upon it, while the oppofite leaf will acquire its full dimenfions. When the animal has quitted its nymph ftate, it make no more Froth, but leaves that under which it had lived, and takes its courfe freely about the plant.

FRUCTIFICA'TION. The organs of Fructification in plants are the pointal, generally contained in the middle of flowers; and the threads, which furround it, furnifhed at their extremities with little heads; these the botanifts term, the firft the piftillum, the fecond the ftamina, and the third, or heads of the ftamina, the antheræ, or apices.

The apices contain the farina fœcundans, a fine fubtile matter analogous to the femen mafculinum in animals; the ftamina ferve only for their fupport, and to convey nutrition to them; and the piftillum is the part deftined to receive this farina, and convey it to the feeds.

It is upon thefe principles that the excellent Linnæus has founded his fyftem of the vegetable world, and formed his claffes. This author's work has been received by the learned world in all nations with the refpect it merits; but has been too generally cenfured among the flighter proficients in botanical refearches, as abftrufe, difficult, and unintelligible. The viewing thefe things in a new light, and the neceffity of making new words to convey new ideas, has indeed given this great attempt fomething of the face of an abftrufe piece; but, premifing a few general hints, it may not be difficult to vindicate the author from the heavy charges which have been laid againft him, and give the Englifh reader a clear and perfect view of his work.

From the ftructure and ufe of the piftillum, ftamina, and apices, it is eafy to conceive that the former muft be accounted the female, and the two latter the male parts of flowers. This is the great bafis of his fyftem. To exprefs the different combinations of thefe in the different claffes of plants, by formal defcriptions of each, had been tedious, and an overburden to the memory: to avoid this, he has excellently contrived the comprifing that defcription, or general character, in one word. It is eafy to conceive there could be no words already in ufe, that could exprefs what had never before been thought of; he has therefore been neceffitated to invent new ones for this purpofe. He has ventured therefore to form twenty-four fuch, for his claffes, classes, which are of that number, and has taken them from that language which all the learned have ever used on the same occasion, the Greek; and this with the least ostentation or shew of learning imaginable: in short, to understand all these, there is no need of knowing more Greek than that ἀνὴρ signifies a man, or any thing male; and γυνὴ, a woman, or female; that δύναμις, is power or efficacy; ἀδελφὸς, a brother; and thence ἀδελφαὶ, brotherhoods or communities; that σὺν is together; γένεσις, generation or origin; and οἶκος, a house, or habitation; that πολὺς, signifies many; γάμος, marriage; and κρυπτὸς, hidden or concealed; and that the numbers one, two, three, four, five, six, seven, eight, nine, ten, twelve, and twenty, or their derivations, once, twice, &c. are expressed by the Greek words μόνος, δὶς, τρὶς, τέτρα, πέντε, ἓξ, ἑπτὰ, ὀκτὼ, ἐννέα, δέκα, δώδεκα, εἴκοσι: there needs, I say, no more knowledge of Greek than this, to understand perfectly the meaning of all the terms this author, to avoid tedious descriptions, has used as the characters of his classes. To begin with certainty and regularity,

He first divides the whole vegetable world into such species as have their flowers visible and obvious to the eyes, and such as have them invisible, or at the utmost scarce discernable.

Those which have them visible he then divides again into such as have the stamina, apices, and pistillum, that is, the male and female part, of Fructification, in the same flower:

These he, for that reason, calls hermaphrodite flowers.

And such as have the male and female parts of Fructification, that is, the apices and pistillum, either in different flowers upon the same stalk, or upon different plants of the same species: these he calls the distinct male and female flowers.

Those which have the different organs of Fructification lodged in the same flower, he again divides into such as have the stamina in no part growing together, or cohering to one another: and such as have them either growing together or cohering together mutually in some part, either with one another, or with the pistillum.

Those which have them in no part cohering either with the pistillum, or with one another, he again subdivides into such as observe no exact or accurate proportion of length one among another, and such as have ever two of the stamina shorter than the rest.

From these general divisions he descends to his particular classes, of which he establishes twenty-four.

The first thirteen are of the plants which have hermaphrodite flowers, with the organs of Fructification disjunct, no where cohering with one another, and observing no exact proportion in length.

The first is of the monandria: the word is derived from the Greek μόνος and ἀνὴρ one male part, and signifies a flower which has only one such. This class accordingly comprehends those plants with an hermaphrodite flower, and in it only one single stamen: of this class are the blite, turmeric, &c.

The second is of the diandria; the word, derived from the same ἀνὴρ and δὶς, twice, and signifying a flower that has two male parts, comprehends all those plants which have hermaphrodite flowers with two stamina on each: of this class are the jasmine, phillerea, olive, rosemary, butterwort, &c.

The third is of the triandria; the word, derived from the same ἀνὴρ and τρὶς, thrice, signifies a flower that has three male parts in it, and comprehends those plants which have hermaphrodite flowers with three stamina in each: of this class are the valerian, saffron, many of the grasses, &c.

The fourth is of the tetrandria; the word, derived from the same ἀνὴρ and τέτρα, four times, signifies a flower that has four male parts, and accordingly comprehends those plants which have hermaphrodite flowers with four stamina in each; of this class are the teasel, madder, plantain, &c.

The fifth is of the pentandria; the word, derived from the same ἀνὴρ and πέντε, five, signifies a flower with five male parts, and accordingly comprehends those plants which have hermaphrodite flowers with five stamina in each; of this class are the primrose, willow-herb, bind-weed, &c.

The sixth is of the hexandria; the word, derived from the same ἀνὴρ and ἓξ, six, signifies a flower that has six male parts, and accordingly comprehends those plants which have hermaphrodite flowers with six stamina in each; these stamina, the author observes, are either all equal in length, or alternately one shorter than another: of this class are garlic, hyacinths, meadow saffron, &c.

The seventh is of the heptandria; the word, derived from the same ἀνὴρ and ἑπτὰ, seven, signifies a flower which has seven male parts, and comprehends those plants which have hermaphrodite flowers with seven stamina in each: of this class are the horse chesnut and trientalis.

The eighth is of the octandria; the word, derived from the same ἀνὴρ and ὀκτὼ, eight, signifies a flower with eight male parts, and comprehends those plants which have hermaphrodite flowers with eight stamina in each: of this class are the maple, rue, heath, &c.

The ninth class is of the enneandria; the word, derived from the same ἀνὴρ and ἐννέα, nine, signifies a flower that has nine male parts, and comprehends those plants which have hermaphrodite flowers with nine stamina in each: of this class are the bay, rhubarb, &c.

The tenth class is of the decandria; the word, derived from the same ἀνὴρ and δέκα, ten, signifies a flower which has ten male parts, and comprehends all those plants which have hermaphrodite flowers with ten stamina in each: of this class are the judas tree, bastard dittany, caltrop, &c.

The eleventh is of the dodecandria; the word, derived from the same ἀνὴρ and δώδεκα, twelve, signifies a flower which has twelve male parts in it, and comprehends those plants which have hermaprodite flowers with twelve stamina in each: of this class are the asarabacca, agrimony, &c.

The twelfth is of the icosandria; the word, derived from the same ἀνὴρ and εἴκοσι, twenty, signifies strictly a flower with twenty male parts in it; the author however does not understand it in that strict sense, but, using it as we frequently do words expressing large quantities, as indefinite and in an indeterminite sense, defines it to mean only a larger number of stamina than are expressed under any other of the distinctions; and comprehends under it, in this class, all those plants which have hermaphrodite flowers and more than twelve stamina in each; those stamina also growing to the inner side of the cup of the flower, not to the receptacle of the future seeds: of this class are the torch thistle, the myrtle, storax, the almond, &c.

The thirteenth is of the polyandria; the word, derived from the same ἀνὴρ and πολὺς, many, signifies, in an exact sense, no other than what he makes the icosandria, the title of the last class, express: these are, perhaps, the only two words in which his expression is deficient, the names he has given the classes not at all importing their particular difference from one another: this, however, he has very accurately done in the character which follows them; and comprehends under this class those plants which have hermaphrodite flowers with more than twelve stamina in each, but which grow in this to the receptacle of the future seed, not as in the other class to the inner side of the cup of the flower; of this class are the water lily, poppy, celandine, &c.

These are the classes this accurate distinguisher has established among the hermaphrodite flowers, whose stamina have no regular proportion of length, in regard to one another. To these he next subjoins two classes of such of them as have two of their stamina shorter than the rest.

The first of these (the fourteenth class of the general order) is of the didynamia: the word, derived from the before-mentioned δὶς and δύναμις, power or efficacy, signifies with him such flowers as have two of their male parts of more efficacy than the rest; and, in this class, he accordingly comprehends all those plants which have hermaphrodite flowers, two of whose stamina are longer, and of greater efficacy in the great work of fecundating the seeds, than the rest: of this class are the thyme, lavender, basil, &c.

The second of these (the fifteenth class of the general order) is of the tetradynamia; the word, derived from the before-mentioned τέτρα and δύναμις, signifies a flower with four of its male parts of more efficacy than the rest; and in this class he comprehends the plants with the hermaphrodite flowers, four of the stamina of which are longer than the rest: of this class are the scurvy-grass, radish, mustard, &c.

From these he proceeds to those hermap .rodite flowers whose stamina cohere, either mutually among one another, in different manners, or with the pistillum of the flower: these coalitions of the stamina he calls brotherhoods or communities; and according to the different state of these, and their conjunctions with the pistillum, he establishes five classes of them.

The first of these (the sixteenth in the general order) is of the monadelphia; the word, derived from the before-mentioned μόνος, single, and ἀδελφαὶ, brotherhoods, or communities, signifies, with him, a flower whose stamina, by the filaments running in one among another, are all formed into one body; and under this class he comprehends those plants with hermaphrodite flowers, whose stamina, or male parts, are all bound together in one body: of this class are the crane's bill, mallow, &c.

The second of these (the seventeenth class in the general order) is of the diadelphia; the word, derived from the before-mentioned δὶς and ἀδελφαὶ, signifies, with him, a flower whose stamina are, by the conjunction of their filaments, formed into two bodies; and under this class he comprehends those plants with hermaphrodite flowers, the stamina of which are so clustered together into two bodies: of this are the fumitory, milkwort, broom, &c.

The third of these (the eighteenth in the general order) is of the polyadelphia; the word, derived from the before-mentioned πολὺς and ἀδελφαὶ, signifies with him a flower whose male parts are clustered into three or more separate bodies; and in this he comprehends these plants with hermaphrodite flowers, whose stamina, by the conjunction of their filaments, are formed into three or more clusters: of this class are the orange, St. John's wort, &c.

The fourth of these classes (the nineteenth in the general order) is of the syngenesia: the word, derived from σὺν, together, and γένεσις, generation, origin, or formation, signifies, with him, such flowers as have their male parts naturally formed into a single regular congeries; and accordingly he comprehends under this class such plants as have hermaphrodite flowers, the stamina of which, by the junction of their apices, are formed into a single,

regular,

regular, cylindric body: of this class are the lettuce, succory, hawkweed, &c.

The fifth of these classes (the twentieth in the general order) is of the gynandria: the word, derived from γυνη, a woman, or female, and ανηρ, male, signifies, with this author, a conjunction of the male and female parts of a flower at their origin; and he accordingly comprehends under this class those plants which have hermaphrodite flowers, the stamina or male parts of which grow to the pistillum, or female parts of the flower, and not to the receptacle of the seeds: of this class are the barrenwort, passion-flower, birthwort, &c.

Next after these he ranges those plants which have flowers not hermaphrodite, but regularly and distinctly male and female, as the sexes in animals are disposed; and after these such plants as have flowers irregularly of one, or the other, or sometimes of both sexes.

Of these he establishes only three classes.

The first of these (the twenty-first class of the general order) is of the monœcia: the word, derived from the before-mentioned μονος, and οικος, a habitation, signifies, with this author, such plants as have their distinct flowers on the same individual; and he comprehends accordingly under it those plants which have the male and female flowers distinct in themselves, but placed on the same plant, or the different stalks from the same root: of this class are the alder, mulberry, amaranth, arrowhead, &c.

The second of these (the twenty-second class in the general order) is of the diœcia: the word, derived from the same, οικος and δις, signifies, with him, plants which have their male and female flowers, not on the same individual; and accordingly comprehends under it such plants as have distinct male and female flowers, and different plants of the same species, either of which, the male and female plants, as they are hence called, might have arisen from the same seed: of this class are the willow, misletoe, hemp, and spinach, &c.

The third of these (the twenty-third in the general method) is of the polygamia: the word, derived from πολυς many, and γαμος, marriage, signifies, with this author, plants which have a diversity of combinations and many ways of Fructification, in the same species; and accordingly he comprehends under this class those plants which have, in the same species, some flowers male, others female, each distinct and perfect in its kind, and others mixed or hermaphrodite, with the male and female organs of Fructification both in each: of this class are pellitory, of the wall, orrache, the ash, &c.

After all these he places those plants whose flowers are either absolutely invisible, or scarce discernable by the eye: of these he makes only one, his twenty-fourth and last class, the cryptogamia: the word, derived from κρυπτος, hidden, or concealed, and the before-mentioned γαμος, or marriage, signifies a set of plants, in which the Fructification is concealed: and under this last class he comprehends those plants which either flower, as is generally supposed, within the fruit, or have the organs of their Fructification so mingled as to escape our observation: of this class are the ferns, mosses, liverworts, and mushrooms.

These are the classes into which this author has regularly and certainly reduced the whole vegetable world; the characters of which are so expressive, and the parts they are founded upon so fixed and invariable in their nature and office, that there seems no reason hereafter to perplex the world with any new system.

As the classes are here taken from the number, site, and disposition of the male parts of the flower; so the orders which make their subdistinctions are, by this author, deduced from the differences of the female parts or pistillum; and as that is single, double, triple, and so on, they are on the same principles named monogynia, digynia, trigynia, &c.

It were to be wished indeed that the characters of the different genera of these classes were as perfect and accurate as the classes themselves: this, however, was more than the work of one man; the author has fixed the general distinction, and led the way; and it is easy now for a much less genius to follow him.

FRUIT (*Dict.*)—The Fruit of some plants are produced singly, as are their flowers; and sometimes they are produced in clusters, as in most fruit-trees, which are also fleshy; but in many plants they are dry.

The word Fruit is also used to signify an assemblage of seeds in a plant; as in a pea, bean, ranunculus, &c. and, in its general signification, for all kinds of grain, whether naked, or inclosed in a cover, capsula, or pod, whether bony, fleshy, skinny, membraneous, or the like.

Fruit is the product or result of the flower, or that for whose production, nutrition, &c. the flower is intended.

The structure and parts of different Fruits are different in some things; but, in all the species, the essential parts of the fruit appear to be only continuations or expansions of those which are seen in the other parts of the tree.

Dr. Beale suggests some very good reasons for a direct communication between the remotest parts of the tree and the Fruit; so that the same fibres or stamina, which constitute the root, trunk, and boughs, are extended into the very Fruit.

Thus, if you cut open an apple transversely, you will find it to consist chiefly of four parts: viz. 1. a skin or cortex; which is only a production of the skin or outer bark of the tree. 2. A parenchyma or pulp, which is an expansion and intumescence of the ble or inner bark of the tree. 3. The fibres or ramifications of the woody part of the tree. 4. The core, which is the produce of the pith or medulla of the plant, indurated or strengthened by twigs of the wood and fibres inosculated therewith. This serves to furnish a cell or lodge for the kernels, filtrates the juice of the parenchyma, and convers it, thus prepared, to the kernel.

Of the fibres authors generally reckon fifteen branches; of which, ten penetrate the parenchyma, and incline to the basis of the flower; the other five ascend, more particularly from the pedicle or stalk, and meet with the former at the base of the flower; to which branches the capsulæ or coats of the kernels are fastened.

These branches, being first extended through the parenchyma to the flower, furnish the necessary matter for the vegetation of it: but, as the Fruit increases, it intercepts the aliment; and thus the flower is starved, and falls off.

In a pear, there are five parts to be distinguished, viz. the skin, parenchyma, ramification, stone, and acetarium.

The three first parts are common to the apple. The stone, observed chiefly in choke pears, or baking pears, is a congeries of strong corpuscles, that are dispersed throughout the whole parenchyma, but in the greatest plenty, and closest together, about the center, or acetarium: it is formed of the stony or calculous part of the nutritious juice.

The acetarium is a substance of a tart acid taste, of a globular figure, inclosed in an assemblage of several of the stony parts before-mentioned.

In a plum, cherry, &c. there are four parts, viz. a coat, parenchyma, ramification, and nucleus or stone. The stone consists of two very different parts: the external or harder part, called the stone or shell, is a concretion of the stony or calculous parts of the nutritious juice, like the stone in pears, within it. The inner, called the kernel, is soft, tender, and light, being derived from the pith or medulla of the tree by seminal branches, which penetrate the base of the stone.

The nut, or acorn, consists of a shell, cortex, and medulla; the shell consists of a coat and parenchyma, derived from the bark and wood of a tree.

The cortex consists of an inner and outer part; the first is a duplicature of the inner tunic of the shell: the second is a mossy substance, derived from the same source as the parenchyma of the shell. But authors are not agreed, whether the medulla or pulp of the kernel does arise from the pith of the tree, or the cortical part thereof.

Berries, as grapes, &c. contain, besides three general parts, viz. coat, parenchyma, and ramification, grains of a stony nature, to do the office of seeds.

Fruits, in general, are serviceable in guarding, preserving, and feeding the inclosed seed; in filtrating the coarser, more earthy, and strong parts of the nutritious juice of the plant, and retaining it to themselves; sending none but the most pure, elaborated, and spirituous parts to the seed, for the support and growth of the tender delicate embryo, or plantule, which is therein contained.

FRUIT-*trees*. There is, in the Philosophical Transactions, a method of making Fruits and flowers grow in winter instead of summer, without the common way of doing it by heat. This method is, to take up the trees with their roots in the spring season, just as they begin to shoot out their buds; let them be placed upright in a cellar, and stand there till the end of September following; then fit vessels to them, and place the roots in them, covering them in a proper manner with earth, and bring them up into a common stove; water them at times with a solution, of the bigness of a walnut, of crude sal armoniac, in a quart of rain water, and they will make their natural progress, as in summer; and, in the months of February or March following, the Fruit will be full ripe, and as well tasted as if it had grown on them in the common way, and ripened at its natural season. *Philos. Transf.* N°. 282.

The superfluous shoots from these trees must be pruned off at such times of the year, when the trees are full of juice, and furnished for a farther supply; and, by this means, there will be no marks of the wounds, they will close up so perfectly.

The manner of producing pyramidal trees by ingrafting is not only applicable to Fruit-trees, but has been tried on oaks, limes, and roses, with the same success.

Laurembergius tells us of a peculiar way of managing Fruit-trees for ready services and beauty, by means of which they will bear fruit the first year. The method is this: draw a branch of a Fruit-tree through a pot of earth, and prick it full of holes with a knife, so far as it is to stand in the pot; let it be well watered for the first seven or eight days, to make it shoot out a great quantity of roots: in the March following cut off the branch from the tree, and let it depend wholly on itself for nourishment; break the pot away, and place the clump of earth with the young tree in it in the place where it is intended to stand. The author assures us, it will partake so much of the nature of the stock, as to bear Fruit the first year. *Phil. Transf.* N°. 3.

FULIGO, *soot*.—The learned Boerhaave has given us the following analysis of soot.

Take of the blackest and driest soot, gathered in the chimney of of an oven, where nothing but bread is baked, and nothing burnt but vegetables, and gathered on a very dry day; with this fill a large glass retort almost to the neck; apply a large glass receiver, after the neck of the retort has been thoroughly cleansed, on the inside; and lute the juncture with the common linseed paste; raise a fire of an hundred and fifty degrees, and keep it up equably: a large quantity of transparent water will thus come over, with considerable violence; so that, if the fire was immediately made strong at first, the receiver would easily crack. Continue in this manner, so long as any clear water comes over, which it will long do, although the soot was dry. Then taking away this first water, and pouring it into a glass, apply the receiver again, and raise the fire a little above two hundred degrees; a white, milky, fat water, will now come over in quantity, and with considerable violence; proceed with a slowly increased fire, so long as this continues; keep it apart; apply the receiver again, and raise the fire briskly; a yellow, volatile, copious salt will come over, and stick all round the sides of the receiver; continue the fire thus brisk, so long as any salt arises; then with the strongest heat, that sand will give, and with a heat of suppression, there arises a thick black oil. Let all cool, and there will be found, in the neck of the retort, a salt which could rise no higher, even by so violent a fire; but, in the bottom of the retort, there remains a black feculent matter; the upper surface whereof is covered with a very thick, whitish, saline crust, which, both in colour, figure, concretion, and striæ, resembles the common sal ammoniac. If the milky water be rectified, it affords a very penetrating volatile spirit, and some sharp volatile salt.

Remarks.

Here we are taught what the agitation of an open fire can move, change, expel, and drive through the air by burning; first, in the form of smoke; then, of flame; lastly, of exhalation, and how high it may carry them. For a chimney is a kind of still-head, converging in an open top; and sometimes rises to the height of above thirty feet, and carries soot up to the top; and, after this, discharges a black smoke, at its upper orifice, and disperses it through the air, where it seems gradually to vanish. It may deserve to be considered, what an immense quantity of such matter is, by the force of fire, thrown up from the surface of the whole habitable globe, in the places where fire is constantly used: whence we may learn, that combustible vegetables, thin smoke, flame, and soot, and the black clouds dispersed in the air, consist of one and the same matter agitated by fire. This matter consists of several parts; as, 1. a fœtid, oily, bitter, unpleasant, nauseous spirit, residing in the water, that first comes over, and is afterwards constantly dispersed through all the other parts: this spirit seems to be the oily and more subtile part of the vegetable, acted on by the force of fire. 2. Water, which is here contained in great plenty, residing in this spirit, in the first limpid, and in the second milky liquor, as also in the saline spirit, the volatile salt, and, in some measure, in the oil itself. This water can scarce be rendered pure by any art, being always foul with the unalterable bitterness, and the inseparable disagreeable odour of the spirit. 3. A sharp, volatile, alcaline, oily salt, which first comes over, rises into the receiver, and sticks to the sides thereof; for this salt is truly alcaline, as appears by its state, smell, fiery virtue, the violent effervescence it makes with acids, and by concreting therewith into a compound salt; and hence a volatile alcali continually impregnates the atmosphere, in great plenty, by conflagration. 4. A sharp, alcaline, fat spirit, consisting of the salt just now mentioned, dissolved in water, and so resembling spirit in fluidity, pungency, subtility, and volatility. 5. A fœtid, black, bitter, nauseous, inflammable, thick, and almost caustic oil, mixed with an oily salt. 6. A true sal ammoniac, sticking in the lower part of the neck of the retort, and raised to the surface of the black earth below. For, if this salt be carefully collected and separated from the alcaline kind, that first comes over, it proves a genuine sal ammoniac. It is of a whitish colour somewhat transparent, makes no effervescence with acids, and, if mixed with fixed alkalies, presently affords a true volatile alcaline salt, as sal ammoniac does; whence the true origin of this salt is derived from soot. 7. A black fixed earth, which, being afterwards calcined in an open fire, and burnt from its oil, which tenaciously adheres thereto, leaves a white earthy calx behind.

This is the analysis of soot; by considering of which, we may learn what parts of vegetables are volatile, and fly off by an open fire, and what are fixed and remain behind, and what fire throws off from vegetables into the air. Hence we see, that even earth, which appears so fixed in the most violent fire, after being separated from the other principles, yet, when mixed with the rest, is, either by the force of flame, or fire, thrown to the distance of forty feet through the air, in the form of a thin cloud; but there would be no end, if we should minutely pursue the physical uses of this process. Pills composed of dry soot, and gilded, are recommended for the cure of cold distempers, and this often with success. The volatile salt of soot is used with the same success as that of animals. Hartman recommends the salt which rises last, for giving relief in cancers; and, certainly, sal ammoniac, prudently employed, is of service against the putrefaction of running cancers. But the soot, produced by oak wood alone, the common Dutch tufts, or pit coal, appears different upon chymical analysis; and that again would be very different, which should be collected from the chimney of a public kitchen, which is continually filled with the fumes, not only of the fuel, but likewise of all kinds of boiled, roasted, and fried meats. And thus much may help us to form a judgment of soot. *Boerhaave's Chymistry.*

FU'LLING (*Dict.*) — *Method of* FULLING *cloths and woollen stuffs with soap.*

Let a coloured cloth of about forty-five ells be laid, in the usual manner, in the trough of a Fulling-mill, without first soaking it in water, as commonly practised in most places.— To full this trough of cloth, fifteen pounds of soap are required, one half of which is to be melted in two pails of river or spring-water, made as hot as the hand can bear. Let this solution be poured, by little and little, upon the cloth, in proportion as it is laid in the trough: thus it is to be fulled for at least two hours; after which, let it be taken out and stretched. — This done, let the cloth be immediately returned into the same trough, without fresh soap, and there fulled two hours more. Then take it out, wring it well, and express all the grease and filth.—After the second Fulling, dissolve the remainder of the soap, as the former part, and throw it at four several times on the cloth, not forgetting to take it out every two hours to undo the plaits and wrinkles it got in the trough. —When it is sufficiently fulled, and brought to the requisite quality and thickness, it is scoured out for good in hot water, keeping it in the trough till it be thoroughly clean. — White cloths Fulling more easily than coloured ones, a third part of the soap may be spared.

Fulling of caps, stockings, &c. is performed either with the hands or feet, or a kind of wooden machine, either armed with wooden teeth, or those of horses or bullocks.—The ingredients generally used on this occasion are urine, green soap, white soap, and fuller's-earth. — But a water softened with chalk is far preferable.

FUMA'RIA, *fumitory*, in botany, a genus of plants whose characters are:

The leaves are divided as in umbelliferous plants; the calyx is small, and bifoliated, in some lying under the spur of the flower, and in others wanting. The flower, if curiously examined, in many plants, appears tetrapetalous, the lower petal running out in the shape of a keel from the end of the pedicle: the upper, being bent in the figure of a spur, rises upwards, in the form of an erect galea; to this latter petal grow the calyx and pedicle: the third and fourth petals are lateral, and, by their opposition, form the representation of a very sharp-pointed vagina, concealed between the two former petals.

The ovary, at the extremity of the pedicle, is short and contracted, and furnished with a long tube, with a globous or discous head: the whole length of it seems carefully covered up, and concealed within the vagina before described. To the tube, for its whole length, grow two stamina, so closely, that, in conjunction with it, they are included in one very small, thin, pellucid, vagina, in such a manner, that nothing appears outwardly but the apex of the tube of the ovary, and the two testes. The ovary, when ripe, becomes an unicapsular pod, full of round seed.

If the ripe flower be cautiously opened, as soon as the two interior petals are disclosed, the testes discharge the seed by a sudden explosion.

This plant gives the blue paper much such a red colour as aloes; so that, probably, it contains very near the same principles, such as a salt like that which is natural in the earth, but in which the sal ammoniac predominates over the nitre and marine salt: besides, the salt of the fumitory is joined with a great deal of sulphur and earth, and dissolved in a considerable quantity of phlegm.

By the chymical analysis, fumitory yields a great deal of concreted, volatile, fixed, lixivial salt, and very thick oil.

All these principles render this plant laxative, diuretic, good to cleanse the blood, and remove obstructions of the parts. It passes for a specific in all diseases of the skin, in hypochondraic melancholy, in a cachexy, and dropsy: they give the juice of fumitory from two ounces to six; the infusion in whey, from six ounces to ten or twelve; the simple syrup, to two or three ounces, in ptisans; the compound syrup, to one or two ounces, if you would have the patient purged. The water, also, of fumitory is detersive, and good to dry up ulcers of the mouth. Anointment is made of the juice of this plant, mixed with equal quantities of the juice of elecampain, thickened over the fire with some hog's lard. Fumitory is used in the electuary de Psyllis, in that which they call sennatum, in the confection hamech, and in the compound syrup of succory. *Martyn's Tournefort.*

FU'NDS, a term adopted by the monied men, and those who speak of the public revenue of nations, to signify the several taxes that have been laid upon merchandizes, either by way of duties of custom or excise or in any other shape, to supply the exigencies of the state, and to pay the interest for what sums of money it may have occasion to borrow. Thus we say, such a duty, or such a tax, is a good Fund to answer such a purpose. The term is also applied to the stocks of great trading and monied corporations.

The Funds, or taxes if you please, of this kingdom are, to ſpeak in the language of parliament, either temporary or perpetual. Temporary ones are ſuch which are impoſed for a certain number of years, or annually, as the land and the malt-taxes; the perpetual Funds are ſuch whereon monies have been borrowed for the public ſervice, and which are appropriated for the ſecure and certain payment of the intereſt of ſuch monies, till the diſcharge of the principal ſo borrowed.

FU'NGUS (*Dict.*) — Certain tumors of the joints, generally called white ſwellings, are alſo called Fungi, by ſome authors, particularly Heiſter, who gives the following directions relative to them:

Excreſcences of the joints very nearly reſemble œdematous tumors, are attended with danger, and therefore require a peculiar examination; nothing but an ignorance of the nature and origin of them, that is, whether they proceed from the blood or ſerum, from a corrupted matter, flatus, or any other cauſe, could have tempted ſo many authors to paſs them over in ſilence, or treat of them ſo ſuperficially. A Fungus in the joints is a tumor in the articulations of the limbs, without heat or pain, ſo ſoft, that it eaſily yields to the preſſure of the fingers; but, upon the removal thereof, expands itſelf immediately, like a muſhroom, without retaining any marks. Though no joints either of the arms or legs are exempt from this diſorder, the knees, from the quantity of glands and latent fat between the ligaments and tendons, are moſt ſubject to it. There are ſeveral kinds of theſe Fungi; ſome are ſmall, others large; ſome ſoft, others hard; according as the humours, producing it by their ſtagnation and inſpiſſation, are either thin or glutinous. In ſome the noxious fluids are without ſide the articulation; theſe are properly termed Fungi: in others they ſtagnate within the very joint, as the ſerum in the ſcrotum, when there is an hydrocele, which I have both ſeen and cured: this laſt may juſtly be called a dropſy of the joint; and, by its diſtention of the intire joint, may be diſtinguiſhed from the Fungus, as that occupies rather one ſide. Theſe two diſeaſes, then, may be eaſily diſtinguiſhed from what has been ſaid.

A Fungus undoubtedly ariſes from an inſpiſſation of the viſcid, glutinous ſerum about the ligaments of the joints, which, being collected after a fall, or violent blow, immediately raiſes a tumor externally, or in the very joint, and, by debilitating the ligaments, deſtroys the natural mobility of the part. When the nerves, arteries, or veins, are affected by theſe ſwellings, the uſual conſequence is, that the ſubjected parts are deprived of their nutriment, and the joint, being preternaturally inlarged, is by degrees inſenſibly conſumed.

We have already obſerved, that, in excreſcences of the joints, the ligaments are too much extended and relaxed, and, conſequently, the natural ſtrength of the affected limb is more or leſs weakened, in proportion to the violence of the injury received: now, ſince it is very difficult to remedy this diſorder, and theſe tumors cannot eaſily be reſolved or ſuppurated, every one muſt acknowledge, that the ſurgeon lies under great difficulties, who attempts this cure; for, beſide the difficulty of bringing them to ſuppurate, there is danger in the ſuppuration, as it is often attended with a caries, or incurable fiſtula, which induce a neceſſity of amputation. Recent, ſmall, and ſoft, Fungi are often remedied by reſolvent and corroborating medicines, though they are generally irritated by emollients; whereas great and inveterate ones reſiſt all the power of medicine, and depend intirely on the knife for relief, and this does not always prove ſucceſsful: for, though by inciſion you may extract the noxious humours, the ſwelling often returns, after the wound is healed.

But the proper method for the cure ſeems to be this: rub the part affected ſeveral times in a day with warm cloths; then foment it with the beſt tartariſed ſpirit of wine, or linen dipped in the ſame; continue this, till the natural form and vigour of the limb are reſtored. Purmannus's fomentation is likewiſe a very noble remedy: take of the pickle of herrings, two pints; of the ſtrongeſt vinegar, one pint; leaves of ſage, two handfuls; Roman vitriol, an ounce and an half; and alum, ſix ounces; boil theſe together for half an hour; then apply them. When the tumor begins to be diſperſed, and the former vigour of the limb a little recovered, the reſolution is greatly promoted by fomenting with tartariſed ſpirit of wine, or fœtid oil of tartar, ſeveral times in a day; then, to keep out the cold, which is very injurious, bind it up firmly with compreſſes and bandages. Laſtly, I cannot but recommend fomentation above all others: which I have uſed myſelf, with great ſucceſs: take of litharge, half a pound; Armenian bole, an ounce; maſtic and myrrh, each half an ounce; wine vinegar, a pint: boil theſe together for a quarter of an hour. You muſt uſe this decoction warm, and every morning and evening dip compreſſes, or thick linen cloths, into it, and foment the part; obſerving to order, internally, proper purging, attenuating, and ſudorific medicines.

If none of the medicines recommended anſwer the purpoſe, Wurtzen and Purman place their ſole confidence in an inciſion into the tumefied joint, towards the lower and moſt commodious part, but with the utmoſt circumſpection, leſt any of the ligaments or tendons ſhould be injured; for, by the help of this, if the ſtagnating ſerum is collected in one cavity only, it will immediately diſcharge itſelf; if it is diſperſed into ſeveral, it will gradually flow out in a few days. This may be promoted, by applying tents dipped in ſome digeſtive, and ſprinkled with alum. But, before the inciſion, you ſhould preſs the tumor hard with your fingers, and retain it with a bandage placed above it, to prevent its giving way; for this will not only expoſe the part more commodiouſly to your ſight, but, after inciſion, promote the efflux of the ſerum, and make it burſt out, as the blood does after veneſection, or the water after an inciſion of the hydrocele. When you have done this, if any ſwelling ſtill remains, lay on a dyachilum or oxycroceum-plaiſter, or Wurtzen's red one, which, in this caſe, he ſtrongly recommends; with limewater, or ſpirit of wine, which will reſolve the remainder. Thus, when the member is reſtored to its priſtine form, the wound is healed by vulnerary balſams; carefully avoiding the uſe of fat oily medicines, as very prejudicial to the ligaments and tendons. But, if the ſerum be found too tenacious and glutinous to diſcharge itſelf voluntarily, apply ſome attenuating injection at every dreſſing. A decoction of agrimony, alchimilla, and birthwort, mixed with honey of roſes, or of celandine, is the beſt. Theſe injections will generally reſolve the tumors ſurpriſingly.

Though inciſion is the more ready way of cure, ſome prefer cauſtics; and, when the eſchar is ſeparated, they turn out the collected humors, proceeding afterwards as directed above. During this proceſs, I would adviſe anointing the affected joints with a nervous unguent, or ſome aromatic ſpirit, till it has recovered its natural ſtrength.

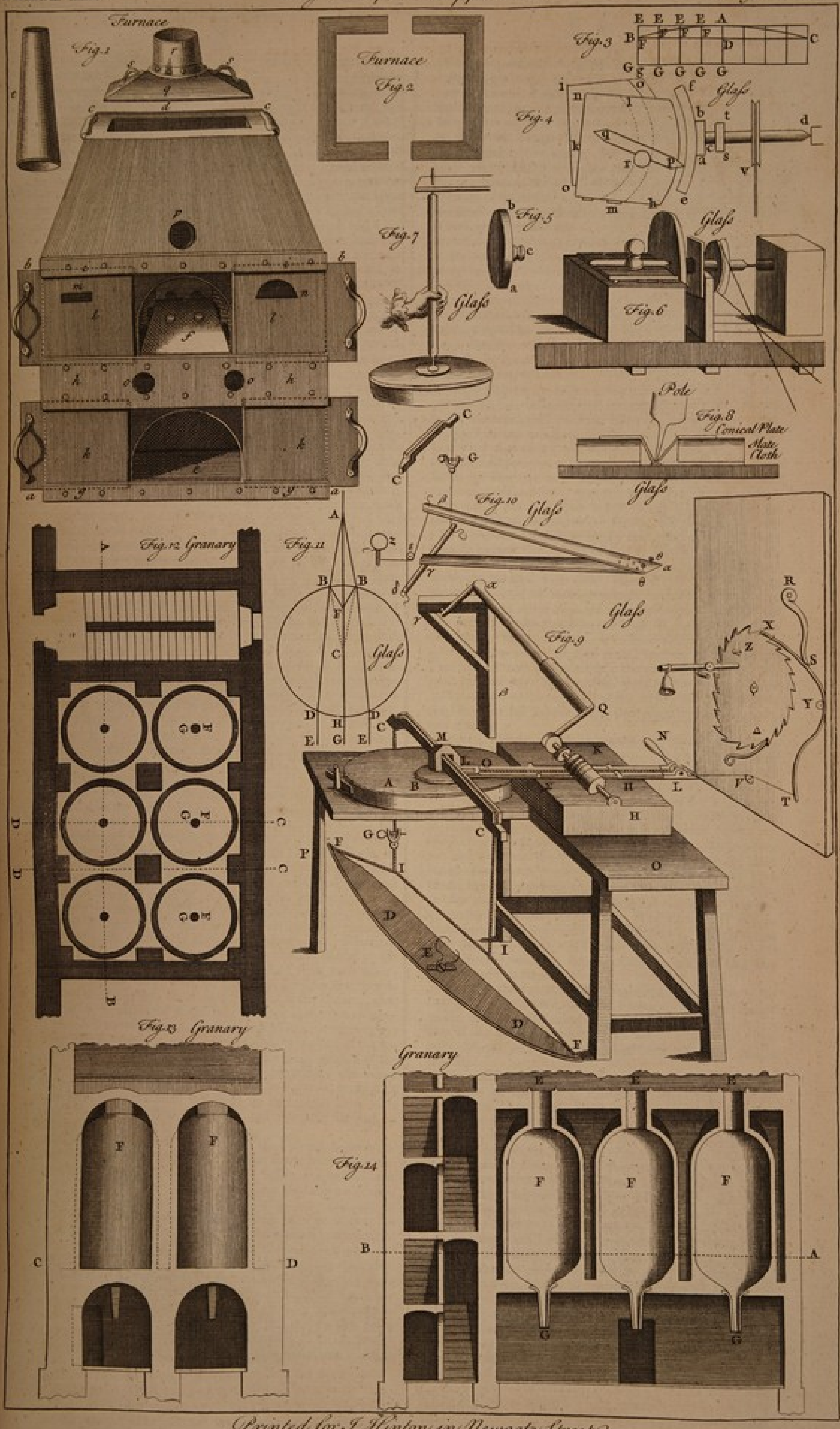
As it is very common for the inſpiſſated ſerum, after the formation of the cicatrix, to collect again; in order to prevent this, you muſt obſerve, not only to preſcribe internal reſolvent, purging, and ſudorific medicines, but likewiſe to keep the wound open with tents for ſome time, and cleanſe it daily with a vulnerary injection of a decoction of birthwort, agrimony, alchimilla, or the like, mixed with honey of roſes, or of celandine; for in Purman's opinion this method is the moſt expeditious, inſomuch that the ſinus of the wound is not only cleanſed, but filled up alſo with new fleſh, ſometimes in ſix days. It will, however, not be improper to inject ſome lime water into the wound, and to apply the ſame, or a digeſtive plaiſter, externally, always binding up the knee carefully, to prevent a collection of the ſerum. This will prevent a return of the Fungi, as Wurtzen, who had been very converſant in theſe cures, teſtifies.

Every excreſcence of the joints is not formed, ſo as to admit of an inciſion ſafely; for, when it is inveterate, hard, or very large, or the patient is weak, you muſt forbear it, as rather more prejudicial than ſerviceable, becauſe it is frequently attended with new diſorders, as a caries, fiſtula, and gangrene, by which the man is deſtroyed, who might otherwiſe have arrived at a good old age. *Heiſter's Chirurg.*

Fungus, in minerology, a name given by Dr. Liſter to a blackiſh bituminous ſubſtance, found in ſome of the mines of Derbyſhire. It adheres to the ſides of the fiſſures of rocks, and lies in ſeams of the ſtrata. It is of a blackiſh colour and fatty ſubſtance, which never dries in the air, but always remains as moiſt, as when taken out of the mine. Some maſſes of it are ſoft and like a jelly, others are hard and firm, and in theſe there are ſeveral lumps of bitumen in many parts. This is inflammable like reſin. It is light, but breaks finer, and ſhines like good aloes when freſh broken, but that it is a little darker-coloured, and has ſome tinge of purple in it. In ſome pieces the purple is wanting, and there is a green in the place of it. On being diſtilled, it yields firſt a limpid and inſipid, then a whitiſh water of a ſharp taſte, and finally a yellow and clear oil, much reſembling oil of amber; but the proceſs affords no volatile ſalt in the neck of the receiver, in which it differs from amber when treated in the ſame manner. *Phil. Tranſ.* N°. VI. See AMBER, in the Dictionary.

FU'RNACE (*Dict.*)—*Docimaſtical* Furnace, a Furnace uſed in aſſaying metals, ſometimes called the aſſay-oven.

It is made in the following manner. 1. Make with iron plates an hollow quadrangular priſm, eleven inches broad, and nine inches high, *a a*, *b b* (*plate* XXI. *fig.* 1.) ending at top in a hollow quadrangular pyramid *b b*, *c c*, ſeven inches high, terminating in an aperture at top ſeven inches ſquare. But this priſm muſt be cloſed at bottom with ſuch another iron plate, which ſerves as a baſis or bottom to it *a a*. 2. Near the bottom make a door *e*, three inches high, and five inches broad, that leads to the aſh-hole. 3. Above this door, and at the height of ſix inches from the baſis, make another door *f*, of the figure of a ſegment of a circle, four inches broad at its baſis, and three inches and a half high in the middle. 4. Then faſten three iron plates on the fore-part of this Furnace: let the firſt of them *g g*, eleven inches long, and half an inch high, be clapped, its lower edge, againſt the bottom of the Furnace, with three or four rivets, in ſuch a manner, that there may be, between the upper edge of the ſaid plate and the ſide of the Furnace, a groove ſo wide, as that the ſliders of the lower door *k k* may be put into it, and freely move backwards and forwards therein; theſe muſt be made of a thicker iron plate. The ſecond iron plate *b b*, eleven inches long, three inches high, and perfectly parallel to the foregoing plate, muſt be clapped in the ſpace between the two doors, in ſuch manner, that both the upper and the lower edge of it may form a hollow groove with the ſide of the Furnace. One of theſe grooves, which



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which looks downwards, serves to receive the upper edges of the sliders, that shut the lower door. The other that looks upwards, is to receive the inferior edges of the sliders of the small door above. The third plate *i i*, which is like the first, must be riveted close above the upper door, in such manner, that it may form a groove looking downwards, and contiguous to the upper edge of the upper door. 5. In order to shut both doors, you must adapt to each of them two sliders made of iron plates, that may move within the above-mentioned grooves, *k k*, *l l*. But the two sliders, belonging to the upper door, must have each a hole near the top; that is, one a small hole one fifth part of an inch broad, and one inch and a half long *m*; and the other a semi-circular aperture, one inch high and two inches broad *n*. Let besides each slider have a handle, that they may be laid hold of, when they are to be moved. 6. Moreover, let five round holes, one inch broad, be bored in the Furnace: two of which must be made in the fore-part of the Furnace *o o*, two others in the back-part, all at the height of five inches from the bottom, but three inches and a half distant from each side of the Furnace; and, finally, a fifth hole *p*, at the height of one inch above the upper edge of the upper door *f*. 7. In short, let the inside of the Furnace be armed with iron-hooks, jetting out half an inch, and about three inches distant from each other, to fasten the lute with which the Furnace is to be covered over within. 8. Let then an iron, moveable, hollow, quadrangular pyramid *q*, three inches high, be adapted to the upper aperture *d* of the Furnace at the basis seven inches broad, ending upwards in a hollow tube *r* three inches in diameter, two inches high, almost cylindrical, tho' somewhat convergent at top. This prominent tube serves to support a funnel or flue, which is almost cylindrical, hollow, made of iron plates, and two feet high *t*, and which, when a very strong fire is required, is put perpendicularly upon the shorter tube, in such manner, that it enters close into it one inch and a half, or two inches deep, and may again be taken off at pleasure, when there is no need of so strong a fire. But this pyramidal cover *q* must besides have two handles *s s* adapted to it, that it may be laid hold of, and thus be taken away or put on again. And, that this, being put on the aperture *d* of the Furnace, may not be easily thrown down, let an iron plate be riveted to the right and left upper edge of the Furnace *c c*, and be turned down towards the inside, so as to make a furrow open before and behind, into which the lateral edges of the cover may enter and be fastened, and at pleasure be moved backwards and forwards, whenever it must be put on, or removed. 9. Let a square ledge, made of a thick iron plate *fig.* 2. be fastened at top of the upper edge of the lower door *e*; this is designed to support the grate and the lute. But it must be made of two pieces, that it may be easily introduced into the cavity of the Furnace. Thus you will have an assay Furnace, which must afterwards be covered over inwardly on the inside with lute: this you are to do as follows:

That the fire may be the better confined, and the iron not be destroyed by growing red-hot, the whole inside of the Furnace must be covered over with the lute, one finger, or one finger and a half thick. The lute, fit for this, is made with Windsor loam, or with French clay, moistened with three or four times as much of ox-blood diluted with water. But, before you cover the insides of your Furnace with this lute, you must first put within the Furnace small iron-bars, equal in length to the diameter of the oven, quadrangular, prismatical, half an inch thick, having their extremities supported by the ledge, and three fourths of an inch distant from each other; and you must fasten them so, that their flat sides may be oblique with regard to the transverse section of the Furnace, and, that the two opposite angles may look one upwards and the other downwards, the bars must not be laid flat, but edge-ways; by which situation, you hinder the ashes of the fuel of the fire from being detained too long, between the interstices of the said iron-bars, and from making an obstruction, that would oppose the free draught of the air. The Furnace, being then covered over with lute, and dried up by a gentle heat, is at last fit for docimastical operations, and especially for such as must be performed in the assay-oven.

If then an operation is to be made in the Furnace hitherto described, you must let through the four lower holes above described, of the Furnace *o o*, placed before and behind, and directly opposite to each other, two iron bars one inch thick, and long enough, that their extremities on every side may jut out of the holes a small matter. These serve to support the muffle, and its bottom. You then introduce the muffle thro' the upper aperture of the Furnace, and place them upon the above described iron bars, in such manner that the open forefide of it be contiguous to the inward border of the upper door *f*. The fuel of the fire is introduced through the top of the Furnace; the cover of which, on this account, must be moveable, and not very heavy as *q*. The best fuel for the fire is charcoal made of the hardest wood, especially of beech, broken into small pieces of the bigness of an inch, wherewith the muffle must be covered over some inches high. We then reject larger bits of coals, because they cannot fall through the narrow interstices, between the sides of the muffle and those of the Furnace, and cannot of course sufficiently surround the circumference of the muffle: whence it happens, that there are on every side places void of fuel, and the fire is either not strong enough, or unequal. But, if, on the contrary, you use coals too small, then a great part fall immediately through the interstices of the grate into the ash-hole; and the tenderest particles of them turn too soon into ashes; and, by increasing the heap of ashes, obstruct the free draught of the air, which is here greatly requisite.

A perfect management of the fire is most commonly necessary, in the performing of operations in this Furnace: therefore, the reader must give attention to what follows. If the door of the ash-hole *e* is quite open, and the sliders of the upper door *f* drawn towards each other, so as to touch one another in the middle of the door; and, if besides the cover *q*, and the funnel *t*, adapted to its tube *r*, is upon the top *d* of the Furnace, the fire will then be in the highest degree possible: though, in the mean time, it is hardly ever necessary to put the funnel on, except in a very cold season. But if, after having disposed the Furnace in the manner just described, you put red burning coals into the open upper door *f* of it, the fire is still more increased thereby: however, this artifice is never, or very seldom, necessary. When you shut the upper door, with only that slider, that has a narrow oblong hole in it *m*, then the heat becomes a little less: but it diminishes still more, when you shut the door with the other slider, that has in it the semi-circular hole *n*, which is larger than that of the first slider: nay, the heat again is less, when you take away the funnel put at top of the cover: finally, the door of the ash-hole being either in part or totally shut, the heat is still diminished, because the draught of air, so necessary to excite the fire, is thereby hindered. But if, besides all these, you likewise open the upper door quite; then the cold air rushing into the muffle, cools the bodies put under it, that are to be changed to a degree never required in any operation, and such as will entirely hinder the boiling of lead. If, during the operation, the fire begins to decay, or to grow unequal, it is a sign, that there are places void of coals, between the sides of the Furnace and those of the muffle: therefore, in this case, you must stir your coals on every side, with an iron rod, which is to be introduced through the upper hole *p* of the Furnace, that they may fall together, and thus act in a proper manner, and equally.

However, you are to observe, concerning the regimen of the fire just described, that, though the apparatus is made with all the exactness mentioned, the effect does not always answer it: the cause of which difference has most commonly its origin in the various dispositions of the air. For as every fire is more excited by coals, in proportion as the air more condensed, and more quickly agitated, strikes them more violently (which the effect of bellows plainly shews) it thence appears, that in warm and wet weathers, when the atmosphere is light, the fire must be less efficacious in Furnaces; that likewise, when several Furnaces, situated near each other, are burning at the same time, the fire is in part suffocated; because the ambient air is thereby rendered more rare and lighter. The same effect is produced by the sun, especially in summer-time, when it shines upon the place where the Furnace is situated. The atmosphere, on the contrary, being heavier in cold dry weather, excites a very great fire.

The heat of the fire acts the stronger upon the bodies to be changed, as the muffle put in the Furnace is less; as the said muffle has more and larger segments cut out of it; as the sides of this muffle are thinner; in short, as there are more vessels placed in the hinder part of the muffle; and on the contrary.

In this case, when many of the conditions requisite for the exciting of fire are wanting, then indeed the artificer, with all his skill, will hardly be able to excite the fire to a sufficient degree, in order to perform operations well, in common assay-ovens, even though he uses bellows, and puts coals into the upper door of the Furnace. For this reason, I have put the grate almost three inches below the muffle, lest the air, rushing through the ash-hole, should cool the bottom of the muffle, which happens in common assay-ovens; and again, that the smaller coals, almost already consumed, and the ashes, may more easily fall through the interstices of the grate, and the larger coals still fit to keep up the fire, be retained. Finally, I have added the funnel *t*, that, the blowing of the fire being, by means of it, increased as much as possible, this might at last be carried to the requisite degree: for the fire may always be diminished, but not always increased at pleasure, without the assistance of a proper apparatus.

FU'SILE *Marble*, a very common but very improper term used for the green or greenish grey marble full of small sea shells, of which the slender pillars of our Gothic buildings are made.

G.

G.

GAD-*Bee*, in natural hiftory, the common name for a winged infect, called alfo the dun-fly, or ox-fly; a creature very troublefome to cows, horfes, &c.

This creature, examined by the microfcope, has feveral peculiarities worthy of obfervation. It has, like the gnat, a long probofcis, with a fharp dart, or two darts, fheathed within it; the ufe of thefe darts is to penetrate the flefh of animals, for the fucking their blood; whereas the probofcis can only ferve to fuck the dews from flowers, &c.

The eggs of this fly are laid in the waters, and there produce a very remarkable fort of maggot. It is a brown one, of a long flatted figure, with a pencil of fine downy hairs at its tail, which is fpread into a circular form on the furface of the water, while its head is funk down in fearch of food. When the creature would defcend toward the bottom, thefe hairs are made to approach one another in an oval form, and in this ftate they inclofe a bubble of air, by means of which it is able to rife again; and, if this bubble by any accident efcapes, the creature immediately fqueezes another out of its own body to fupply its place. The fnout of this maggot has three divifions, whence are thruft out three little pointed bodies, like ferpents tongues. Thefe maggots are very common on the furface of ditch water, and the motion of their inteftines is very fingular and obfervable. *Baker on the Microfcope.*

GADD'ING, among miners, the digging the ore out of the veins with an inftrument called a gad; which is a fmall punch of iron with a long handle of wood. One of the miners holds the gad in his hand, directing the point to the proper place, while the others drive it into the vein with a large fledge or hammer.

GA'DWALL, in zoology, the name of a fpecies of duck that frequents frefh waters, and is called, in fome parts of England, the gray. It is called anas ftrepera by authors. It is of the fize of the widgeon, or fomething larger; its body is of a longifh fhape, and its rump black; its back is brown, but the edges of the feathers are edged with white; the front of the head, and upper part of the throat, are white, fpotted with fmall brown fpecks; the head is of a bluifh black, the throat of a greyifh white, and towards the breaft fomewhat reddifh; the upper part of the breaft and the fhoulders are beautifully variegated with brown, white, and black; the breaft is white, and belly brownifh, with fmall tranfverfe ftreaks of black; the beak is blackifh and yellow, and the legs are whitifh. The female is different from the male in many refpects, particularly it wants the blacknefs of the rump; but both the male and female are diftinguifhed at fight from the other fpecies, by having marks of three different colours one above another on their wings; thefe are white, black, and a reddifh brown. *Ray's Ornithol.*

GALE, in botany, the name of a genus of plants, whofe characters are:

The leaves are alternate; the male flowers are produced on pedicles from the alæ of the leaves, and difpofed on a ftalk, in the form of a long fpike; thefe flowers are naked, and adorned with fix ftamina, which appear like branches from them. The ovary is feated in another place of the fame plant, on a much fhorter pedicle, being lodged within a tetraphyllous caducous calyx, and furrounded with other male flowers; it is of a globofe figure, here and there irregular, and containing one feed.

It delights in heaths and uncultivated foils, as well as in watery and marfhy places; and is found in great plenty in the ifle of Ely, among the marfhes, in a boggy foil, and in many fuch places in the north of England, and near the town of Wareham, in Dorfetfhire. The flowers appear in May and June, and the feed is ripe in July and Auguft.

Its extraordinary bitternefs demonftrates it to be of a drying and difcuffive quality; but we are told, that it is principally ferviceable in killing and expelling worms, whether it be taken inwardly, or outwardly applied. The leaves and branches are ufed in fummer, to adorn the windows and chimneys of chambers and parlours, for the fake of the extraordinary fweet fmell diffufed by the flowers and buds; the fame, laid in chefts among cloaths, not only render them fweet-fcented, but keep away moths. Simon Pauli tells us, that the Polanders ufed to deftroy the lice in their fwine by this plant; which being ftrewed in the hog-fties, all the lice die in the fpace of a few hours, and the nits never come to be animated. And ferpents are never known to fettle, or have their nefts, in thofe marfhes where Gale grows, or ever to approach, much lefs to creep over them. Some boil the flowers, inftead of hops, in their beer; which, for that reafon, affects the head, and foon induces ebriety. In Bergen, and other places of Norway, they commonly prepare an ointment of Gale pulverized and May butter, which is found to be very efficacious in the moft ftubborn itch. *Raii Hift. Plant.*

GALE'NA, a name given by mineralifts to a fpecies of poor lead ore. It was alfo the original name given by Andromachus to the theriaca, from its effect in bringing on a pleafing calm over the blood and fpirits on taking it.

GALENA *inanis*, in minerology, a name given by authors to a glittering fubftance, very much refembling fome of the plated ores of lead, but really containing none of that metal. It is more ufually called mock-lead and blende.

GA'LEOPSIS, *hedge-nettle*, in botany, a genus of plants, whofe characters are:

The calyx is quinquefid and funnel-fhaped; the upper lip, or galea, is entirely hollow; the lower lip, or beard, trifid; the middle fegment being the greateft.

The Galeopfis fmells of bitumen, or fœtid oil: it has an herby tafte, a little faltifh, aftringent, and does not ftain the blue paper; which makes us conjecture, that its falt participates very much of the natural falt of the earth, which in this plant is involved in a great deal of fulphur, and terreftrial parts.

It is vulnerary, and very fweetening: an oil made of it by infufion is excellent for burns, and for wounds of the tendinous parts. In the country, they ufe fucceffively the infufion of its leaves and flowers, for a nephritice cholic, fcrophulous tumors, and the pleurify. An extract may be prepared of it to ferve during the winter. *Martyn's Tournefort.*

It has the reputation of difcuffing hard tumors, cancers, pani, and parotides; and is recommended againft putrefactions, gangrenes, and fpreading ulcers. Boerhaave efteems it excellent in hyfteric fits.

GA'LEUS *glaucus*, the blue fhark, a very fierce and voracious fifh of prey. It is of a fine deep blue colour on the back, and of a bright filver white on the belly. The fkin is fmoother than that of the white fhark, and the nofe long-pointed, and fomewhat flatted. The noftrils are long, and placed tranfverfly to the length of the nofe. The fockets of the eyes are of an elliptic figure, but the eyes themfelves are exactly round, and have a membrane, which, at times, the fifh draws over them, and there are no cavities behind the eyes. The teeth are not fo numerous as in the white fhark, there being only two rows of them; but thefe are very large and triangular, exactly of the fhape of the gloffopetræ. The tail is bifid, and one portion of it much larger than the other. It is very voracious of human flefh, and will follow clofe under the fhore, if there is depth enough, and a man is walking there. It is fometimes found on the Englifh fhores, and has been caught on the Cornwal coaft. *Wilaughby's Hift. Pifc.*

GALLI'NA *Guinea*, the Guinea hen, in zoology, the name of a fpecies of gallinaceous fowl, of the fize of the common hen, but with a longer neck. Its body is floped like that of a partridge, and its colour is all over a dark grey, very beautifully fpotted with fmall white fpecks; there is a black ring round the neck; its head is reddifh, and has on its top a hard horny protuberance, of a brown colour; it is blue under the eyes, and has a red flefhy appendage hanging down from thence. They naturally herd together in large numbers, and breed up their young in common; the females taking care of the broods of others, as well as of their own. They breed very well with us. *Ray's Ornithology.*

GA'LLING.— Good horfes are often fubject to gall upon their backs, and the utmoft care ought to be taken to prevent or cure it. The beft method of prevention is, to take a hind's fkin, well furnifhed with hair, and fit it neatly beneath the pannel of the faddle, fo that the hairy fide may be next the horfe; this does not harden by fweat, but keeps the horfe from Galling. This is alfo a method that fhould never be omitted with horfes that are newly cured of fuch a hurt, as it will prevent their falling into it again. In long journeys, and in horfes that are fubject to gall, it is always proper to take off the faddle, as foon as the horfe is brought in, and examine whether the back be at all preffed, or pinched in any part: it will be well

well to re-examine it after an hour or two, to fee what effect the ftanding has had; for often the part hurt will not fhew it at firft, but will fwell very violently afterwards. In this cafe, where the fkin is not fretted, but a fwelling comes on, a bag of coarfe cloth fhould be filled with warm dung, and tied upon the fwelling, which will not only prevent it from growing worfe, but will take it often quite down; or the fwelling may be well rubbed with good brandy, laying on a paper foaked in it. If the fkin be broken, a mixture of red wine and fallad oil is a good remedy.

GA'LLIUM, *cheefe-rennet*, in botany, a genus of plants whofe characters are: it refembles the mollugo in every thing, only its leaves are even fofter than thofe of that herb.

This plant, from a long flender fpreading root, fends forth many fquare weak ftalks, a foot or two high, befet at the joints with flender narrow leaves, about an inch long, fet in a circle; the ftalks of a dark green colour. On the tops of the ftalks, as well as on the fmaller branches, which come out of the fides, grow thick fpikes of fmall, yellow, monopetalous flowers, divided into four fegments, of a pleafant fmell; each of which is fucceeded by two fmall globular black feeds: it grows on banks, and dry barren places, flowering in June and July. The whole herb is ufed.

The plant is drying and incraffating, good in ftopping all kinds of fluxes and hæmorrhages, and for the cure of wounds: fome commend the decoction of it for the gout; and a bath made of it is refrefhing to wafh the feet of perfons tired with over walking. In the northern countries they ufe this herb for the making their cheefes, inftead of rennet, whence it is called cheefe rennet; the flowers containing an acidity, which may be got by diftillation. This is a plant but feldom ufed in the fhops.

This plant is vulnerary and deterfive; it is ufed in Catalonia for the epilepfy. The fyrup made with the juice of its flowers is very aperitive and emmenagogic. Tabernæmontanus fays, that the decoction of it is excellent for the dry fcab of young children, provided you bathe them often with it. *Martyn's Tournefort.*

GALLS (*Dict.*)— The Galls caufed by different infects have a very different internal ftructure; fome of them have only one large cavity within, in which a number of the animals live in community; others have feveral fmall cavities with communications between each; and others have different numbers of little cellules, each feparate, and having no communication with the others: there are fometimes a hundred of thefe cellules in one Gall, fometimes only two or three; and finally, there are others, in which there is only one cavity inhabited by one infect. The creatures of thefe two laft kinds live in perfect folitude during the worm ftate, and can have no knowledge of any other living creature befides themfelves, till they have paffed through the intermediate ftate of chryfalis, and become winged animals, like thofe to which they owed their origin, and are ready to lay eggs themfelves. The general divifion of Galls into thefe claffes admits of a vaft number of fubdiftinctions under each, from the different figure and confiftence of the feveral fpecies. Some of them are fo hard, that they equal, or exceed, the hardnefs of the wood of the tree they grow upon; and, when cut, appear compofed of fibres, much more denfely and clofely arranged: others are foft and fpongy, and refemble fome of the tender fruits in appearance. The firft kind are ufually called Gall-nuts, and the latter apple Galls, or berry Galls. The common Galls, ufed in dying, are of the firft kind, and what are called oak-apples, and oak-grapes, are of the latter. The oak produces feveral of this laft fpecies of Galls, fome of which are oblong, and others round, refembling grapes, goofeberries, and other fruits; thefe are alfo ufually beautifully coloured, fome being of a bright red, others of a bright yellow. Thefe Galls of the oak are of the auftere tafte of the juices of that tree; but thofe of other plants are often well tafted. There is a fpecies of fage, well known by the name of apple-fage, the leaves of which afford a lodging to the worm of a peculiar fpecies of fly, and this Gall grows to a very confiderable fize, fo as to have obtained the name of an apple from its refemblance to this fruit; thefe are eaten by the people of the eaftern nations, and are commonly fold in the markets of Conftantinople, and other places. A plant very common with us, the ground-ivy, has the fame property: its leaves are often loaded with Galls on their under fide, which are very green and juicy, and of no difagreeable tafte. Mr. Reaumur gives us an account of their being one year fo plentiful in the neighbourhood of Paris, that the poor people eat them both raw and boiled as food. *Reaumur's Hift. Inf.*

Box GALLS, in natural hiftory, the name given by authors to a very fingular kind of Galls, of a conic figure, with a conic top, or cover refembling a wooden box, and inclofing a white worm, in the manner of the other vegetable lodgements of the fame kind; this fort of Gall is found only on the leaves of the lime-tree. It is common to obferve the leaves of this tree, in the month of July, to be pierced through with feveral round holes of about a tenth of an inch in diameter, and as exactly circular, as if a round piece of the leaf had been taken out in each place by an inftrument. Mr. Reaumur, to whom the world owes the difcovery of this fingular fpecies of Gall, was led to the obferving it by meeting with leaves thus pierced, and then examining others, till he found fome which had on them the box Galls, which give origin to thefe holes.

Bramble GALLS, a fpecies of Galls found on the branches of the common wild bramble. Thefe are often no other than tumefactions of the ftalk, for the fpace of an inch, or thereabout, which fometimes form only fo many thick cylindric pieces; at other times they are of the fhape of an olive, and fometimes they affect only one fide of the branch: in all cafes, however, the tumid part, or Gall, is much harder than the other parts of the branch, which are in their natural ftate. Thefe Galls are very common in June and July, and in the other fummer months, and, when cut, either longitudinally or tranfverfly, they are found to be inhabited by a great number of worms of an oblong figure, and yellow colour; thefe live in the interftices, which they make between the woody fibres, and thefe interftices they alfo make themfelves, by eating away the fubftance of the wood; for, if the Galls are opened when old, they are found to have a large cavity filled with the fragments of the woody fibres, which the worms have eat to pieces; and there are ufually twenty or thirty worms in every Gall.

GALL-*infects*, in natural hiftory, the name of a clafs of infects, fo called, from their refemblance to fmall Galls, or vegetable protuberances of a like kind upon trees. They are indeed fo like thefe fubftances, as to have been by many miftaken for them, and thought not of the animal, but of the vegetable kingdom. Thefe infects pafs a very great part of their lives, even many months together, faftened againft the leaves or ftalks of plants, without any appearance of life or motion; and this is the time in which they acquire their ftated growth. They are in this ftate as immoveable as the branch they are fixed on, and feem to make a part of it. Their exterior form is remarkably plain and fimple, and, the more the creature increafes in growth, the lefs appearance of life it fhews; and, even when it has acquired its maturity, and is in a condition to depofit its eggs, for the propagation of its fpecies, it then appears leaft of all of an animal form, and more, than in any other ftate, refembles a Gall, or fuch vegetable protuberance. Not only the vulgar and incurious have been deceived by this appearance, but the accurate Count Marfigli, among others, after very attentively examining the Gall-infects of one fpecies, remained feemingly convinced that they were real vegetable excrefcences.

The Gall-infects are ufually found on the ftalks and branches of trees, fhrubs, and perennial plants. There are fo far from being particular trees or plants allotted for their production, that very few are without them, and even the fame fpecies are found on very different fpecies of vegetables. The figures and colours of thefe animals enable us to diftinguifh feveral diftinct kinds of them; they are all very fmall, even at their full growth, and fome of them, in their perfect ftate, refemble little round balls, faftened to the branches of trees, &c. by a very fmall part of their furface. Of thefe round ones, fome fpecies never arrive at a fize beyond that of a pepper-corn; others acquire that of a large pea; other fpecies of them are of the figure of a fphere, part of which has been cut off, and thefe are fixed on the trees by the part feemingly cut; others are of the figure of elongated fpheres, the greater axis of which is raifed above the branch; others are fomewhat flatted, and more pointed at one end than at the other; others are of the figure of a kidney, and thefe are fixed by the part where the cavity is; others refemble, in figure, the half of an oblong fpheroide, and thefe alone furnifh a large number; thefe are divided, as it were, along their larger axis, and have fome fort of refemblance to a boat turned upfide down.

GA'LLOWS *of a plough*, a name given by our common farmers to a part of the common plough, from its refembling a gallows made for the execution of malefactors, in its form; being compofed of three pieces of timber, one placed tranfverfely over the heads of the other two. The Gallows are a part of the plough-head; they are fixed into the box of the plough, or that part through which the axis of the wheels paffes. They make an angle with the box inclining upwards. The upper, or tranfverfe fpecies, is notched in feveral places, and ferves to fuftain the wilds, a pair of irons, to which a ring and hooks are faftened, and to thefe the chains of the harnefs, by which the whole plough is drawn along.

In fome other parts of England they call this whole part of the plough the three pieces, being iron inftead of timber, by the name of the wilds; and the Gallows of the plough is then the tranfverfe piece at the top of the crow-ftaves. *Tull's Hufbandry.*

GA'LLY-*worm*, in zoology, an infect known by moft writers under the name of iulus. It is a land infect, with a long body, compofed of a great number of rings, and furnifhed with a great number of feet. It is found very frequently in gardens, and, when touched, has the power of rolling itfelf up into a ball. *Ray's Hift. Inf.*

GAME-*cock*.— The beft feafon for the breeding the Game-cock is, from the beginning of February to the middle or latter end of March; the neft for the hen is to be made of fweet and clean ftraw, and fhould be placed in fome warm corner, out of the way of difturbance from other fowls; for this fort of inter-

interruption provokes this quarrelsome bird in such a manner, as to endanger the eggs. That she may never have occasion to leave the nest, and cool her eggs, it will be proper to lay all sorts of food, that she is likely to approve of, before her; and to put clean water every day, not only for her to drink, but to wash and trim herself in; some ashes, sand, and gravel should also be sifted on about the nest. The chickens are hatched in about three weeks, and the nest is to be carefully watched about this time, for there are always some of the chickens hatched before the others; these should be taken away, as soon as out of the shell, and laid before the fire, or in some warm place in wool, and, as soon as the rest are hatched, these should be given back to the hen: they are not to be suffered to go abroad for the first fortnight, and the room they are kept in must be boarded, all other floors being too cold and too moist. At about a month old the chickens may be turned out into a walk of some fresh grass, that they may feed at liberty, and eat worms and other insects; but there must be no puddle of water in the place, for they are apt to get into such, and it occasions them a number of diseases. As soon as the comb and wattles appear on the cocks, they must be cut away, and the sore place anointed with fresh butter till it is well. The chickens may all be suffered to run together till they begin to peck one another, then the cocks are to be separated; each must have his particular walk, and, the more free from disturbance this is, the better. The place of feeding them must either be a boarded floor, or a very soft and dry piece of ground. If the place be hard, as a stony pavement, or a plaistered floor, the taking up their food will injure and blunt their beaks, so that they will never be able to hold fast afterwards. Any white corn is good for the Game-cock in his walks, and so is a white bread toast steeped in ale; at times, this may be given him steeped in urine, which will serve to scour and cool him very well. There never should be more than three hens allowed to one cock in his walk, for, if there are more, he will consume his strength in the treading; and, though his courage may not fail, yet he will never have the ability to go through a battle. Care is to be taken also of his roosting-place, that the perch be not too small in the gripe, and be so placed, that he may sit on it without straddling; if the perch be crooked, it is also very disadvantageous, for it will accustom the cock to such an uneven disposition of his feet, that he will be no good striker in the battle. The best method of contriving the roosting-place is, to have a row of short perches, about eight inches long, and the lowest ten inches from the ground, that he may ascend with more ease, and, when he is come to the roosting-perch, be constrained to sit with his legs close together. A cock, bred in this manner, may be fought young, but the best method is, not to hazard a battle till he is somewhat more than two years old.

GA'NET, in zoology, the name used in Cornwal, and some other parts of England, for a large species of larus, or scalpel, called by authors cataractes. It is one of the largest birds of the larus kind, being larger than the common duck. Its beak is stronger, shorter, and more crooked than that of any other bird of this kind; it is web-footed, but has the strongest and sharpest claws of all the birds of that kind: its back is of a dusky, brownish, ferrugineous grey, like that of the buzzard; its belly and breast are paler, but of the same dye, and its long wing feathers are black; its tail also is all black. It is a very bold and voracious bird; it follows the shoals of pilchards and other fish, and picks up vast numbers of them. It is very common in the western coasts of England. *Ray's Ornithology.*

GA'NGRENE (*Dict.*)— The following medicines are, by Heister, recommended for the several intentions of a cure in a Gangrene.

A fomentation which digests, stimulates, and resists putrefaction.

Take of quick-lime-water, one pint; of camphorated spirit of wine, three ounces; and of the spirit of sal ammoniac, half an ounce; mix all together.

Let this preparation be frequently applied warm, with proper compresses: the same intention is also excellently answered by a pint of quick-lime-water, mixed with an ounce of mercurius dulcis. Heister tells us, that, in the hospital of Amsterdam, the surgeons, with great success, use the following fomentation against a Gangrene:

Take, of the spirit of wine, three ounces; of the powders of aloes and myrrh, each half an ounce; and of Egyptian ointment, three ounces: mix all together.

Or spirit of wine, gently boiled with aloes, myrrh, and saffron; or camphorated spirit of wine, mixed with Venice treacle; or the spiritus theriacalis, or the spiritus matricalis, mixed with about a sixth part of elixir proprietatis; or, what Garengeot so much extols, warm wine, mixed with simple or camphorated spirit of wine, either by itself, or quickened with sal ammoniac; which he recommends as a highly efficacious medicine for reviving the gangrenous parts.

Or take of leaves of scordium, southernwood, and recent rue, each two handfuls; of chamomile flowers, one handful: boil in a sufficient quantity of common water, strain off the liquor, and, to every two pints of it, add, of the spiritus vini theriacalis, four ounces; of Venice soap, two ounces; and of sal gemmæ, half an ounce.

These fomentations are to be applied frequently every day, with linen or woollen cloths; applying over them, in order to preserve the heat, folded cloths and heated bricks.

A penetrating, resolvent, and digestive cataplasm, for restoring the circulation of the blood in the affected part, may be prepared in the following manner:

Take of the herbs scordium, mallows, wormwood, and feverfew, each two handfuls; of mint and southernwood, each one handful.

Boil these in a sufficient quantity of oxycrate, in a close vessel, to the consistence of a cataplasm; to which add, of sal ammoniac, half an ounce; of the meal of linseed, two ounces; of the oil of rue, or chamomile, by infusion, an ounce and an half: and, before the cataplasm is applied, let it always be sprinkled with camphorated spirit of wine, or the spiritus vini theriacalis, in order to render it more efficacious: or, instead of this, the following cataplasm, recommended by Koenerdingius, may be used:

Take of the crums of wheaten bread, one pound; of the powders of wormwood, scordium, and rue, each one handful; of wine, a quantity sufficient to reduce them to the consistence of a cataplasm: after gentle boiling, add four ounces of the spirit of wine, and apply warm.

A fomentation for stopping the spreading of a Gangrene may be prepared in the following manner:

Take of the decoction of barley, or scordium, one pint; of the vinegar of rue, six ounces; of the spiritus vini theriacalis, four ounces; of sea-salt, one or two ounces: to be applied warm with compresses.

A cataplasm for softening the gangrenous crust, and promoting its separation, may be prepared in the following manner:

Take of the flowers of scordium, two handfuls: and of the leaves of mallows, henbane, and marshmallows, each one handful; and of the flowers of lavender, half a handful: boil in vinegar, or oxycrate, to the consistence of a cataplasm: to which add, of the meal of linseed, three ounces; of the oil of linseed, one ounce; and of sal ammoniac, two ounces.

If, in any stage of the disorder, the use of corrosives should be indicated, the celebrated Belloste orders the following preparation, as the most efficacious of all others:

Take of the spirit of nitre, or of aqua-fortis, two parts; and of quick-silver, one part: mix over a gentle heat, till the mercury is dissolved.

With this corrosive liquor, the mortified part is to be anointed, or a little lint, or a linen cloth soaked in it, is to be applied to the corrupted part; for, by this means, the mortified parts will soon be divided from such as are sound and alive. *Heister's Chirurgery.*

GA'RBOARD-*strake*, in a ship, is the first seam next to the keel.

GARBOARD-*plank*, in a ship, the first plank fastened on the keel.

GA'RDEN (*Dict.*)— In a garden, the principal things to be considered, are, 1. The situation; 2. The soil, aspect, or exposure; 3. Water; 4. Prospect.

1. Situation: this ought to be such a one as is wholesome, in a place that is neither too high nor too low; for, if a garden be too high, it will be exposed to the winds, which are very prejudicial to trees; if it be too low, the dampness, and the vermin, and venomous creatures, that breed in ponds, add much to their insalubrity.

A situation on a rising ground, or on the side of an hill, is the most happy; especially if the ground be not too steep; if the slope be easy, and in a manner imperceptible; if a good deal of level may be had near the house; and if it abounds with springs of water; for, being sheltered from the fury of the winds, and the violent heat of the sun, a temperate air will be there enjoyed; and the water that descends from the top of the hills, either from springs or rain, will not only supply fountains, canals, and cascades, for ornament; but, when it has performed its office, will water the adjacent valleys, and render them fertile and wholesome, if it be not suffered to stagnate in them.

Indeed, if the declivity of the hill be too steep, and if the water be too abundant, a garden on the side of it may often suffer, by having the trees torn up by the torrents and floods; and the earth above tumbling down, the walls may be demolished, and the walks spoiled.

It cannot, however, be denied, that the situation on a plain, or flat, has several advantages that the higher situation has not: floods and rains make no spoil; there is a continued prospect of champaigns, intersected by rivers, ponds, and brooks, meadows, and hills, covered with buildings or woods; and the level surface is less tiresome to walk on, and less chargeable, than that on the side of an hill; the terrace walks are not necessary: but the greatest disadvantage of flat gardens is, the want of an extensive prospect, which rising grounds afford.

2. The second thing to be considered in chusing a plat for a garden, is a good earth or soil.

It is scarce possible to make a fine garden in a bad soil: there are

are indeed ways to meliorate ground, but they are very expensive; and sometimes, when the expence has been bestowed of laying good earth three feet deep over the whole surface, a whole Garden has been ruined, notwithstanding the exposure has been southerly and healthful, when the roots of the tree have come to reach the natural bottom.

To judge of the quality of the soil, observe whether there be any heath, thistles, or such-like weeds, growing spontaneously in it; for they are certain signs, that the ground is poor. Likewise, if there be large trees growing thereabouts, observe whether they grow crooked, ill-shaped, and grubby, of a faded green, and full of moss, or infested with vermin; if so, the place is to be rejected: but, on the contrary, if it be covered with good grass fit for pasture, then you may be encouraged to try the depth of the soil.

To know this, dig holes in several places, six feet wide, and four feet deep: if you find three feet of good earth, it will do well; but less than two will not be sufficient.

The quality of good ground is, neither to be stony, nor too hard to work; neither too dry, nor too moist; nor too sandy and light; nor too strong and clayey, which is the worst of all for Gardens.

3. The third requisite is water. The want of this is one of the greatest inconveniencies that can attend a Garden, and will bring a certain mortality upon whatever is planted in it; especially in the greater droughts that often happen in an hot and dry situation, in summer; besides the usefulness of it in fine Gardens, for making jets d'eau, canals, cascades, &c. which are the greatest ornaments of a Garden.

4. The fourth thing required in a good situation is, the view and prospect of a fine country; and, though this is not so absolutely necessary as water, yet it is one of the most agreeable beauties of a fine Garden; besides, if a Garden be planted in a low place, that is buried, as I may say, and has no kind of prospect, it will be not only disagreeable, but unwholesome, by being too much shaded and obscured; as the trees will rather retain insalubrious damps, than communicate the refreshing air, that is so purifying to vegetable nature.

In short, a Garden necessarily requires, besides the care of the gardener, the sun, a good soil, a full, or, at least, an open prospect, and water; the last, above all, and it would be egregious folly to plant a Garden where any of these are wanting.

In a fine Garden, the first thing that should present itself to the sight, should be an open lawn of grass, which, in size, should be proportionable to the Garden: in a large Garden, it should not be less than six or eight acres; but, in middling or small Gardens, the width of it should be considerably more than the front of the house; and, if the depth be one half more than the width, it will have a better effect. The figure of this lawn need not be regular; and if, on the sides, there are trees planted irregularly, by way of open grove, some of which may be planted forwarder upon the lawn than others; whereby the regularity of the lawn will be broken; it will render it more like nature; the beauties of which should always be studied in the laying out and planting of Gardens; for, the nearer these Gardens approach to nature, the longer they will please: for what is a Garden but a natural spot of ground, dressed, and properly ornamented? There are those who have erred in copying of what they call nature, as much as those who have drawn a whole Garden into straight lines, great alleys, stars, &c. by bringing the roughest and most deformed part of nature into their compositions of Gardens: as, for instance, where the ground has been naturally level, they have, at great expence, made hollows and raised molehills; so that the turf has been rendered not only more unpleasant to walk upon, but much worse to keep: and, after all the pains that have been taken to ape nature, the whole is as easy discovered to be the work of art, as the stiffest slopes, and the most finished parterres.

The great art of laying out of Gardens is, to adapt the several parts to the natural position of the ground, so as to have as little earth to remove as possible: for this is often one of the greatest expences in making of Gardens; and it may with truth be affirmed, that, wherever this has been practised, nine times in ten, it has proved for the worse: so that, if instead of levelling hills, to form large terraces, stiff slopes, and even parterres, as has been too often practised; or the sinking of hollows, and raising of hills, as hath by others been done; the surface of the ground had only been smoothed, and well turfed, it would have had a much better effect, and been more generally approved than the greatest number of these Gardens, which have been made with an infinite expence both of time and money.

The next thing to be observed is, to contrive a dry walk, which should lead quite round the whole garden: for, as Gardens are designed to promote the exercise of walking, the greater the extent of this dry walk, the better it will answer the intent; since in bad weather, or in dewy mornings and evenings, when the fields are unpleasant, or unsafe to walk over, these dry walks in Gardens become useful and pleasant: and such walks, if laid either with gravel or sand, may lead through the different plantations, gently winding about in an easy natural way; which will be more agreeable than those long straight walks, which are too frequently seen in Gardens.

Another thing absolutely necessary is, where the boundaries of the Garden are fenced with walls or pales, they should be hid by plantations of flowering shrubs, intermixed with laurels, and some other ever-greens, which will have a good effect; and at the same time conceal the fences, which are disagreeable, when left naked and exposed to the sight.

In situations where there is a good supply of water, the designer has room for adding one of the greatest beauties to the Garden, especially if it will admit of a constant stream: for, in such places, if the water is properly conducted through the Garden, it will afford infinite pleasure: for, although these streams may not be sufficient to supply a large surface, yet, if these narrow rivulets are judiciously led about the Garden, they will have a better effect than many of the large stagnating ponds or canals, so frequently made in large Gardens: for where these pieces of water are large, if the boundaries can be seen from one point of view, they cannot be esteemed by persons of judgment; and frequently these standing waters are brought so near the house, as to render the air damp and unhealthy; and many times they are so situated, as to occasion this inconvenience, and, at the same time, are not seen to any advantage from the house.

Where wildernesses are intended, these should not be cut into stars and other ridiculous figures; nor formed into mazes or labyrinths, which in a great design is trifling: but the walks should be noble, and shaded with tall trees; and the spaces of the quarters planted with flowering shrubs and ever-greens; whereby they will be rendered pleasant at all seasons of the year: and, if there are hardy sorts of flowers, which will thrive with little care, scattered about near the sides of the walls, they will have a very good effect, in making a variety of natural beauties almost through the year.

The situation of these wildernesses should not be too near the house, lest they should occasion damps; therefore it is much better to contrive some open groves, through which there may be a communication, under shade, from the house to these wildernesses; which are much the best when they are planted at the farthest part of the Gardens, provided they do not obstruct the view of fine objects.

Fountains are also very ornamental to a Garden, if they are magnificently built, and where a constant supply of water can be obtained: but, if they are meanly erected, or have not water to keep them constantly running, they should never be introduced into Gardens; for nothing can be more ridiculous than to see a dry fountain, which, perhaps, at a great expence, may have water forced up, to supply it for an hour or two, and no more; and this, perhaps, not in dry seasons, when there is a general scarcity of water.

When trees have been long growing in a Garden, nothing can be more disagreeable than to have them destroyed, to alter the Garden according to the fashion of the time; because it requires much time to bring up trees to such height as to afford shade and shelter: and, as time is precious, so, where the disposition of the Garden is altered, there should be great attention given to the preservation of all the good trees, wherever they can be either useful or ornamental.

There is another essential part of Gardening, which cannot be too much considered by persons who design Gardens; which is that of adapting the several sorts of trees and shrubs to the situation and soil of the garden; as also to allow the trees a proper share of room: but, however necessary this will appear, yet very few persons have made this their study: insomuch that, when one views many modern gardens, and sees the great number of trees and shrubs, which are crouded into them, one would be induced to believe, that private interest has had a greater influence, than any other motive, with the designers. Indeed this fault may often be ascribed to the master, who perhaps is too much in haste for shade and shelter; so will have three or four times the number of trees and shrubs planted, as should have been; or that can remain long without injury, where the plantations succeed: and to this over haste are owing the miserable plantations of large trees, so often seen in gardens and parks; where trees of all sorts, and of any age, are taken out of woods, hedge-rows, &c. and removed at a great expence to stand and decay annually, till they become so many dead sticks, than which nothing can be a more disagreeable sight to the owner, who, after an expectation for several years, attended with an expence of watering, digging, and cleaning, finds himself under a necessity either of replanting, or giving up the thoughts of having any. Numbers of persons have indeed amused themselves with the hopes of success, by seeing these new planted trees put out branches for a year or two which they generally do; but in three or four years after, instead of making a progress, they decay at the top, and continue so to do gradually, until they quite perish; which perhaps may not happen in eight or ten years, especially if no severe winter, or very dry summer, intervenes: either of which generally proves fatal to these plantations; so that persons may be led on with hopes, for so many years, in the best part of their lives, when there is a certainty of their falling, or at least of their never increasing in size. *Miller's Gard. Dict.*

GA'RNET, aboard a ship, is a tackle having a pendant coming from the head of the main-mast, with a block strongly fixed

fixed to the main-ſtay juſt over the hatch-way, in which block is reeved the runner, which hath an hook at one end, in which are hitched the ſlings; and at the other end is a double block, in which the fall of the runner is received; ſo that by its means any goods, or caſks, that are not over heavy, may be haled and hoiſed into, or out of the ſhip; when this Garnet is not uſed, it is faſtened along by the ſtay at the bottom of it.

GARNET *colour*. To give this colour to glaſs, the workmen take the following method: they take equal quantities of cryſtal and rochetta frit, and to every hundred weight of this mixture they add a pound of mangancſe, and an ounce of prepared zaffer; theſe are to be powdered ſeparately, then mixed and added by degrees to the frit while in the furnace: great care is to taken to mix the manganeſe and zaffer very perfectly, and, when the matter has ſtood twenty-four hours in fuſion, it may be worked. *Neri's Art of Glaſs*.

GARNET *paſte*. The making the counterfeit Garnet in paſte is done in three different proportions of the ingredients, which are theſe:

Take prepared cryſtal two ounces, common red lead ſix ounces, manganeſe ſixteen grains, zaffer three grains; mix all well together, and put them into a crucible, cover it with a lute, and ſet it in a potter's kiln for twenty-four hours.

Or take cryſtal two ounces, minium five ounces and a half, manganeſe fifteen grains, zaffer four grains; mix them well together, and leave room for their ſwelling in the pot; bake them twenty-four hours in a potter's kiln.

The laſt method is this: take cryſtal prepared two ounces, minium five ounces, mix them, and add manganeſe fifty-two grains, zaffer ſix grains; mix them well together, and let all be baked, in a pot well luted, in a potter's kiln for twenty-four hours.

The firſt of theſe makes a very handſome Garnet of the common tinge; the ſecond a deep one with ſomething of a violet tinge, as many of the natural Garnets have; but the third makes infinitely the fineſt and brighteſt. *Neri's Art of Glaſs*.

GAVO'TTA, or GAVOTTE, in the Italian muſic, is a kind of dance, the air whereof has two ſtrains, briſk and lively, and in common time; each of its ſtrains are played twice over; the firſt has uſually four or eight bars, and the ſecond contains eight, twelve, or more. The time begins with a minim, or two crotchets, or notes of equal value, and the hand riſing; and ends with the fall of the hand upon the dominant, or mediant of the mode; never upon the final, unleſs it be a rondeau. And the laſt begins with the riſe of the hand, and ends with the fall upon the final of the mode. *Breſſ. Dict. Muſ.*

Tempo di GAVOTTA, in the Italian muſic, is when only the time or movement of a Gavotta is imitated, without any regard had to the meaſure or number of bars, or ſtrains. We often find parts of ſonnatas, which have this phraſe to regulate their motion. *Breſſ. Muſ. Dict.*

GAZE'LLA, in natural hiſtory; ſee ANTILOPE.

GE'BERRS, the name of a ſect in Perſia, who worſhip the everlaſting fire, near Baku. See *Everlaſting* FIRE.

Zoroaſter, the founder of this religion, appeared about the year of the world 2860. This great philoſopher was ſtruck with the demonſtrations of that ſelf exiſtent being, who is the author of all good. Being at a loſs how to account for the introduction of evil into the world, he imagined there were two principles; one the cauſe of all good, which he repreſented by light; and the other the cauſe of all evil, which he figured to himſelf by darkneſs. He conſidered light as the moſt perfect ſymbol of true wiſdom and intellectual endowment, and darkneſs the repreſentative of things hurtful and deſtructive. From hence he was called to inculcate an abhorrence of all images, and to teach his followers to worſhip God only, under the form of fire; conſidering the brightneſs, activity, purity, and incorruptibility of that element, as bearing the moſt perfect reſemblance to the nature of the good Deity. For the ſame reaſon the Perſians ſhewed a particular veneration to the ſun, which was founded on their belief, that it is the nobleſt creature in the whole world, and that the throne of the Almighty is ſeated in it. This good principle which they acknowledge to be the omnipotent creator and preſerver of all things, they called Yezad, and alſo Ormuzd, which ſignify ſupreme. The evil principle they ſtiled Ahariman, i. e. the devil. Some have aſſerted that the antient Perſians held a co-eternity of theſe two principles; but others, who ſeem better acquainted with the true tenets of this religion, agree that Ormuzd, according to the Perſian mythology, firſt ſubſiſted alone; that by him both light and darkneſs were created; and that Ahariman was created, or rather aroſe from darkneſs. In the compoſition of this world good and evil being thus mixed together, they believed they would continue to the end of all things, when each ſhould be ſeparated and reduced to its own ſphere.

The antient Perſians erected no temples, but offered their ſacrifices in the open air, and generally on the top of a hill; for they eſteemed it injurious to the majeſty of the God of heaven, to ſhut up in walls him to whom all things are open, whom the world cannot contain, who fills immenſity by his preſence, and to whom the whole earth, with regard to man, ſhould be eſteemed as an houſe or temple.

Between the beginning of the reign of Cyrus the Great and the end of that of Darius the ſon of Hyſtaſpis, being about 600 years after the firſt Zoroaſter, another philoſopher of the ſame name aroſe. He undertook to reform ſome articles in the antient religion: he taught that there is one ſupreme, independent, and ſelf-exiſtent being. That under him there are two angels, the one of light, who is the author of all good, and the other of darkneſs who is the author of all evil. That theſe two by a mixture of light and darkneſs made all things which are. That they are in a perpetual ſtruggle with each other; where the angel of light prevails, there good reigns; and, where the angel of darkneſs, there evil predominates. That this ſtruggle ſhall laſt till the end of the world, when there will be a day of judgment, in which all ſhall receive a juſt retribution according to their works: after which the angel of darkneſs and his followers ſhall be caſt into a world of their own, where they ſhall ſuffer for their evil deeds in darkneſs, which to all eternity ſhall be ſeparated from the light. But thoſe who cheriſhed and cultivated their ſpiritual nature, and obeyed the angel of light, ſhall go with him into a world, where, amidſt everlaſting brightneſs and triumphant glory, they ſhall receive the rewards due to their good deeds. This laſt Zoroaſter, contrary to his great predeceſſor, cauſed temples to be built, in which the ſacred fires were ordered to be conſtantly preſerved.

Theſe opinions, with a few alterations, are ſtill maintained by ſome of the poſterity of the ancient Indians and Perſians, who are called Geberrs or gaurs, and are very zealous in preſerving the religion of their anceſtors, particularly in regard to their veneration for the element of fire.

GENE'RICAL *Name*, in natural hiſtory, the word uſed to ſignify all the ſpecies of natural bodies, which agree in certain eſſential and peculiar characters, and therefore all of the ſame family or kind; ſo that the word, under the Generical name, equally expreſſes every one of them, and ſome other words expreſſive of the peculiar qualities or figures of each are added, in order to denote them ſingly, and make up what is called the ſpecific name.

Thus the word roſa, or roſe, is the Generical name of the whole ſeries of flowers of that kind, which are diſtinguiſhed by the ſpecific names of the red roſe, the white roſe, the apple roſe, &c. The ignorance of former ages in the true principles of natural hiſtory has occaſioned the bodies, which are the objects of it, to be arranged into very unnatural ſeries under the name of genera; and theſe have been called by names as improper, as the characters they were diſtinguiſhed by. Linnæus has done a great deal in the exploding the bad Generical names in botany, and Artedi has applied his rules about the formation of theſe names, with very little difference, to the ſubjects of ichthyology.

Many of the Generical names of fiſhes, till the time of this author, were ſo barbarous and obſcure, that it was not eaſy to trace them to their original, or to find whether they were truly Teutonic, Engliſh, Dutch, Swediſh, French, Italian, Spaniſh, Portugueſe, Latin or Indian. The ignorance of the writers on theſe ſubjects, or their too ſcrupulous adherence to the cuſtoms of their predeceſſors, ſeem to have been principally the cauſes of this, and often an entire negligence. Artedi's rules for Generical names for fiſhes are theſe: whatever fiſhes there are which agree in the ſame Generical characters, and are properly of the ſame genus; theſe ought all to be called by the ſame Generical name, their differences being only expreſſed by ſpecific ones. This appears ſo plain, ſo juſt, and ſo neceſſary a rule, that it is almoſt a ſhame to lay it down; yet the writers on fiſhes, till the time of this author, had very ſeldom kept up to it: but, in many different parts of their works, fiſhes of the ſame genus were found deſcribed under different Generical names, and in the other parts, on the contrary. The greateſt confuſion imaginable was brought on by the deſcribing fiſhes of really and truly diſtinct genera under the ſame Generical name. Thus the alburnus, the barbus, bubulca, brama, capito, caraſſius, carpa, erythrophthalmus, fundulus, gobius, griſlagine, leuſiſcus, mugil, naſus, orfus, phoxinus, pigus, rutilus, ſqualus, tinca, and varius, are all uſed as ſo many diſtinct Generical names; yet they are all the names of the different ſpecies of only one genus, the cyprini. In the ſame manner, the agonus, alauſa, celerinus, and chalcis, the encraſicholus, harengus, lycoſtomus, pilchardus, ſardanus, ſprattus, ſparlingus, thriſſa, &c. are a parcel of barbarous names uſed as diſtinct Generical terms; yet the fiſhes they are applied to, are all ſpecies of the ſame genus, viz. the clypeæ. Numerous other inſtances of this kind might be brought.

On the other hand, fiſhes of the moſt different genera have been confounded under the ſame Generical name: thus we have two fiſhes deſcribed under the ſame name tinca, as if of the ſame genus, but diſtinguiſhed by the ſpecific additions of their places of abode; the one called tinca lacuſtris, and the other tinca marina. The firſt of them is truly a ſpecies of cyprinus, and the other a ſpecies of as different a genus as can be well conceived.

Another

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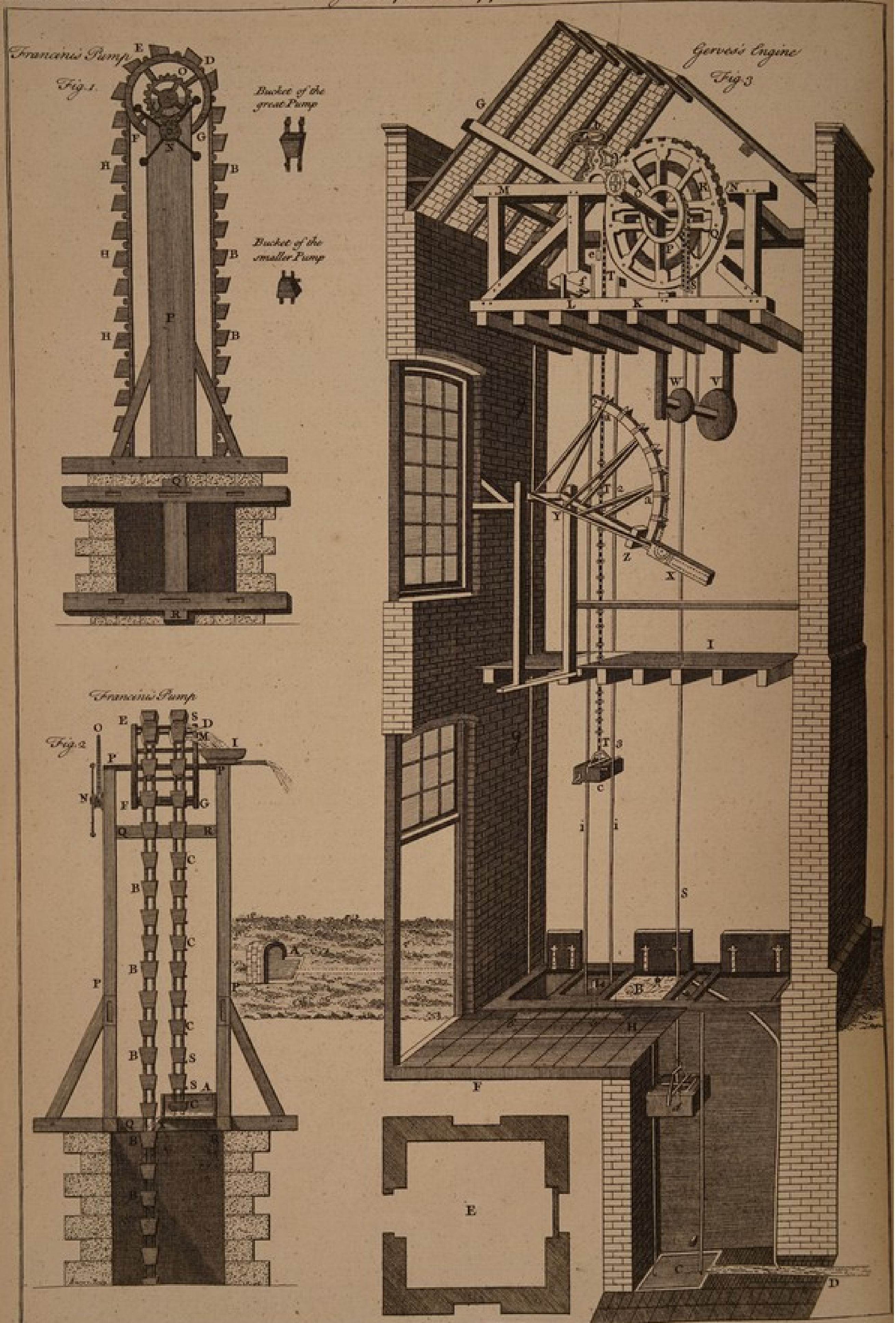

Printed for J. Hinton in Newgate Street.

Another barbarism and impropriety, in the Generical names of fishes among the old authors, is the using the same words to express them, which are also the names of other animals, quadrupeds, birds, and reptiles. These are subject to great objections; because, when they are used, it is not easy to see, in some cases, whether the author is speaking of a bird, a beast, or a fish. It is therefore one of the general rules of Artedi, that all these names are to be abolished, as also all those which are common to fishes, and to plants, minerals, and to the tools of husbandry, or other services. *Artedi, Ichthyology.*

GENE'VA. There never was so great a quantity of the liquor vulgarly called by this name made as at present; but it is wholly different from what the liquor so called was at first. The best Geneva we now have, is made from an ordinary spirit, distilled a second time with an addition of some juniper berries; but the original liquor of this kind was prepared in a very different manner. It was a custom, in the distilling of spirits from wort, or other fermented liquors, to add, in the working, some aromatic ingredient; such as ginger, cortex Winteranus, or grains of paradise, to take off the bad flavour, and to give a pungent taste to the spirit. Among other things used with this intent, some tried the juniper berries, and, finding that they gave not only an agreeable flavour, but very valuable virtues also to the spirit, they brought it to a general custom, and the liquor sold under this name. The method of adding the berries was to the malt in the grinding: a proper proportion was allowed, and the whole was reduced to meal together, and worked in the common way. The spirit thus obtained was flavoured ab origine with the berries, and exceeded all that could be made by any other method. Our common distillers leave out the juniper berries intirely from the liquor they now make and sell under that name. Our rascally chemists have let them into the secret, that the oil of juniper berries, and that of turpentine, are very much alike in flavour, though not in price; and the common method of making what is called Geneva in London, is with common malt spirit and a proper quantity of oil of turpentine distilled together. *Shaw's Essay on Distill.*

GERA'NIUM, *Crane's-bill*, in botany, a genus of plants whose characters are:

The leaves are, for the most part, conjugated, the calyx pentaphylloidal, and expanded in form of a star. The flower here, in Europe, is pentapetalous, and rosaceous; but in Africa sometimes tetrapetalous, and in a manner galeated and labiated, and furnished with ten stamina, which closely surround the base of the ovary. The fruit is pentangious, or quinquevascular, beaked, containing, at the base, five capsules, including each a tailed seed, and producing a long slender tube; which five tubes, uniting close, representing with the ovary, the head of a stork, or crane. See *plate* XXII. *fig.* 9.

This plant has an emollient virtue like the acetosa: as it is esculent, its tuberous roots are eaten in Africa, as we eat turneps. An infusion, or decoction, of the herb, or its juice, are effectual in resolving the coagulated blood in wounds; it has something of astringency, and is recommended by the antients for the cure of foul ulcers; they used it also in ulcers of the pudenda. A bath prepared of the decoction of this herb has a good effect in fevers; and a decoction of the seeds is in use for the healing of wounds, and as a demulcent of asperities in the body; it is highly comforting and refreshing to the breasts labouring under a cancer, being reckoned among those plants which preserve from corruption: the leaves boiled in wine discuss an inflammation, and are commended for an erysipelas. The juice of the root cures diseases in the ears, and is good in a fomentation for pains of the joints; for which purpose it is used by some surgeons, as also for fissures in the breasts, and discussion of the milk.

Boerhaave mentions several other species of the African Geranium; all which, he says, are possessed of an emollient quality.

GERMA'NDER *Galls*, in natural history, a term used by those who have treated on the subject of galls, to express a peculiar vitiated state of a part of this plant. The stalks and leaves of other plants, and the bark and branches of trees, are the parts which furnish these sorts of excrescences, and, being vitiated by the biting and sucking of some insects, swell out in the parts where so injured into a protuberance; but in this plant it is the flower that becomes then vitiated, and forms what is properly enough called a flower-gall. Mr. Bernard Jussieu was the first who observed this fact. He observed, that many of the flowers of this plant never opened like the rest, and yet grew much larger, and that these always contained an insect. Other galls owe their origin to the worms of several kinds of flies, or to the little pucerons; but this is produced by an insect not known before to have any such power. A small and very beautiful kind of bug of a grey colour, with spots of white and brown, deposits its eggs in the calyx, or cups of this flower.

These soon hatch into so many small worms, which, feeding on the juices of the bud of the flower, eat their way into its cavity; when lodged there, they remain perfectly at ease, and, continuing to feed on the petal, the flower grows like all other parts of vegetables, injured in the same manner, to a much larger size than it otherwise would have done, but never opens into a flower.

While all the rest of the flowers are open, those thus injured, which are usually several on each plant, form so many red tubercles, which, being opened, are always found to contain either the worm of the bug, or its chrysalis, or, at the utmost, the remains of that state from which the creature has escaped in its perfect state. *Reaumur, Hist. Insect.*

GE'RVES'S *Engine*, a curious engine for raising water to supply a gentleman's seat, &c.

If there be a spring affording but a small quantity of water, and having but a small fall, suppose 10 feet, it is possible by the loss of some of the water to raise the rest to supply a gentleman's seat, or any place where it is wanted; but in a less quantity, by a little, than what runs waste, if the place to which the water is to be raised is higher than the fall of the spring is low. For example, the fall of one hogshead 10 feet will raise very near a hogshead 10 feet: one hogshead, falling 10 feet, will raise very near ¼ of a hogshead 40 feet. This has been thought of by Schottus a great many years ago, and he gave a draught of it; but I do not find that it was ever put in execution (at least to any good purpose) till the late George Gerves, carpenter, erected an engine for this purpose, for Sir John Chester, Bart. at his seat at Chichester, in Buckinghamshire. This engine has not been out of order since it was first set up, about 15 years ago.

Explanation of *Plate* XXIII. *fig.* 3. representing Gerves's engine.

A. Is a small spring of water, running four gallons per minute, conveyed 72 yards into B.

B. A cistern holding about 12 gallons, with a fall from B to C.

C. A cistern 10 feet below B, where the waste is conveyed off along D.

D. A drain, or sewer.

E. A plan of the building by a scale of 8 feet in an inch.

F G. A section of the house built over the well or cistern, drawn by a scale of 4 feet in an inch; with

H I K. Three floors, for the conveniency of fixing and ordering the engine; on the uppermost is

L M N. A frame of timber, on which the moving part is supported (part broken off in the figure, to shew the work;) across this frame lies O,

O. An horizontal axis, three feet and an half long, moving on two gudgeons in brasses. Upon this axis are framed three wheels.

(1) P. A wheel 2 feet diameter shrouded, whose sole is 5 inches broad, and shod with iron.

(2) Q. The largest wheel 6 feet diameter, lying close by the other, 1 inch and an half broad on the sole, and shrouded; this is spiraled 2 inches, both in sole and shrouds.

(3) R. A wheel 3 feet 10 inches diameter, fixed on the sides of the spokes of the wheel Q. and shrouded; this is spiraled ¼ of an inch.

P. Upon the wheel P, is fixed a chain, made flat and very flexible, which, after it has wrapped once round, is made double to stride on each side the single part, to prevent its fretting and galling, and to keep exactly the perpendicular.

S S. To this chain is hung S S, a long rod of iron, at the bottom of which the greater bucket *d* is fixed.

Q. Upon the wheel Q, is fixed a smaller chain made flat as the other; and, when this wheel has made one revolution from left to right, the spiral sole takes up as much of the chain, as is between T and T 2. The lower part of the chain from T 2 to T 3 has cross bars, which fall upon the edge of the shroud in notches plated with iron; which, by the help of the spiral, not only prevent this part of the chain from riding upon the other, but help to equiponderate the increase of weight of the other chain S S.

R. Upon the wheel R, is fastened a rope, one end of which goes about V.

V. A wheel of 2 feet diameter, to which that end is fixed; and on the same axis is fixed W.

W. Another wheel one foot diameter, to which is fastened a rope, which goes over a pulley to a sliding weight in a box at X.

X. Being the stilyard end of Y *a a.*

Y *a a.* A quadrant wheel moving on the axis Y; the rope falling upon pullies, running betwixt iron plates, upon the circumference.

Z. Is a lead weight, fixed to counter-balance the weight of the chains, keeping exactly an æquilibrium in every position they move in.

O. Upon one end of the axis O, is a strong iron wheel, giving motion to a fly *b* which regulates the motion of the engine.

T T. Upon one end of the chain T T, is a copper bucket *c*; whose capacity is about 5 gallons, having a valve in the bottom on the left hand, and a waste pipe near the top on the right: upon the lower end of the rod S S, is hung *d.*

d. A copper bucket containing about 15 gallons; in the bottom of this is a valve opened by a trigger falling upon a stud at the bottom of the well.

i i. Are

ii. Are iron-rods, for the guiding of the buckets, whose ears have brass rolls in them, and inclose three sides of each rod, which is square.

The operation.

When the lesser bucket descends, it falls upon a trigger at 4, which is jointed to a treddle at 5, expressed with pointed lines, moving on an axis at 6, which by a rod at 7 opens a valve in the bottom of the cistern B; whence the water, by a brass cock and branch-pipe, is conveyed underneath into both buckets, *c* and *d*.

When the lesser bucket has received about four gallons and an half, it runs out at the pipe or spout into a leaden trough, which conveys the water underneath the cistern into the great bucket, till it overpoises the lesser; which descending, and raising the lesser bucket, the valve shuts, and the water that is left in the trough and branch-pipe runs into the greater bucket *d*, accelerating the motion, which falling 10 feet, the lesser bucket rises 30 feet; which taking up the trough *f*, and its trigger striking upon a stud at *e*, its valve is opened, and its water runs out into a small cistern at *f*, and down a pipe *g g*, and so is conveyed to the place designed: at the same time a stud opens the valve of the greater bucket, the water running along D the drain or sewer.

When both buckets are empty, the lesser overpoises the greater, and descends down to the cistern, bringing up the greater, where they fill as before.

To regulate the weight of the chains in every position, as they act in winding on and off the wheels P and Q, the spiraling of the wheels helps in some measure; but the quadrant wheel and stilyard X, with the weight Z, compleat the equilibrium, by acting with the greatest force in the horizontal position, when the chain T is all down, and acts with its whole weight upon the wheel Q. Then, as that chain is drawn up, its acting weight being thereby diminished, the stilyard X is moving down towards its perpendicular, where the weight Z ceases to influence the motion of the wheel R; at which time the sliding weight runs down to keep the rope tight.

At the first moving down of the lesser bucket, the weight X slides up to a shoulder, before any motion is given to the stilyard; but, whilst the chain T evolves from its wheel Q, its acting weight increasing; and, at the same time, the chain S wrapping itself upon the wheel P, its acting weight decreasing. The stilyard, by rising higher, brings the line of direction of the weight Z farther from the center of the quadrant, and so lays a greater force or obstruction to retard the wheel R, and continually keeps a counter-balance.

The fly *b* regulates the motion of the engine to an equal velocity; and, by its running forwards, after the buckets are quite up or down, holds them steady till they begin to fill or empty, and prevents their recoiling back.

This engine, at a slow motion, carries up one bucket full in five minutes; but, if the spring run double the quantity, it would go up twice in the same time; and an engine, in this kind, may be made to raise one hogshead per minute, or more, if required; the waste water not being the hundredth part of what is spent by a water-wheel, to raise an equal quantity of water to the same height.

GI'BBOUS, *crooked or hump-backed*. Gibbosity is a preternatural incurvation of the spina dorsi, either backward, or on one side. Infants are more subject to this disorder than adults, and it oftener proceeds from external, than from internal causes. A fall, blow, or the like violence, frequently thus distorts the tender bones of infants. When it proceeds from an internal cause, it is generally from a relaxation of the ligaments that sustain the spine, or a caries of its vertebræ; though the spine may be inflected forward, and the back thrown out, by a too strong and repeated action of the abdominal muscles; and this, if not timely redressed, usually grows up and fixes as the bones harden, till in adults it is totally irretrievable: but when the disorder is recent, and the person young, there are some hopes of a cure. The common method is by a machine of pasteboard, wood, or steel, which is made to press principally upon the Gibbous part, and this by long wearing may set all right. The surgeons have however a different instrument which they call a cross, much more efficacious, though not quite so convenient in the wearing; by the use of this, the parts are always prevented from growing any worse, and are often cured. During the application of these assistances, the parts should be at times rubbed with Hungary water, spirit of lavender, and the like, and defended with a strengthening plaister of oxycroceum, opodeldoc, or the like. *Heister's Surgery.*

GIBBOUS *fish*, *gibbosus piscis*, in zoology, a name given by Mr. Ray to the fish called by the Dutch kromrugh. It is a smooth fish without scales; its belly is white, its fins and tail black. It grows to a considerable size, sometimes to four feet. It is caught all over the East-Indies, near the sea-shores, and is very firm, and much esteemed at table. It has its name from the remarkable rising of its back, which is like that of a perch, but much higher. *Ray's Ichthyolog. Append.*

GI'LDING *on China ware*. The gold is very much valued on China ware, and would be much more so, were it not that it is very liable to lose its lustre, and to rub off. The Chinese at present have a method of preventing both these accidents in a great measure, by means of a sort of polishing, which they give it, after it is laid on. They prepare for this purpose a fine piece of agate, which they polish on one surface in as perfect a manner as possible. With this, they rub over the gold as it lies on the porcelain several times, when it first comes from the baking.

This gives the gold a lustre which it would not otherwise have, and fixes it down to the ware in such a manner, that it cannot easily be got off. The principal mischief that gold thus laid on is subject to, is, the tarnishing, or growing dull; this is remedied by the same sort of means. They wet the vessel upon which they would revive the lustre of the gold, in common clean water, and, while it is wet, they rub it with the same polished agate, adding a little fair water at times to keep it moist. If the gold has not been laid on well at first, this may possibly raise it or take it off in some places; but if it was originally put on with the help of this stone, as all the gold on porcelain now is, the rubbing it with it a second time never gives it any scratches, but recovers its pristine lustre and beauty. It must be observed, that the rubbing with this stone must be all done one way, both in the first laying on the gold, and in the brightening it up afterwards. This may serve as a method for us, as well as the Chinese, not only to recover the beauty of our tarnished gilt China ware, but also to lay gold upon some of our home manufactures of this kind. *Obser. sur les Coutumes de l'Asie.*

GILLS *of fishes*, the parts which serve to their taking and throwing out again proper quantities of water, impregnated with its due and natural portion of air. The branchiæ, or Gills of fish, therefore, are the organs which correspond to the lungs in quadrupeds and birds, as also of frogs, serpents, and lizards, creatures too much confounded with fish by the old authors; all fishes therefore have these branchiæ, except the cetaceous and the petromyzum. The Gills in all fish are eight in number, four being placed on each side the throat. The lowest Gill is always much smaller than either of the others; the other three on each side are gradually larger to the top one, which is in all fish the largest. Every one of these Gills is composed of a bony substance formed into a semicircle, in most kinds, or bent into the shape of a bow; in the convex side of which there is formed a sort of plume, or the resemblance of a leaf.

Each leaf, to use that word, is composed of a double row of bony lamellæ, formed like so many sickles; and each of these lamellæ is fixed to the convex part of the bow, by means of the membrane with which that bow is covered. These lamellæ have one part convex, and the other concave. The convex side is covered with numerous hairs in all parts, and these are longest near the base, and shortest toward the apex. They are less hairy on the concave side; the hairs there being shorter, and continued only to the middle of the lamellæ, not running all the way along it. These hairs are all the way connected to the Gill by a very tender membraneous substance, which covers the lamellæ; but they are each single at the base. *Artedi, Ichthyolog.*

GLASS.— Under this article in the Dictionary we have given the method of blowing and casting large plates glass as performed in England; we shall here describe a famous manufacture of that kind at St. Gobin in France.

The building at St. Gobin in France, where the Glasses are run, is called the hall, which may be eleven fathoms long, and about ten and a half broad in the clear. The furnace is in the center, and is three fathoms long, and two and a half wide. It is built of very good brick.

There are two doors three feet high on each of the sides, of two fathoms and a half; and a door three feet and a half high on the longer side. The two former serve to throw wood continually into the furnace, and the last to get the pots and pans in and out; by means of a crane fixed before it for that purpose.

This furnace is upon solid foundations, and paved with square tiles of a well-baked earth, of the same quality with that of the pots into which the matter is put to be melted. It is arched within to the height of ten feet. The tube for the venting of the smoke is in the center.

On one of the sides of the length of the furnace and at the height of three feet and a half, there is the great arched aperture, ten feet wide and three feet high, and shaped like the mouth of an oven. Through this aperture they put in the solder and sand to be melted in the pots, and through it they take out the melted matter, which is carried into the pan, when they are ready to run it.

Round the furnace are the walls of the hall well built with free-stone: there are in these walls, within, apertures like the mouth of a common oven. The hearth of these apertures, which are about four fathoms and a half deep, is two feet and a half from the ground-floor. These small furnaces are called carquaisses, and serve to neal the Glasses after they have been run. These furnaces make so many small buildings round the hall, and much lower than the under part of the roof that covers it. There are without a like number of apertures of the same shape right over-against those that are within the hall, which makes a parallel arch, three feet high. There are by the sides of these apertures small arched niches, with pipes to give vent

to

to the smoke. They light the fire in them to heat the carquaisses. A large gallery terminates these small buildings, and helps the outward service of the carquaisses.

The manufacture is composed of many of these halls, and of a multitude of large rooms, the upper part of which serves to lodge the workmen. It has fine buildings to lodge the masters, a very pretty chapel and wide yards, many of which are full of stacks of wood of several kinds. The compass of the furnace is very large, and inclosed with good strong walls. The whole is situated at the top of a small hill, close to the village of St. Gobin, near la Fere and Chauny, two towns of Picardy. The forest of St. Gobin, which is of considerable extent, gave birth to the establishment of this manufacture. There are fine springs in the forest, that supply, on the declivities of the hill, all the water necessary for the work. Stone is very good and very common there: and now and then they draw some out of the inclosure of the manufacture.

The matter of which the Glasses are made, is a composition of solder, and of a very white sand, which is fetched from the neighbourhood of Creil, eleven leagues distant from Paris. There are above 200 people employed round tables in the halls, about cleaning and picking the solder and sand, to take out all heterogeneous bodies out of them. After this, the whole is washed several times, and dried so as to be pulverised in a mill, consisting of many pestles, which are moved by horses that turn round blindfold. This done, the sand is sifted through silk sieves, and then carried to be dried in narrow places, contrived in the corners of the furnace, four feet and a half from the ground-floor, whence it is put into the pots, to be melted.

The largest Glasses are run: the middle-sized and small ones are blown.

The abovesaid furnace is not sufficiently heated before it has consumed 50 cords of wood, which is 100 cart-loads. After that, it melts the solder and sand. It keeps the same degree of heat by means of a continual supply of wood: which is done by two men in their shirts, who are relieved every six hours. The furnace is never extinguished but at six months end, in order to be rebuilt. During this time, they rebuild that which was extinguished before the furnace actually made use of was employed, and they make the necessary repairs in both the hall and the carquaisses.

The furnace contains several pots formed like crucibles, three feet high, and about as much in diameter, of a well-baked earth of a whitish colour, inclining to that of tripoly. These pots may hold the quantity of a hogshead of wine, and are very costly. Few of them will hold out the full six months of the furnaces being hot. It happens sometimes that the pots break, when full of matter, which is a considerable loss to the manufacture.

These pots being in the oven, the solder and sand are put into them by the men that run the Glasses, who have in their hands an iron shovel in the form of a scoop to take water out of a boat, and which is full either of sand or solder: they pass one after another before the master workman, who puts a small quantity on each shovel-ful to facilitate the melting of it, by repeating the same mixture till the pots are quite full. The solder and sand remain in the pots for six and thirty hours together, after which the matter is fit to be run.

All hands are now ready for the running of the Glasses. They begin by emptying with a large iron-ladle the matter out of one of the pots into a pan, which is put into the furnace for that purpose. This pan is of the same earth as that of the pots, and may be six and thirty inches long, eighteen inches wide, and as many deep. There are some thirty inches long, with the same depth and width as the rest. There are in the length of these pans notches three inches wide, to stop them on the sides of the sledge, which is all iron, and very low: the tail of this sledge forms a square kind of pincers, which, when shut into the pan, takes off the notches. The two sides of these pincers, stretched out in form of an X, make the shaft of the sledge. The motion of these pincers is made upon the axle-tree of the sledge, where there is a large iron peg that crosses it, and is stopped with a pin. They fix the pan upon the sledge, with an iron chain on the side of the shaft.

Several workmen carry the sledge over-against one of the heated carquaisses, where the Glass is to be run upon a table of cast iron, which is horizontal and level with the hearth of that carquaisse. This table is ten feet long, and five feet wide, and stands solid upon a timber-support.

They put, in a parallel direction upon this table, a couple of flat iron bars or rulers, of the thickness intended in the glass, and which serve also to fix the width of it by their distance from each other. They put on the right side of the table an engine in form of a crane, which is fastened to the wall at top, and ends at bottom in a pivot, to make it turn, as occasion requires. This machine is full three fathoms high, its cross-piece a fathom in length, and its upright beam eight or ten inches thick. This engine is moveable, and they carry it to all the carquaisses. It serves to lift the tub above the table, by means of a couple of iron bars nine feet long, and forged so as to clip the whole tub, that it may be easily inclined, and the matter run out of it upon the table. There are four iron chains to support the pincers, which unite at a big rope that runs through a couple of pulleys in the cross-beam of the crane. The whole is lifted up or lowered with a cric, which is a kind of dented machine that wheel-wrights and coach-makers use to lift up the wheel from the ground, to make it turn freely on its axle-tree, when any thing is to be mended in it, and to support the coach on the side: it has several iron teeth which move up and down with a turning handle.

There is, at the foot of the table, a roller of cast iron five feet long, and a foot in diameter, resting up on a couple of timber tressels. This roller being laid upon the rulers or bars on the table, that raise above the said table the pan full of matter, led by two men, who holding the two sides of the bars, they grasp it like pincers, cause the pan to swing in the manner of a sweep, and pour down the matter before the roller, which is held by a couple of workmen. These people make it roll swiftly, and in a parallel situation over the matter towards the carquaisse, and roll it back the same way to bring it to its place again. They have the upper half of their body and their face wrapped up in a thick cloth, to preserve themselves from the dartings of the fire.

There are on the three other sides of the table small wooden troughs full of water, to receive the overplus of the matter just run. The men that run the Glasses are twenty in number at least; and act so perfectly in concert, that the work is done quickly, and without confusion, every one having his peculiar province.

The running of the Glasses is performed in presence of the head of the Glass-house, attended by the overseer and the secretary. When the Glass is run, these gentlemen examine it, whether there are any bubbles in it: these are small places shining like stars, when the Glass is hot. If any be perceived, the Glass is cut directly in that place: if it be at the third or fourth of the Glass, the parts cut off serve to make small Glasses: when they are but sheards, they are thrown among the waste.

When the Glass has cooled and been declared good, or free from bubbles, by the approbation of the inspectors; they push it off the table into the carquaisse level to it. This is done with an iron raker as wide as the table, that has a handle two fathoms long.

On the other side of the carquaisse, without, there are workmen who pull the Glass to them with iron hooks, and range it in the carquaisse, which holds six large Glasses. When it is full, they stop up its apertures with the doors which are of baked earth, and every chink of them with cement, that the Glasses may be smothered and better heated. They remain in that condition for a fortnight, and then are drawn out with all imaginable caution, to be put in boxes, and sent by water to Paris, where they are polished.

It may be observed that the oven full, or the quantity of matter commonly prepared, supplies the running of eighteen Glasses, which is performed in eighteen hours, being an hour for each Glass. The workmen work but six hours, and are relieved by others, who perform the same operations, transporting both the crane and the table near another carquaisse.

The manufacture would make vast profits, if the eighteen Glasses did all succeed, and were all of their intended measure. But there are sometimes runnings in which not one of the Glasses will be able to preserve the finest size, which is an hundred inches in length and fifty in width. However, I have seen many of them succeed with these dimensions.

When the last Glass is run, they scour the pots before they put into the furnace the matter of another running, which is to begin six and thirty hours after the foregoing: so that they put the matter into the furnace and begin to run it every fifty-four hours. The men who run the Glass have nothing to do, whilst the matter is melting, except those who are appointed to watch the fire.

Let us now see the particulars of the blowing of Glasses. The hall of the blown Glasses is smaller than that of the running: it is made in the same manner, with this difference, that there are no carquaisses round it. But there is over-against the furnace a large covered gallery twelve feet wide, in the middle of a building which is above twelve fathoms long: there are all along, and both to the right and left of this gallery, carquaisses, the hearth of which is raised four inches above the ground-floor: they are fifteen feet deep, and their arches three feet high, like those of the run Glasses. The furnace here, as well as in the running, is not heated above six months together; so that there is a second hall to perform the blowing, whilst they are making all proper repairs in that at rest. The pots are of the same earth as those of the run glasses. They are scoured, and the matter put in the furnace in the same manner. The matter is melting the same space of time, to be fit for the blowing of the Glasses, which are all of them less than forty or fifty inches.

The workman who blows the Glasses, when the matter is melted, takes an iron rod six feet long and two inches in diameter, bored hollow quite through, sharpened at the end, which is put in the mouth, and widened at the other, that the matter may adhere to it. He dips this rod into one of the pots through the mouth of the furnace, and by that means

takes

takes up a ſmall ball of matter four inches in diameter; which ſticks to that end of the rod by conſtantly turning it. Then he takes it out and blows a little into the cane, that the air may ſwell this ball of matter. Next to this he carries his rod over a large round bucket full of water, and reſting upon a three-footed ſupport, at the height of four feet; then with his hand he takes water and ſprinkles the end of the rod to which the ball of matter ſticks, ſtill turning the rod, that, by this cooling, the matter may coaleſce, and make but one body with the rod, ſo as that it may ſuſtain a greater weight.

This operation being over, he again dips the rod into the ſame pot, to take a greater quantity of matter, ſtill turning the cane as before: he takes it out, and cools it in the above-mentioned manner.

He, for the third and laſt time, take in the ſame pot a quantity of matter ſufficient to make his glaſs. He takes the rod out of the pot, loaded with matter, and being of the ſhape of a large pear, which may be ten inches in diameter, and a foot long; he goes to the bucket and cools it at the tail: this cooling is performed more quickly than the other two, not to loſe the opportunity of the heat of this maſs of matter. He at the ſame time blows into his rod, and, with the aſſiſtance of one of the labourers, gives his rod a balancing motion, that cauſes the matter to lengthen; which, by being thus blown and lengthened ſeveral times over, aſſumes the form of a cylinder ending like a ball at bottom, and in a point at top, which ſticks to the rod only by means of the ſeveral coolings already mentioned.

When the workman has blown ſufficiently, and lengthened his matter ſo as to make it become of an even thickneſs, he deſires his aſſiſtant to mount upon a ſtool three feet and a half high, on which there are two ſmall upright pieces of timber with a croſs beam of the ſame, to ſupport the weight of the Glaſs and rod, which are kept ſomewhat obliquely by the aſſiſtant, that the maſter may, with a puncheon ſet in a wooden handle, and with a mallet, make a hole into the maſs. This hole is drilled at the center of the ball that terminates the cylinder: it is an inch in diameter at moſt.

When the Glaſs is pierced, if there be any defects in it, they are perceived after this operation: if it have too many, they break it directly, and throw the matter among the waſte: if there be none or very few about the extremities, the workman goes and lays his rod horizontally on a little iron treſſel placed on the ſupport of the aperture of the furnace. He expoſes the Glaſs to the heat of it for about half a quarter of an hour, and then takes it away. In the mean time the aſſiſtant mounts the foot-ſtool again in the former ſituation, whilſt the maſter, with a pair of long and broad ſheers extremely ſharp at the end, widens the Glaſs by inſinuating the ſheers into the hole already made with the puncheon, and by thruſting them more and more into it, as it grows wider. Whilſt the aſſiſtant turns the maſs of Glaſs, the maſter goes on with opening of it, till the opening is ſo large at laſt as to make a perfect cylinder at bottom.

Next to this the workman lays his Glaſs upon the treſſel at the mouth of the furnace to heat it: then he takes it and gives it to his aſſiſtant on the foot-ſtool, and with large ſheers cuts the maſs of matter up to half its height. If there be any defects in the Glaſs, it muſt be cut in that place, as this ſection makes the extremities of it.

There is at the mouth of the furnace an iron tool called pointil, which is now heating, that it may unite and coaleſce with the Glaſs juſt cut, and do the office which the rod did before it was ſeparated from the Glaſs. This pointil is a piece of iron ſix feet long, and much of the form of a rod: there is at the end of it a ſmall iron bar a foot long, laid equally upon the long one, and making with it a T. This little bar is full of the matter of the Glaſs about four inches thick.

This red-hot pointil is preſented to the diameter of the Glaſs, which coaleſces directly with the matter round the pointil, ſo as to be able to ſupport the Glaſs for the following operations. This done, they ſeparate the rod from the Glaſs, by ſtriking a few blows with a chiſſel upon the end of the ſaid rod which has been cooled; ſo that the Glaſs breaks directly, and makes this ſeparation, the rod being unloaded of the Glaſs now carried by the pointil.

This done, they preſent to the furnace the pointil with the Glaſs, laying it on the treſſel to heat; and redden the end of that Glaſs, that the workman may open it with his ſheers, as he has already opened one end of it to complete the cylinder, the aſſiſtant holding it on his foot-ſtool as before.

They then again, and for the laſt time, put the pointil on the treſſel, that the Glaſs may grow red-hot, and the workman cuts it quite open with his ſheers right over-againſt the foregoing cut. This he does as before, taking care that the two cuts make but one and the ſame line.

In the mean time, the man who looks after the carquaiſſes, comes to receive the Glaſs upon an iron ſhovel two feet and a half long without the handle, and two feet wide, with a ſmall border of an inch and a half to the right and left, and towards the handle of the ſhovel. They lay the Glaſs upon it, flattening it a little with a ſmall ſtick a foot and a half long; ſo that the cut of the Glaſs is turned upwards. They ſeparate the Glaſs from the pointil, by ſtriking a few gentle blows between the two with a chiſſel. This done, they carry the Glaſs on the ſhovel to the mouth of the hot carquaiſſe, where the Glaſſes are to be nealed. They take away the ſhovel: the Glaſs grows red-hot gradually, by the vaſt heat which is at the mouth of the carquaiſſe: the workman belonging to it takes an iron tool ſix feet long, and widened at the end in form of a club at cards, four inches long and two inches wide on each ſide, very flat, and not half an inch thick. With this tool he gradually lifts up the cut part of the Glaſs to unfold it out of its form of a flattened cylinder, and render it ſmooth by turning it down upon the hearth of the carquaiſſe. The ſaid club, being inſinuated within the cylinder, performs this operation, by being puſhed hard againſt all the parts of the Glaſs.

This done, and the Glaſs being quite ſmooth, the workman puſhes it to the bottom of the carquaiſſe with a ſmall iron-raker. He ranges it with a little iron hook. When the carquaiſſe is full, they ſtop and cement it as they do the carquaiſſes of the run Glaſſes; and the Glaſſes remain there alſo for a fortnight to be nealed. When this time is over, they take them out to poliſh them.

A workman can make but one Glaſs in an hour, and he works but ſix together, after which he reſts ſix hours, to begin the ſame operation a-new: being never at reſt, but when the matter is melting in the pots.

Glass *for teleſcopes*. The following curious method of grinding and poliſhing Glaſs for teleſcopes, is that practiſed by the ingenious Mr. Molyneaux and Mr. Huygens.

Of making and poliſhing the tools. — It is eaſier to make an object Glaſs of equal convexities than of any other figure, becauſe the ſame tools will ſerve for forming both its ſurfaces. And a Glaſs of this figure will make as perfect an image in its focus as any other, becauſe the aberrations of the rays cauſed by the ſphericalneſs of the figures of the ſurfaces, whatever be the proportion of their ſemidiameters, are inconſiderable in long teleſcopes, in compariſon to the aberrations cauſed by the different refrangibility of the rays; and theſe latter aberrations are the ſame, whether the ſemidiameters of the ſurfaces be equal or unequal, ſuppoſing the aperture and focal diſtance to be the ſame. If it be propoſed then to make a Glaſs of equal convexities, that ſhall have a given focal diſtance, the radius of the ſpherical ſurface will be found by taking it in proportion to the given focal diſtance as twelve to eleven, putting the ſine of incidence to the ſine of refraction out of air into Glaſs, as ſeventeen to eleven, as Sir Iſaac Newton has accurately determined it.

The focal diſtance of the Glaſs being found, and becauſe its figure cannot be formed exactly true to the very edges, the breadth of the Glaſs may be taken about half an inch more than the diameter of its aperture, or even three quarters or a whole inch more, if its focal diſtance be between fifty and 200 feet.

Mr. Huygens directs in general to make the breadth of the concave tool, or plate, or diſh, or form, in which an object Glaſs muſt be ground, almoſt three times the breadth of the Glaſs. Though, in another place, he ſpeaks of grinding a glaſs whoſe focal diſtance was 200 feet, and breadth eight inches three quarters, in a plate only fifteen inches broad. But, for eye Glaſſes and others of leſſer ſpheres, the tool muſt be broader in proportion to the breadth of theſe Glaſſes, to afford room enough for the motion of the hand in poliſhing. Mr. Huygens made his tools of copper or caſt braſs; which, for fear they ſhould change their figure by bending, can hardly be caſt too thick; nevertheleſs, he found by experience that a tool fourteen inches broad, and half an inch thick, was ſtrong enough for forming Glaſſes to a ſphere of thirty-ſix feet diameter, when the tool was ſtrongly cemented upon a cylindrical ſtone an inch thick, with hard cement made of pitch and aſhes.

In order to make moulds for caſting ſuch tools as are pretty much concave, he directs that wooden patterns ſhould be turned in a lathe, a little thicker and broader than the tools themſelves. But, for tools that belong to ſpheres above twenty or thirty feet diameter, he ſays it is ſufficient to make uſe of flat boards turned circular to the breadth and thickneſs required. When the plates are caſt, they muſt be turned in a lathe, exactly to the concavity required. And for this purpoſe it is requiſite to make a couple of braſs gages in the manner following:

Take a wooden pole a little longer than the radius of the ſpherical ſurface of the Glaſs to be formed, and through the ends of it ſtrike two ſmall ſteel points, at a diſtance from each other, equal to the radius of the ſphere intended; and by one of the points hang up the pole againſt a wall, ſo that this upper point may have a circular motion in a hole or ſocket made of braſs or iron fixed firmly to the wall. Then take two equal plates of braſs or copper, well hammered and ſmoothed, whoſe length is ſomewhat more than the breadth of the tool of caſt braſs, and whoſe thickneſs may be about a tenth or twelfth of an inch, and whoſe breadth may be two or three inches. Then, having faſtened theſe plates flat againſt the wall in an horizontal poſition, with the moveable point in the pole, ſtrike a true arch upon each of them. Then file away the braſs on one ſide exactly

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exactly to the arch struck, so as to make one of the brass edges convex and the other concave; and, to make the arches correspond more exactly, fix one of the plates flat upon a table, and grind the other against it with emery. These are the gages to be made use of in turning the brass tools exactly to the sphere required.

But, if the radius of the sphere be very great, the gages must be made in this manner: I imagine the line A E (*plate* XXI. *fig.* 3.) drawn upon the brass plate to be the tangent of the required arch A F B, whose radius, for example, is thirty-six feet, and diameter seventy-two. From A set off the parts A E, E E, &c. severally equal to an inch, and let them be continued a little beyond half the breadth of the tool required. Then, as seventy-two feet, or 864 inches, are to one inch, so let one inch be to a fourth number; this will be the number of decimal parts of an inch in the first line E F, reckoning from A. Multiply this fourth number successively by the numbers 4, 9, 16, 25, &c. the squares of 2, 3, 4, 5, &c. and the several products will be the number of parts contained in the 2d, 3d, 4th, 5th, E F respectively. But, because these numbers of parts are too small to be taken from a scale by a pair of compasses, subtract them severally from one inch, represented by the lines E G, and the remainders, being taken from a scale of an inch divided into decimal parts, and transferred by the compasses from G to F, will determine the points F, F, of the arch required. And, the same being done on the other side of the line A D, the brass plate must be filed away exactly to the points of this arch, and polished as before.

To apply the brass tool to a turning lathe, in order to turn the concave surface of it exactly spherical, let figure 4 represent a view of some part of the lathe taken from a point directly over it; and here let (*fig.* 4, 5, 6,) represent a strong flat disk of brass, half an inch thick at least, having a strong iron screw-pin fixed firmly in the center of it, and standing out exactly perpendicular to one side of it; by which it may be screwed into the end *c*, of the mandrel or axis of the lathe represented by *c d*. This disk is represented separately in figure 5, and must be well soldered to the back side of the tool *e f*, which therefore in the middle of it must be made plane, and exactly parallel to the circumference of its opposite surface, to the intent that the circumference may be carried round the axis of the lathe in a plane perpendicular to it. The mandrel or axis *c d* turns upon a point *d* in the puppet-head of the lathe, and in an iron collar represented by *s t*, as usual.

Let *g h i k* represent a board nailed fast upon the other puppet-head; and let the concave gage *g h* be laid upon this board, with its concave arch parallel to the concavity of the tool *e f*, and be screwed down to the board with flat-headed screws sunk into the brass. Let *l m n o* represent such another board lying upon the former, with the convex gage *l m* screwed to the underside of it, so that by moving this upper board the arch of the convex gage may be brought to touch the concave one and slide against it. The turning tool *p q* is laid upon this moveable board, and is held fast to it by a broad-headed screw at *r*, to be turned or unturned by the hand upon occasion. To know whether the concave gage be exactly parallel to the concavity of the tool *e k* screwed fast to the mandrel, direct the point *p* of the turning tool *p q* to touch any point of the tool *e f* near its circumference; then, having fixed the turning tool *p q* by the screw *r*, turn the brass tool *e f* half round, and move the upper board till the point *p* of the turning tool be brought over-against the same mark upon the tool *e f*; and, if it just touches it as before when the gages coincide, all is right. If not, the position of the head of the lathe may be altered a little by striking it with a mallet. But the best way is to make this examination of the situation of the concave gage, when only one end of it is fixed to the head of the lathe by a single tack or screw, about which it may easily be moved into its true position. And, while the tool or plate *e f* is turning, the same examination of its parallelism to the gage must be frequently repeated; otherwise its surface will take a false figure. It is convenient that the upper board *l m n o* should project over both the gages; and, to keep its surfaces parallel to that of the under board, two round-headed nails, or a plate of brass, as the gages, must be fixed to its under surface, towards the opposite side *n o*. Care must be taken to drill the holes in the gages, through which they are screwed to the boards, not too near the polished arches, for fear of altering their figure, by the yielding of the brass. The tool and all the parts of the lathe must be fixed very firm; because any trembling motion will cause the graving tool *p q* to indent the brass. After the tool is well turned, it must be separated from the back *a b*, by melting the solder with live coals laid upon it.

It is easy to understand, that, by transposing the gages, a convex tool may be turned in the same manner.

Mr. Huygens would have his plates or tools first formed in a turning lathe, and then ground together with emery; that is to say, the concave and convex tool of the same sphere together. But the tools of very large spheres he would have ground at first quite plane by a stone-cutter; and then ground hollow, with a round, flat stone and emery, to the desired gage. And he prescribes to use for this grinding first a stone half as broad as the tool, and after that another stone very nearly as broad as the tool; and, in this way of forming the tools, it is convenient to tie a little frame of thick paper, or rather of thin paste-board, about an inch high round about the tool to keep in the emery; and, in grinding, the whole must be made extreamly firm and stable. And, when the tool is to be polished, it must still remain upon the stone pedestal; otherwise it will be in danger of bending a little in the operation.

For polishing these tools thus ground, Mr. Huygens takes some soap, and daubs the concave tool therewith; then he takes the last mentioned round stone, somewhat less than the tool (or the convex tool itself) and heats it, and then he pours upon it some hot melted cement (made of pitch and fine powdered and sifted ashes as much as he can mix with it) and then he turns over the stone and cement upon the concave tool, into which also he had poured a good quantity of the same cement, having first laid three little pieces of brass of equal thickness on the circumference thereof, in order to press and keep this crust of cement of an exact equal thickness in all its parts; and thus he lets them cool together: then, taking the stone from the tool and turning it up, he sifts, upon the cement that sticks to it, a crust of very fine emery, and with a flat iron spatula about one third of an inch thick, gently warmed, he presses lightly the emery, to stick to and incrustate upon the cement; then he again gently warms the whole stone (or convex tool) cement and emery, and he again replaces it upon the concave tool, and leaves it again to cool; so that he has by this means a crust of emery exactly of the figure of his tool; with this he polishes the tool dry, without the addition of any wet, pressing it down hard on the surface of the tool. And, to press it the harder, he places upon it a long pole, a little bent to make it spring; whose upper end is fixed to the cieling of the room, or else is pressed downward by a strong iron spring; and he says it will be necessary to have two persons to rub the stone upon the tool. And here it is to be noted, that great care must be taken, in this and all cases where this way of grinding by a pole is made use of, to fix the point of pressure exactly and truly in the middle, as shall be more particularly explained hereafter, when the Glass comes to be ground in this tool.

For the method of making the cement, see CEMENT.

To bring the concave tool still to greater perfection, and still to preserve its true form, take equal pieces, about an inch square, of blue hone, such as engravers polish their copper withal, and place as many of them, laying the grain some one way, and some another, as you can, upon the surface of the tool to be polished; sticking and steadying the same, as close as you can to one another, with soap or common white starch; then fill up all the interstices between the said pieces of hone with clean dry sand, to about two thirds of the thickness of the said hones; then, having a border of paper or paste-board put round the tool as before, shake the tool gently, that the sand may every-where equally subside, and blow it to an equal depth with a pair of bellows. Then take some hard cement extreamly hot, and pour it all over the hones, and having cleaned the stone (or the convex tool) which before was incrustated with pitch and emery, place this stone (or convex tool) warmed on the top of this cement, and let all cool together. Then, rubbing the tool with this polisher made with hones, by applying your pole to the top of the stone as before, you shall know when the tool is brought to perfection, if, wiping off the dirt and filths you fine, by looking obliquely upon it against the light, that it shines equally bright and strong in all parts. If you would use this polisher again, it must be kept in a cool cellar, leaving the hones uppermost; otherwise in warm weather they will change their situation in the cement, even with their own weight.

And here is to be observed that this method of grinding these tools by an incrustation of emery on hard cement, formed to a convexity by the very tool itself, and also the method of polishing the same by the blue hones fixed in hard cement, may probably as well be used and applied to the grinding and polishing of a reflecting metal for a telescope. But in that case I believe it is best not to use a springing pole, but one that shall turn upon a point above, being nearly equal in length to the radius of the sphere intended.

Of chusing GLASS.—The best sort of Glass has generally a yellowish, reddish, or a greenish colour, when we look through it against the sky-light, or lay it upon a sheet of white paper. That which is perfectly white, though it transmits the most light, is generally fuller of veins, and is often subject to grow moist in the air, which in time destroys its polish. In these parts there is no better Glass to be had, than pieces of broken looking Glasses. But after some time I found pretty good Glass at a Glass-house; and made use of the same matter with which they make drinking-Glasses, which I found was always the best after the matter had rested for two or three days, when the workmen kept holydays. I ordered pieces of Glass to be made for my own use in the same manner as they make looking Glasses, that is, by cutting off the top and bottom of the round globe they blow up, and by slitting the side of it, and then by flatting it upon the hearth of the furnace. These pieces, which were about half an inch or three quarters thick, I ordered to be ground to an equal thickness by a stone-cutter, in the machine they polish marble with.

To discover the veins in Glass one should look very obliquely against a small light in a room, otherwise dark. Thus one may examine the pieces of a polished looking-Glass. But, because they are seldom thick enough for object Glasses, it is necessary to take some pieces of the same sort of Glass before it is polished, and to get it round to an equal thickness, and polished a little by the common Glass-grinders, in order to judge what pieces are fit for use. Sometimes little veins will appear like fine hairs or threads, which scarce do any harm. I have several very good Glasses of this sort. Sometimes their imperfections cannot be discovered by the former way of trial, and yet, after the Glass is well formed and polished, they will appear by reflection in this manner: in a dark room, place the Glass upright upon a table, turning that surface from you which is suspected to be faulty; then holding a lighted candle in your hand, so that the middle of the broad light reflected from the first surface may fall upon your eye, recede from the Glass till the rays reflected from the back surface shall just begin to invert the candle; then the whole Glass will appear all over bright, and then you will discover its defects, and the imperfections of the polish. When the glass is a portion of a large sphere, we use a small perspective, three or four inches long, to magnify the defects.

Of preparing the GLASSES *before they can be ground and polished.*—The pieces of Glass above-mentioned, which we directed to be planed to an equal thickness and polished a little by a Glass-grinder, should be much broader than the intended object Glass, and there may be room enough for chusing the best part of them. For planing and smoothing those large pieces of Glass, I ordered the workmen to make use of plates of cast iron, such as are sold at the ironmongers shops, after they had been ground and planed in a stone-cutter's engine. Upon the plate of Glass, with a diamond-pointed compass, strike a circle representing the circumference of the object Glass; and also another concentric circle, with a radius about a tenth or twelfth part of an inch bigger. And also two other such circles, on the other side of the Glass directly opposite to the former: which may be done by means of a circular Glass to be described by and by. The larger parts of the Glass may be separated from the outward circle by a red-hot iron, or by a strong broad vice, opened exactly to the thickness of the Glass. The remaining inequalities may be taken off by a grind-stone, beginning with the largest first, and taking care they do not splinter. Then, having warmed the Glass, cement a wooden handle to it, and in a common deep tool for eye Glasses, making use of white clear sand and water, grind the circumference of the Glass exactly true to the innermost circle on each side of it. Then having made a great many small cavities with a punch upon one side of a round copper-plate, and having fixed the other side of it upon the middle of the round Glass, by cement made with two parts of rosin or hard pitch, and one part of wax, place the steel-point of the springing pole, being fourteen or fifteen feet long, into that cavity of the copper-plate, which lies nearest to the thickest part of the Glass. Then work the Glass by the pole with sand and water, upon a flat plate of cast iron, of a round figure, the plate having been planed with sand and water by a stone-cutter. Then having examined the thickness of the Glass in several places, by a hand-vice, which is better than a pair of callippers, by repeating the same operation it will be reduced to an equal thickness in all its parts.

Towards the end of this operation it is convenient to make use of sifted emery, because the sand will scratch too deep; and then it will also be necessary to place the steel point of the pole exactly over the center of the under surface of the Glass; otherwise that surface will take a cylindrical or sort of a convex figure instead of a plane one, even though it was exactly plane before you began to grind it. The reason of which is well worth observing. And, when convex Glasses are to be polished, it is also absolutely necessary to place the point of pressure exactly over the center of the under surface of the Glass. Therefore, to bring one of the little cavities in the copper-plate exactly over that center, we make use of a circular Glass formed from a broken looking-Glass, the quicksilver being rubbed off; having described upon it, with a diamond-pointed compass, eight or ten concentric circles at the distance of about a quarter of an inch from each other, so that the large circles may be somewhat bigger than the circumference of the Glass to be polished. Lay this circular Glass upon the surface of the Glass to be polished, and move it to and fro, till you perceive the circumference of the Glass to be polished is exactly parallel to the nearest circle upon the circular Glass; then, having inverted both the Glasses, lay the circular Glass upon a table, and, having laid a small live coal upon the copper-plate to make it moveable upon the cement, place one point of a pair of compasses in one of the little cavities, and move the copper till a circumference described with the other point coincides exactly with any one circle upon a circular Glass, and the business is done. With starch it is convenient to paste three slender shreds of fine linen, directly towards the center of the circular Glass, that the other Glasses may not slide too easily upon it, and that they may not scratch one another.

The cavities punched in the copper-plate, and also the point of the pole, should be triangular, to hinder the rotation of the Glass; which is still more necessary in perfecting the polish of the Glass. And here it must be observed again whether the circumference of the Glass remains exactly circular on both sides of it, which must be tried with a pair of compasses; and, if it be not, it must be corrected again by grinding it exactly circular in a common tool for making eye Glasses; which will contribute very much to its taking an exact spherical surface, when it comes to be ground in its proper tool. For, if any part of the circumference be protuberant, it will hinder the adjoining parts of the surface from wearing so much as they should do; and, by consequence, will spoil the spherical figure of the surface.

Of grinding the GLASSES.—The Glass being planed and rounded as above, take away the plate with several cavities, and with some of the same cement fixed on a smaller round piece of brass or rather steel, truly flat and turned about the bigness of a farthing, but thicker, having first made in the center thereof, with a triangular steel punch, a hole about the bigness of a goose quill, and about the depth of one twelfth of an inch; and, at the very bottom of this triangular hole, a little small round hole must be punched somewhat deeper with a very fine small steel punch. A small steel point, of about an inch long, must be truly shaped and fitted to this triangular hole, and, at the very apex, to the small, round, deeper impression. Nevertheless, it must not be fitted so exactly to the same, but that it may have some liberty to move a little to and fro; the apex always continuing to touch and press upon the surface of the round hole below. This steel triangular point must be fixed to the end of a pole (*plate* XXI. *fig.* 7.) to the other end of which another round iron point must be fixed, of about five or six inches long, to play freely up and down in a round hole in a piece of brass let into a board, fixed against the ceiling for that purpose, perpendicularly over the bench, and over the center of the tool, which must be strongly and truly fixed horizontally thereon.

Now, here is to be noted that Mr. Huygens prescribes to fix his brass-plate to the Glass by the means of a cement, and takes no notice of any other method whatever; though a very small experience in these affairs will convince any body that it is hardly possible, in this or any other case, to bring the cement to a fluidity sufficient to fix two plane surfaces exactly parallel one to the other, without heating the Glass and the brass also to a great degree, and so as to endanger the figure of the Glass considerably.

To avoid this in fixing Glasses to brass or wood, or the like, some have done it with plaister of Paris: Mr. Scarlet does it by cementing another intermediate Glass to the brass (or wood) and then fixing the Glass, to be ground, to the outward surface of the cemented Glass with common glew. Without all this trouble I have done it only with common icthyocolla or fish glew, which will run very fluid, and will fix the Glass and the brass itself strongly together; and, round the edges of the brass, I stick on some common soft red-wax, such as is used for the privy seal, to keep the wet from getting to the glew.

For grinding Glasses truly plane, upon a plane tool, by this method, Mr. Huygens prescribes this pole to be about fifteen feet long; but, in grinding upon a concave plate, the pole had best be made equal to the radius of the sphere of the tool; though I believe it would not be material, if made considerably shorter, according as the height of the room will allow.

It is necessary to have lying by one an ordinary piece of coarse Glass, ground in the same tool, called a bruiser; whereby, when any new emery is necessary to be laid on the tool in grinding your Glass, the said emery is to be constantly first run over and smoothed, for fear any little coarse grains should remain and scratch the Glass to be ground.

Having these things prepared together with some pots of emery of various fineness, take of your roughest sort a small half pugil, wetting the same, and daubing it pretty equally on the tool; then lay on your Glass and fix up your pole, and continue to grind for a quarter of an hour, not pressing upon the pole, but barely carrying the Glass round thereby; then take the like quantity of some finer emery, and work another quarter of an hour therewith; then take the like quantity of emery still finer, and work for the same time; last of all, take a less quantity of some of the very finest you have, which will be sufficient for a Glass of five inches diameter, and work therewith for an hour and half, taking away, by little and little, some of the emery with a wet sponge. Do not keep it too wet nor too dry, but about the consistence of pap; for much depends on this. If it is too dry, your emery will clog, and stick, and incorporate, so as for the most part to cut little or not at all, unless here and there where its body chances to be broke, and there it will scratch and cut your Glass irregularly; and, if it is too wet, and too much diluted, it will form the irregular separation of its parts cut in some places more than others, just as in the other case.

But Mr. Huygens tells us this method of using various sorts of fresh emery is not good, finding by experience that the surfaces of large Glasses are often scratched. And, therefore, he says it is best to take a large quantity of the first or second sort of emery, and so work with the same from the first to the last; taking away, by little and little, every half hour, or quarter of an hour, more and more of the emery with a wet sponge; by which means he could bring the Glass extremely smooth and fine, so as to see pretty distinctly a candle or the sash-windows well

well defined through it; which is a mark when it is ground enough to be ready to receive a polish. But, if the Glass has not acquired this degree of transparency, it is certain, says Mr. Huygens, that too much emery remains; and therefore it must still be diminished, and the operation continued. He found it best to make use of common well-water in this grinding; and he took care to move the Glass in circles, taking in an inch beyond the center of the tool, and somewhat beyond the outside of the tool; and he found in a Glass of two-hundred feet whose diameter was eight inches three-fourths, which he ground in a tool of fifteen inches diameter, that the figure of the tool in grinding would alter considerably, unless he carried the Glass round an inch beyond the center of the tool one way, and three inches one-fourth beyond the skirts of it another way; but, if he carried it no more than a straw's breadth beyond the skirts of the tool, and accordingly farther beyond the center, the Glass would always grind falsly, too much being taken off on the outsides, so that he could never after bring the outsides of the Glass to a true and fine polish.

When you first begin to grind, and the emery begins to be smooth, the Glass will stick a little to the tool and run stiff; then fresh emery is to be added. When it afterwards comes to be polished, it will, if large, require a considerable strength to move it, but this inconvenience will happen less in grinding by the pole than in grinding by hand. For the warmth of the hand makes the substance of the Glass swell, and not only increases the sticking of the Glass, but in some measure may also spoil the figure of it, and also of the tool. When it is ground with the pole, it never sticks very strongly, unless when you take the Glass off from the tool, and keep it from it for some time, and then apply it to the tool again; and this in large Glasses; for, by this means, says Mr. Huygens, the Glass gets from the air a greater warmth than it had on the tool; and, being again applied to the tool, its lower surface is suddenly contracted by the coldness of the tool, and so sticks to it. Wherefore, saith he, you must, in that case, wait till the Glass and the tool come to be of one temper. The like effect is observeable in grinding large Glasses when there is a fire in the room. Perhaps, the cause of those effects may be more truly deduced from the attractive qualities of warm Glass. But, whatever is the cause, we may from hence perceive the great nicety of grinding large Glasses, and the necessity there is of grinding them slowly, and with the greatest caution, in the most minute circumstances.

The method hitherto described of grinding with emery is what is recommended by Mr. Huygens. Le Pere Cherubin prescribes another material, and it is the grit of a hard grindstone well beaten into a fine powder and sifted pretty fine. And here in England the same thing was used to be performed by Mr. Cox with common clean fine white sand, taking away, by little and little, the said grit and sand, as it ground finer and finer. Nay, Mr. Cox was used to continue his grinding till the matter of the sand came to be so fine, and so little of it to remain in the tool, that he could, and frequently did use to polish off his Glasses therein, without the use of any other material whatsoever; and I myself have been present, while Mr. Scarlet ground and polished, or dried off, a Glass of sixteen feet in this manner. They call this way drying off on sand, because, as the matter grows finer and finer, they wet it less and less, till for the last quarter of an hour (the whole work lasting near two hours) they only wet it by breathing upon it, and, at the very last, not at all.

It seems this method is now quite disused; perhaps the violent labour requisite at the last may be the reason of it. A better reason may be the great improbability of grinding or polishing true by this method, by the uncertain and unequal force of the hand; and, if this be the true reason of its disuse, I cannot well see but that this method of grinding and polishing out and out in the same tool, and with the same material, viz. white sand, might be perhaps again restored, and greatly improved by adding, to the old way, Mr. Huygens's method of grinding and polishing with a pole and spring to press down the pole, or some analogous contrivance. And, in relation to grinding by all or any of the methods above described, this one general remark must be made, that the artist must allow time and patience to bring his Glass by grinding to the smoothest and finest surface, that he possibly can, before he attempts to polish. For this, and this only, makes his Glass polish truly smooth, well and easily; and, the smoother you bring it in grinding, the less labour you will have in polishing; in which consists not only the greatest difficulty but the greatest danger too of spoiling all you have done before.

Of giving GLASSES *the last and finest polish.*—Having removed the little brass plate from the Glass (See *fig.* 8.) take, says Mr. Huygens, a very thick slate, or rather a block of blue or grey stone; let it be half an inch thick, and let it be ground true and round at the stone-cutter's; its diameter being somewhat smaller than the diameter of your Glass, leaving a hole, quite through, in the center, of about an inch diameter. Then make some cement two parts rosin, or hard pitch, and one part wax; and, taking a piece of thick kersey cloth, truly and equally wrought, cut this cloth round, and leave a like hole, one inch diameter, in the middle. Then warming the stone, and also warming the Glass, and spreading thinly and equally upon them some of this cement, lay on the cloth, and thereupon lay on also the Glass, having left in the middle a space the breadth of a shilling uncemented and blacked with a candle. Then provide an hollow conical plate of iron or steel (shaped like an high-crowned hat) having the basis of the cone one inch diameter, and having round the basis a flat border about two inches one half diameter, and having the depth or altitude of the cone exactly of the thickness of the slate, cloth, and cement, to which the Glass is fixed. The vertex of this cone must go down through the slate and cloth, so that, being cemented on the slate, the said vertex may approach to the Glass within a hair's breadth, and lie perpendicularly over the center of the lower surface of the Glass: and this must be adjusted by the circular Glass described above. Within the vertex of this hollow cone, the lower point of the pole is to be applied in polishing; but it may be first proper to be observed, that, perhaps, fish-glew and a brass plate, in lieu, and of the dimensions of the above-said slate, may perhaps be better. Mr. Huygens observes also, that the angle of the cone should be eighty or ninety degrees, and that the hollow vertex of it should be solid enough to receive a small impression from a round steel punch, to put the point of the pole into, which might otherwise have too much liberty and slip from the vertex. The design of the black spot, in the middle of the Glass, is to discover, by the light of a candle, obliquely reflected from your Glass, after it has been polished some time, whether it be perfectly clear, and free from the appearance of any bluish colour like that of ashes.

Before the work of polishing is begun, it is proper to stretch an even well wrought piece of linen over the tool, dusting thereupon some very fine tripoly. Then, taking the Glass in your hand, run it round forty or fifty times thereupon; and this will chiefly take off the roughness of the Glass about the border of it, which otherwise might too much wear away the lower parts of the tool, in which the Glass is chiefly to obtain its last polish. If I understand Mr. Huygens right, this cloth is then to be removed, and the Glass to be begun to be polished upon the very naked tool itself. But, first, there is to be prepared some very fine tripoly, and also some blue vitriol, otherwise called cyprion, English and Hungarian vitriol finely powdered; mix four parts of tripoly with one of vitriol: six or eight grains of this mixture (which is about the quantity of two large pease) is sufficient for a Glass five inches broad. This compound powder must be wetted with about eight or ten drops of clear vinegar in the middle of the tool; and it must be mixed and softened thoroughly with a very fine small mullet. Then with a coarse painting brush take great care to spread it thinly and equally upon the tool, or at least upon a much larger space in the middle of it, than the Glass shall run ever in the polishing. This coat must be laid on very thin (but not too thin neither) otherwise it will waste away too much in the polishing, and the tool will be apt to be furrowed thereby, and to have its figure impaired; insomuch that sometimes a new daubing thereof must be laid on, which it is not easy to do so equably as at first. This daubing must be perfectly dried by holding over it a hot clean frying-pan, or a thin pan of iron, with lighted charcoal therein for that purpose; then leave all till the tool is perfectly cold. Then having some other very fine tripoly very well washed and ground with a mullet, and afterwards dried and finely powdered; take some of the same, and strow it thinly and equably on the tool so prepared: then take your coarse Glass which lay by you, and smooth all the said tripoly, very equably and finely: then, take your Glass to be polished, and wipe it thoroughly clean from all cement, grease, or other filth which may stick to it, with a clean cloth dipped in water, a little tinged with tripoly and vitriol; then taking your Glass in your hand, apply it on the tool, and move it gently twice or thrice, in a straight line backwards and forwards; then take it off, and observe whether the marks of the tripoly, sticking to the Glass, seem to be equably spread over the whole surface thereof; if not, it is a sign that either the tool or the Glass is too warm; then you must wait a little, and try again, till you find the Glass take the tripoly every-where alike. Then you may begin boldly to polish, and there will be no great danger of spoiling of the figure of the Glass; which in the other case would infallibly happen. If the tool be warmer than the Glass, it will touch the Glass harder in the middle than towards its circumference; because the upper surface of the tool, being swelled by heat, will become too flat. On the contrary, if the Glass be warmer than the tool, it will bear harder towards its circumference than at the center; because the inferior surface of the Glass is contracted by the coldness of the plate more than the superior.

Mr. Huygens says, that, if the work of polishing were to be performed by strength of hand only, it would be a work of very great labour, and even could not be performed in Glass of five or six feet focal distance: and he seems to think it absolutely necessary that an extraordinary great force or pressure should be applied upon the Glass. For this purpose, he has therefore contrived and described two methods for sufficiently increasing the pressure; for the explanation of which, recourse must be had to the book itself and his figures; it may suffice here to

say

say that they chiefly consist in applying the force of a strong spring to press down the center of the Glass upon the polisher. This operation of polishing, as it is one of the most difficult and nice points of the whole, hath been very variously attempted and described by various authors. Sir Isaac Newton, Pere Cherubin, Mr. Huygens, and the common Glass-grinders have taken different methods in this matter. Sir Isaac is the only person who seems not to insist on the necessity of a very violent and strong pressure. In the English octavo edition of his Optics, page 95, he hath these words: 'An object Glass of fourteen feet, made by an artificer at London, I once mended considerably, by grinding it on pitch with putty, and leaning very easily on it in the grinding, lest the putty should scratch it. Whether this may not do well enough for polishing these reflecting Glasses, I have not yet tried. But he that shall try either this or any other way of polishing which he may think better, may do well to make his Glasses ready for polishing, by grinding them without that violence, wherewith our London workmen press their Glasses in grinding. For by such violent pressure Glasses are apt to bend a little in the grinding, and such bending will certainly spoil their figure.'

As to his own method of polishing Glass, I do not know that he any where expressly describes it; but his method of polishing reflecting metals he doth, and it was thus in his own words, page 92. 'The polish I used was in this manner: I had two round copper-plates, each six inches in diameter, the one convex, the other concave, ground very true to one another. On the convex, I ground the object-metal or concave, which was to be polished, till it had taken the figure of the convex and was ready for a polish. Then I pitched over the convex, very thinly, by dropping melted pitch upon it, and warming it to keep the pitch soft, whilst I ground it with the concave copper wetted to make it spread evenly all over the convex. Thus, by working it well, I made it as thin as a groat, and, after the convex was cold, I ground it again, to give it as true a figure as I could. Then I took putty which I had made very fine by washing it from all its grosser particles, and, laying a little of this upon the pitch, I ground it upon the pitch with the concave copper, till it had done making a noise, and then upon the pitch I ground the object-metal with a brisk motion for about two or three minutes of time, leaning hard upon it. Then I put fresh putty upon the pitch and ground it again, till it had done making a noise, and afterwards ground the object-metal upon it as before. And this work I repeated till the metal was polished, grinding it the last time with all my strength for a good while together, and frequently breathing upon the pitch to keep it moist, without laying on any more fresh putty. The object-metal was two inches broad, and about one third part of an inch thick to keep it from bending. I had two of these metals, and, when I had polished them both, I tried which was best, and, ground the other again, to see if I could make it better than that which I kept. And thus, by many trials, I learned the way of polishing, till I made those two reflecting perspectives I spake of above. For this art of polishing will be better learned by repeated practice than by my description. Before I ground the object-metal on the pitch, I always ground the putty on it with the concave copper till it had done making a noise, because, if the particles of the putty were not by this means made to stick fast in the pitch, they would, by rolling up and down, grate and fret the object-metal, and fill it full of little holes'. It seems not improbable but that the Glass may also be polished with proper care by the same method.

The method of polishing, described by Pere Cherubin, seems to be chiefly thus: he polishes with tripoly or putty, or first with tripoly, and afterwards with putty. But what he seems most to approve of is putty alone. He polishes in the same tool he grinds in, and he very verbosely describes various ways of doing it. He prescribes to stretch, very tight, a very fine thin leather, or fine English fustian, or fine holland, or any fine linen, or fine silk taffety, or sattin, all of an equable thickness as near as may be, upon the tool; then he daubs thinly on this surface, thus stretched, a streak of putty, sufficiently wetted to the consistence of thick syrup, about as broad as the Glass or a little more, passing through the center of the tool directly from him; then smoothing the putty by running his bruiser, and pressing it backwards and forwards to him and from him, he at length lays on the Glass cemented to its handle; and giving it always the same motion, strongly pressing to him, and from him along the streak of putty, and by such pressure forcing the surface of the silk, already somewhat stretched, close to the surface of the tool, to which the figure of the Glass was exactly adapted, he says that he could by that means obtain an excellent fine polish on any of the above-mentioned substances. Before the stroke he turned the Glass a little on its axis, and its handle was on this occasion considerably heavier than usual in grinding, which he commends as very useful in this business; and, if new putty was wanting, he made no difficulty of laying it on, as often as necessary; always carefully smoothing it thereon with the bruiser, before the Glass was applied.

This method I am of opinion might be improved by moving the Glass not by hand but by the pole, and spring, somewhat after the method of Mr. Huygens, especially if the pole were contrived not to move loose in a round brass hole above, but on a strong point pressed down by some spring; the length of the pole being equal to the radius of the tool, and the point where the spring presses the upper end of the pole, being truly perpendicular over the center of the tool, and exactly in the center of its sphere.

Another method which the same author prescribes for polishing in the tool is thus: he takes a sheet of very fine paper, and, examining it very carefully by looking upon it and through it, he takes off with a fine penknife all the little lumps, hard parts, roughnesses and inequalities that he can find; then he soaks it in clean water, then he takes it and dries it between two clean linen cloths, though not so much as to make it quite dry, but to leave it dampish; then with some very thin starch or paste he daubs equally all over the surface of his tool as thin as possible, but some every-where; then he lays on his paper very gently and slowly, letting it touch and stick first at one side, and by degrees more and more towards the middle, and by degrees to cover the whole; and he does this slowly to let all the air get out; then with the palm of his hand he presses the center and every-where round about it towards the circumference to make the paper stick every-where; and this he does three or four times, while it is drying, to get out all the air; he lets it dry of itself, then he revises it again with his knife as before; then he hath a very coarse bruiser of glass whose circumference is sharply ground round and at right angles to its surface, which he had coarsely ground before in the same tool; with this and a very heavy handle he smooths and polishes and rubs off all the remaining inequalities of the paper, and, when this is done, he lays on a streak of tripoly and polishes as in his other method.

At C C (*Plate* XXI. *fig.* 9.) is represented a square beam of wood a little longer than the diameter of the tool, and about 1 , inch thick; the two extremities of it at C and C are bent downwards, and then are again directed parallel to the whole length, and serve for handles for the workman to lay hold upon. In the middle of this beam there is fixed an iron spike, so long that, when the lower surfaces of the handles C, C, are placed upon a plane, the point of the spike shall just touch the plane. This point presses upon the apex of the hollow cone, which descends through the hole in the slate, which by the interposition of a cloth was cemented to the glass B lying upon the tool A. To increase this pressure a sort of bow D E D is shaped out of a deal board, half an inch thick and 5 feet long, being 7 inches broad in the middle, and tapered narrower towards its extremities, so as to end almost in a sharp point. The middle of the bow is fixed to the floor by an iron staple at E driven cross it, and is bent into an arch by a rope F I I F; to which two other ropes are tied at I and I; the interval I I being equal to the length of the beam C C. One of these ropes I C C G goes over the back of the beam C C, passing through a hole in each handle at C and C, and then is lapped round a cylindrical peg at G, that passes through two wooden chaps, to the bottom of which the other rope is tied that comes from the other I. So that by turning the peg G, to lap the rope about it, the bow D D may be bent as much as you please. The tool A is placed upon a strong square board fixed to the table O on one side, and supported on the other side by the post P. Then the workman sits down, and, taking hold of the handles C C, he draws the glass to him and from him over the tool A, with a moderate motion. And after every 20 or 24 strokes he turns the Glass a little about its axis. This way of polishing took up two or three hours, and was very laborious as well as tedious, because the glass, being so much pressed downwards, was moved very slowly.

Instead of the bow D D (*fig.* 10.) afterwards I invented another spring, by sloping the flat ends of a couple of deal boards $\alpha\beta$, $\alpha\gamma$, and by nailing the flat slopes together very firmly, that the boards might make an acute angle $\beta\alpha\gamma$. One of these boards so joined was laid upon the floor under the polishing table, the end $\beta\gamma$ being under the middle of the tool A, so that they lay quite out of the way of the workman, who before was a little incommoded by the ends of the bow.

D D. The boards at the end α were 8 or 10 inches broad, and from thence went tapering almost to point at β and γ. The board $\alpha\gamma$, lying upon the floor, the end β of the upper board was pulled downwards by a rope $\beta\iota\zeta$ that passed under a pulley ι, fixed to the floor, and then was lapped round a strong peg ζ that turned stiff in a hole in the floor. Under the end γ the middle of a strong stick $\delta\gamma\delta$ was fixed at right angles to the board $\alpha\gamma$, and cords were tied to each end of this stick at δ, δ, which went over the polishing beam C, C, as in the former machine. This stick was lifted up but very little from the floor at the time of polishing; and by consequence the ropes, δ C, δ C, were long enough to give liberty of motion to the polishing beam C C. Two iron pins θ, θ, passing through the ends of the boards α, were skrewed into the floor; but the heads of the pins stood up above the boards, to give them liberty to rise up, when the rope $\beta\iota\zeta$ was stretched.

To facilitate the labour of moving the glass backwards and forwards in the tool, I made this addition to the former machine. At M (*fig.* 9.) is represented a strong hand made of wood or iron, having a square cavity cut through the bottom of of it, for the polishing beam C C to pass through, not tight, but with some liberty. To one side of this hand M a long board L L is annexed, some way or other, by means of an iron bolt. The breadth of the lower surface of this board L L is equal to the breadth of the hand M, being 2 inches and a half; its thickness is half an inch, and its length is equal to three semidiameters of the tool. The board L L must be drawn lengthways backward and forward over a block H fixed firmly to a table O; the thickness of the block being such that the boar L L may lie an inch higher than the surface of the tool A. The wooden hooks at Π and the pins at Σ keep the motion of the board in the same direction, by hindering it from slipping either sideways or upwards. Over this board, at right angles to it, and over the middle of the block H, there lies a wooden roller, having a strong iron axis which turns in the holes of two iron plates fixed to the ends of the block. The thickness of the roller is about an inch and a half. Through two holes bored through this roller and made wider at one end of them, two strong cords are made to pass with knots at one end of them, to be drawn into the wider parts of the holes, that they may neither slip through nor stand out from the roller. Then each cord is lapped round the cylinder several times, and one end of each is pegged firmly into the board L L at the end towards M, and the other ends of them are lapped round a peg at N; which, being turned round will stretch the cords as much as you please. At one end of the axis of this roller there is a handle Q, which being turned round, backwards and forwards alternately, the board L L, with the glass annexed to it, is moved to and fro, so far, that about a third part of its diameter shoots both ways over the margin of the tool. The spike in the middle of the beam C C presses the Glass a little obliquely, because the hand M holds the beam C C, not tight but somewhat loosely, to the end that the Glass may pass over the tool without trembling. Nevertheless this inclination of the spike must be but very small, and may easily be increased or diminished several ways. Two pins or stops must be fixed to the under surface of the board L L, to determine the length of the stroke. The tool A, or rather the stone to which it is cemented, is squeezed fast between the block H and a strong stop on the opposite side of the stone, by the interposition of a wedge. The workman sits upon a round stool, and, when one hand is tired with turning the roller, he applies the other; and therefore is not tried so soon as with the other machine, which required both hands, and also a reciprocating motion of his whole body. Some time after, I caused a longer handle Q *a* to be made that turned at both ends, for the convenience of using both hands at once.

After every 20 or 24 strokes it is necessary to give the glass a small turn about its axis; which is easily done by laying hold of the slate fixed to it, with one hand, while the other hand goes on with the polishing motion. The tool must also be moved a little after every 25 or 50 strokes, by drawing it half a straw's breadth towards that part of it which the Glass has left, and by drawing it back again after as many more strokes. At the beginning of the work the tripoly will be gathered into little lumps in some places of the tool, but will be dispersed again, in a little time; and then the area of the tool will become perfectly smooth.

If the tripoly does not appear to stick equally to the glass in all parts, and to be diffused over it in slender straight streaks, the frying-pan, with coals in it, must be held over the tool again; till you perceive the area or coat of tripoly is not quite so cold as the other parts of the tool. Then let tripoly be rubbed upon the tool again, and let the Glass be pressed over it with your hand, to try whether it sticks equally to the Glass in every place. When it does, you may proceed to the work of polishing. But, after I began to make use of vitriol instead of verdigrease, all that I have said about warming the tool may be omitted. Because these coats always touch the Glass as they should do, and stick better than before. Also let the tool be rubbed with tripoly over the coat without warming the tool, that the coat may be preserved more entire, and that the Glass may touch it better; which must always be repeated after 200 or 400 strokes in polishing. The Glass should also be taken from the tool after 200 strokes, by withdrawing the bolt L which connects the hand M to the board L L, and by removing the beam C C. Then rub your finger upon the glass, or a clean rag or a bit of leather, to examine how much it is polished.

To save the trouble of counting the strokes, there is a wooden wheel Δ X, 7 or 8 inches broad, placed flat against a board, fixed to the side of a wall. It turns easily about an axis, and has 24 teeth, like those of a saw, which are pushed round by a bended wire T Y X, in this manner: the wire turns about a center Y, and while one end of it is pulled by the string T V, tied to the end of the board L L, the opposite end Y X pushes back a long string R S fixed to the board at R; which by pressing upon the wire at S causes the part Y X to bend a little, and so the point X, in returning to the wheel (the string being relaxed) falls a little lower, into the next tooth, and pushes it forward into the position represented in the figure. There is a springing catch at Δ which stays the wheel after every stroke at X. Lastly, there is a pin fixed in the circumference of the wheel at Z, which, by pressing the tail of a hammer and letting it go again, causes a bell to sound after every revolution of the wheel, and gives notice that the Glass must be turned a little about its center. It is easy to understand that another piece of wheel-work, having three or four indexes, whose revolutions are in decimal progression, may be fixed to the block H and impelled by the strokes of the board L L; by which means, without any trouble of counting, one may be informed how many strokes go to polish a Glass.

A glass 5 or 6 inches broad requires about 3000 strokes upon each surface, to bring it to perfection: and you must carefully examine the middle of the Glass opposite to the blacking, whether any place appears darkish or of an ash-colour, or whether any small spots appear by an oblique reflection of the light of a candle or of a small beam of light let into a dark room. For the other parts of the Glass will appear perfectly fine much sooner than the middle.

After the glass has been sufficiently polished, let the stone, the cloth, and the cement be warmed over a pan of charcoal, till the cement grows so soft that the Glass may be separated from it by a side motion. Then whatever cement remains upon the Glass must be wiped off with a hot cloth dipped in oil or tallow, and last of all with cleaner cloths. Then if it does not appear perfectly polished (for we are often deceived in this point) the work must be repeated again, by glewing the Glass to the slate as before; then it must be wiped very clean and be made a little rough, as we said before. We may also lay a new fund or coat upon the tool, if the old one be spoiled, provided no other Glass has been polished in the tool in the mean time. The old fund may be washed off from the tool with a little vinegar. Lastly, take care always to chuse the thickest and the clearest pieces of Glass, to avoid a great many difficulties that arise from the unequal pressure in polishing. *Smith's Optics.*

GLASS-*chalcedony.* A mixture of several ingredients, with the common matter of Glass, will make it represent the semi-opake gems, the jaspers, agates, chalcedonies, &c.

The way of making these seems to be the same thing with the method of making marbled paper, by several colours dissolved in several liquors, which are such as will not readily mix with one another, when put into water, before they are cast upon the paper which is to be coloured. There are several ways of making these variously coloured Glasses, but the best is this: dissolve four ounces of fine leaf silver in a Glass vessel in strong aqua fortis, stop up the vessel, and set it aside.

In another vessel dissolve four ounces of quick-silver in a pound of aqua fortis, and set this aside.

In another Glass vessel dissolve in a pound of aqua fortis three ounces of fine silver, calcined in this manner: amalgamate the silver with mercury, mix the amalgama with twice its weight of common salt well purified; put the mixture in an open fire in a crucible, that the mercury may fly off, and the silver be left in the form of powder. Mix this powder with an equal quantity of common salt well purified, and calcine this for six hours in a strong fire; when cold, wash off the salt by repeated boilings in common water, and then put the silver into the aqua fortis. Set this solution also aside.

In another vessel dissolve in a pound of aqua fortis three ounces of sal armoniac, pour off the solution, and dissolve it in a quarter of an ounce of gold. Set this also aside.

In another vessel dissolve three ounces of sal armoniac in a pound of aqua fortis, then put into the solution cinnabar, crocus martis, ultramarine, and ferretto of Spain, of each half an ounce. Set this also aside.

In another vessel dissolve in a pound of aqua fortis three ounces of sal armoniac, then put into it crocus martis made with vinegar, calcined tin, zaffer, and cinnabar, of each half an ounce; let each of these be powdered very fine, and put gently into the aqua fortis. Set this also aside.

In another vessel dissolve three ounces of sal armoniac in a pound of aqua fortis, and add to it brass calcined with brimstone, brass thrice calcined, manganese, and scales of iron which fall from the smith's anvil, of each half an ounce; let each be well powdered, and put gently into the vessel. Then set this also aside.

In another vessel dissolve two ounces of sal armoniac in a pound of aqua fortis, and put to it verdigrease an ounce, red lead, crude antimony, and the caput mortuum of vitriol, of each half an ounce; put these well powdered leisurely into the vessel, and set this also aside.

In another vessel dissolve two ounces of sal armoniac in a pound of aqua fortis, and add orpiment, white arsenic, painter's lake, of each half an ounce: keep these nine vessels in a moderate heat for fifteen days, shaking them well at times. After this pour all the matters from these vessels into one large vessel, well luted at its bottom; let this stand six days, shaking it at times, and then set it in a very gentle heat, and evaporate all the liquor, and there will remain a powder of a purplish green.

When this is to be wrought, put into a pot very clear metal, made of broken crystalline and white glass, that has been used; for with the virgin frit, or such as has never been wrought,

wrought, the chalcedony can never be made, as the colours do not stick to it, but are consumed by the frit. To every pot of twenty pounds of this metal put two or three ounces of this powder at three several times; incorporate the powder well with the Glass, and let it remain an hour between each time of putting in the powder. After all is in, let it stand twenty-four hours; then let the Glass be well mixed, and take an essay of it, which will be found of a yellowish blue; return this many times into the furnace; when it begins to grow cold, it will shew many waves of different colours very beautifully. Then take tartar eight ounces, soot of the chimney two ounces, crocus martis made with brimstone half an ounce; let these be well powdered and mixed, and put them, by degrees, into the Glass at six times, waiting a little while between each putting in; when the whole is put in, let the glass boil and settle for twenty-four hours, then make a little Glass body of it, which put in the furnace many times, and see if the Glass be enough, and whether it have on the outside veins of blue, green, red, yellow, and other colours, and have, besides these veins, waves like those of the chalcedonies, jaspers, and oriental agates, and if the body kept within looks as red as fire.

When it is found to answer thus, it is perfect, and may be worked into toys and vessels, which will always be beautifully variegated; these must be well annealed, which adds much to the beauty of their veins. Masses of this may be polished at the lapidary's wheel as natural stones, and appear very beautiful. If in the working the matter grow transparent, the work must be stopped, and more tartar, soot, and crocus martis, must be put to it, which will give it again the necessary body and opacity, without which it does not shew the colours well. *Neri's Art of Glass.*

GLASS *of lead*, a Glass made with the addition of a large quantity of lead, of great use in the art of making counterfeit gems. The method of making is this: put a large quantity of lead into a potter's kiln, and keep it in a state of fusion with a moderate fire till it is calcined to a grey loose powder; then spread it in the kiln, and give it a greater heat, continually stirring it, to keep it from running into lumps; continue this several hours, till the powder becomes of a fair yellow, then take it out and sift it fine; this is called calcined lead.

Take of this calcined lead fifteen pounds, and crystalline, or other frit, twelve pounds; mix these as well as possible together, put them into a pot, and set them in the furnace for ten hours; then cast the whole, which will be now perfectly melted, into water; separate the loose lead from it, and return the metal, into the pot, and, after standing in fusion twelve hours more, it will be fit to work. It is very tender and brittle, and must be worked with great care, taking it slowly out of the pot, and continually wetting the marble it is wrought upon.

Glass of lead is capable of all the colours of the gems in very great perfection. The methods of giving are these: for green, take polverine frit, twenty pounds; lead calcined, sixteen pounds; sift both the powders very fine, then melt them into a Glass, separating the unmixed lead, by plunging the mass in water; after this return it into the pot, and add brass thrice calcined, six ounces; and one penny-weight of crocus martis made with vinegar; put this in at six different times, always carefully mixing it together; let it finally settle an hour, then mix it together and take a proof of it; when the colour is right, let it stand eight hours, and then work it. If instead of the calcined brass, the same quantity of caput mortuum of the vitriolum veneris be used, the green is yet much finer.

For topaz colour, take crystal frit, fifteen pounds; calcined lead, twelve pounds; mix them well together by sifting the powders through a fine sieve, then set them in a furnace not too hot, and separate the superfluous unmixed lead, by casting the whole into water; repeat this twice, then add half gold yellow Glass, and let them incorporate and purify, and they will be of the true and exact colour of the oriental topazes.

For sea-green, take crystal frit, sixteen pounds; calcined lead, ten pounds; mix and sift them together, and set them in a pot in a furnace, and in twelve hours the whole will be melted; then cast it into water, and separate it from the loose lead; put them into the furnace again for eight hours, then separate the loose lead by washing a second time, and return it to the pot for eight hours more. *Neri's Art of Glass.*

GLASS-*balls*, a term used to express circular or otherwise shaped hollow vessels of Glass, coloured within, so as to imitate the semipellucid gems. The method of doing it is this: make a strong solution of ichthyocolla or isinglass in common water by boiling; pour a quantity of this while warm into the hollow of a white Glass vessel, shake it thoroughly about, that all the sides may be wetted, and then pour off the rest of the moisture. Immediately after this, throw in red-lead; shake it and turn it about, throw it into many places with a tube, and the moisture will make it stick and run in waves and pretty figures. Then throw in some of the painter's blue smalt, and make it run in waves in the ball as the red-lead; then do the same with verdigrease, next with orpiment, then with red-lake, all well ground; always casting in the colours in different places, and turning the Glass, that the moisture within may run them into the waves. Then take fine plaister of Paris, and put a quantity of it into the ball, shake it also nimbly about; this will every-where stick firmly to the Glass, and give it a strong inner coat, keeping all the colours on very fairly and strongly. These are set on frames of carved wood, and much esteemed as ornaments in many places. *Neri's Art of Glass.*

GLASS *globules for telescopes.*— Mr. Butterfield tells us, he had tried several ways of making Glass globules of the bigness of great pins heads, and less, as in the flame of a candle, made of tallow or wax; but, that the best sort of flame for making them clear and without specks was, that of a lamp, made with rectified spirits of wine. Where, instead of a cotton wick, he made use of fine silver wire doubled up and down like a skein of thread. Then, having prepared some fine Glass, beaten to powder and washed very clean, he took a little of it upon the sharp point of a silver needle wetted with spittle, and held it in the flame, turning it about till it melted and became quite round, but no longer, for fear of burning it. The art lies in giving the globule an exact roundness, which can only be learned by experience. When a great many globules are thus formed, he rubs them clean with a soft leather. Then having several small pieces of thin brass-plates, twice as long as they are broad, he doubles them up into the form of a square, and punches a fine hole through the middle of them: and having rubbed off the bur about the holes with a whetstone, and blacked the insides of the plates with the smoke of a candle, he places a globule between the two holes, and tacks the plates together with two or three rivets. Then he tries how they magnify small objects, and keeps the best of them for use.

Dr. Hook used to take a very clear piece of Glass, and to draw it out into long threads in a lamp; then he held these threads in the flame, till they ran into round globules, hanging to the end of the threads. Then having fixed the globules with sealing-wax to the end of a stick, so that the threads stood upwards, he ground off the ends of the threads upon a whetstone, and polished them upon a smooth metal plate with a little putty.

Mr. Stephen Gray tells us, that, for want of a spirit lamp, he laid a small particle of Glass, about the bigness of the intended globule, upon the end of a piece of charcoal; and, by the help of a blast-pipe, with the flame of a candle he soon melted it into a globule. By this means he made them indifferently clear, and the smallest very round; but the larger, by resting upon the coal, were a little flatted, and received a roughness on that side. Therefore he was wont to grind and polish them upon a brass plate, till he reduced them to hemispheres. But he found that the small globules, besides that they magnified more, shewed objects more distinct than the hemispheres.

These experiments led him to another which is very curious. Having observed, says he, some irregular particles within the Glass globules, and finding they appeared distinct and prodigiously magnified, when held close to my eye; I concluded that if I conveyed a small globule of water close to my eye, in which there were any opacous or less transparent particles than the water, I might see them distinctly. I therefore took on a pin a small portion of water which I knew to have in it some minute animals, and laid it on the end of a small piece of brass wire, that then lay by me, about one tenth of an inch in diameter, till there was formed somewhat more than an hemisphere of water. Then, keeping the wire erect, I applied it to my eye, and standing at a proper distance from the light, I saw them and some irregular particles as I had predicted, but most enormously magnified. For, whereas they were scarce discernable by my Glass microscope, they appeared within the globule not much different in form, nor less in magnitude than ordinary pease. They cannot well be seen by day-light, unless the room be darkened, after the manner of the famous dioptrical experiment, but most distinctly by candle-light. They may also be seen very well by the full-moon light.

Mr. Gray explains the reason of this appearance as follows: Let the circle D B B D (*Plate* XXI. *fig.* 11.) represent a sphere of water, A, an object placed in its focus, sending forth a cone of rays, two of which are A B, A B; which, coming into the water at B and B, will be refracted from their direct course, and become B D, B D; and, at D D, they will, at their passing into air, again be refracted into D E, D E; and so run parallel to one another, and to the axis of the sphere A F C G. Now, it is a known principle in optics, that the angle of reflexion is equal to the angle of incidence: wherefore let the rays B D, B D, be imagined to have come from some point F of an object placed within the sphere of water, by being reflected from the interior surface of the sphere at B B. But C B D is the angle of reflexion, to which making C B F equal, the point F will be the place, from whence, if an object sends forth a cone of rays, two of them as F B, F B, will be reflected into the lines B D, B D; and then, coming to the other side of the globule at D D, they will be refracted into D E, D E, as before: and, consequently, will be fit for distinct vision, whether the object be placed in F within, or in A without the sphere, if its interior surface be considered as a concave speculum.

GLASS *porcelain*, the name given by many to a modern invention of imitating the China ware with Glass. The method given

given by Mr. Reaumur, who was the firſt that carried the attempt to any degree of perfection, is delivered by that gentleman in the Memoirs of the Academy of Sciences of Paris, to this effect.

The mixing of Glaſs reduced to powder, with other leſs eaſily vitrifiable ſubſtances for the forming a paſte to be afterwards made into a ſort of porcelain, has been a contrivance long practiſed, but it is very troubleſome, and the reſult ſubject to many faults; but this new ware is made of Glaſs alone, and that with much leſs trouble, and without the reducing it to powder. By this art, veſſels of Glaſs are changed into veſſels of a ſort of porcelain, without altering their form, and the meaneſt Glaſs ſerves as well as the beſt for that purpoſe; our common coarſe green quart bottles, or the great bell Glaſſes with which gardeners cover their melons, &c. being by this means changeable into a beautiful white ſort of porcelain ware; and this is to be done in ſo eaſy a manner, and with ſo ſmall an expence, that it requires no more trouble or charge, than that of baking a common veſſel of our coarſe earthen ware, and, for this reaſon, the veſſels of this ſort of ware may be afforded extremely cheap.

It is very certain, that all porcelain ware is a ſubſtance in the ſtate of a ſemivitrification; and, in order to bring Glaſs, which is a wholly vitrified ſubſtance, into the condition of porcelain, there requires no more than to reduce it to a leſs perfectly vitrified ſtate.

The queſtion which would naturally be ſtarted on this occaſion, is, whether it be poſſible to reduce Glaſs into a leſs vitrified ſtate, it having already undergone what is eſteemed the laſt change by fire? But when we conſider that the Glaſs of antimony, the vitrifications of many of the metals, as the Glaſs of lead, and the counterfeit gems coloured by the metals, are more or leſs eaſily reduced again by chemiſtry to metals, &c. the reducing ſand, flints, &c. after they are vitrified, at leaſt a little way back toward their native or priſtine ſtate, may appear not wholly impracticable; and the attempts which Mr. Reaumur made on this occaſion, were what gave him the firſt hints of the Glaſs porcelain.

The method of making it is this: the Glaſs veſſels to be converted into porcelain, are to be put into a large earthen veſſel, ſuch as the common fine earthen diſhes are baked in, or into ſufficiently large crucibles; the veſſels are to be filled with a mixture of fine white ſand, and of fine gypſum or plaiſter-ſtone burnt into what is called plaiſter of Paris; and all the interſtices are to be filled up with the ſame powder, ſo that the Glaſs veſſels may no where touch either one another, or the ſide of the veſſel they are baked in. The veſſel is to be then covered down and luted, and the fire does the reſt of the work; for this is only to be put into a common potter's furnace, and, when it has ſtood there the uſual time of the baking the other veſſels, it is to be taken out, and the whole contents will be found no longer Glaſs, but converted into a white opake ſubſtance, which is a very elegant porcelain, and has almoſt the properties of that of China. *Mem. Acad. Scien. Par.* 1739.

GLASS *pots*, the veſſels in the Glaſs trade uſed for melting the Glaſs. Thoſe for the white Glaſs works are made of a tobacco-pipe clay, brought from the iſle of Wight, which is firſt well waſhed, then calcined, and afterwards ground to a fine powder in a mill; which, being mixed with water, is then trod with the bare feet, till it is of a proper conſiſtence, to mould with the hands into the proper ſhape of the veſſels. When theſe are thus made, they are afterwards annealed over the furnace. Thoſe for the green Glaſs work are made of the none-ſuch, and another ſort of clay from Staffordſhire; they make theſe ſo large as to hold three or four hundred weight of metal. And, beſides theſe, they have a ſmall ſort called piling pots, which they ſet upon the larger, and which contain a finer and more nice metal fit for the niceſt works. *Neri's Art of Glaſs.*

GLA'ZING, in pottery, a compoſition applied to veſſels of earth, &c. to render them more beautiful, and prevent fluids from penetrating them.

Black GLAZING, is made of lead-aſhes, eighteen meaſures; iron-filings, three; copper-aſhes, three; and zaffer, two meaſures. This, when melted, will make a brown black; and, if you want it blacker, add more zaffer to it.

Blue GLAZING is thus prepared: take lead-aſhes, one pound; clear ſand or pebble, two pounds; ſalt, two pounds; white calcined tartar, one pound; Venice, or other glaſs, ſixteen pounds; and zaffer, half a pound; mix them well together, and melt them for ſeveral times, quenching them always in cold water. If you would have it fine and good, it will be proper to put the mixture into a glaſs furnace for a day or two.

Brown GLAZING, is made of common glaſs and manganeſe, or brown ſtone, of each one part; and lead of glaſs twelve parts.

Fleſh colour GLAZING, is made of twelve parts of lead-aſhes, and one of white glaſs.

Gold-coloured GLAZING. To make gold-coloured Glazing, take of litharge three parts; of ſand or calcined flint, one part; pound and mix theſe very well together, then run them into a yellow glaſs with a ſtrong fire. Pound this glaſs and grind it into a ſubtile powder, which moiſten with a well ſaturated ſolution of ſilver, and make it into a paſte; which put into a crucible, and cover it with a cover. Give at firſt a gentle degree of fire, then increaſe it, and continue it till you have a glaſs, which will be green. Pound this glaſs again, and grind it to a fine powder; moiſten this powder with ſome beer, ſo that, by means of a hair pencil, you may apply it upon the veſſels, or any piece of earthen ware. The veſſels that are painted or covered over with this Glazing, muſt be firſt well heated, then put under a muffle, and, as ſoon as the glaſs runs, you muſt ſmoak them, and take out the veſſels. Mr. Heinſius of Peterſburgh, who ſent this receipt to the Royal Society, uſes the words afflare debes fumum, which is rendered ſmoak them, in the Tranſactions. *Phil. Tranſ.* N°. 466.

Green GLAZING may be prepared of eight parts of litharge, eight parts of Venice glaſs, four parts of braſs duſt; or of ten parts of litharge, twelve of flint or pebble, and one of æs uſtum, or copper aſhes.

Iron-colour GLAZING is prepared of fifteen parts of lead aſhes, fourteen of white ſand, five of copper aſhes, one of manganeſe, one of zaffer, and one of iron filings.

Liver-coloured GLAZING is prepared of twelve parts of litharge, eight of ſalt, ſix of pebble or flint, and one of manganeſe.

Purple-brown GLAZING conſiſts of lead aſhes, fifteen parts; clear ſand, eighteen parts; manganeſe, one part; white glaſs, fifteen meaſures; and one meaſure of zaffer.

Red GLAZING is made of antimony, two pounds; litharge, three; and ruſt of iron calcined, one; grind them to a fine powder.

Sea-green GLAZING is made of five pounds of lead aſhes, one pound of tin aſhes, three pounds of flint, three quarters of a pound of ſalt, half a pound of tartar, and half a pound of copper duſt.

White GLAZING. A fine white Glazing for earthen ware is thus prepared: take two pounds of lead, and one of tin; calcine them to aſhes: of this take two parts, calcined flint or pebble, one part; and ſalt, one part; mix them well together, and melt them into a cake for uſe.

The white Glazing for common ware is made of forty pounds of clear ſand, ſeventy-five pounds of litharge or lead aſhes, 26 pounds of pot-aſhes, and ten pounds of ſalt: theſe are three times melted into a cake, quenching it each time in clear cold water. Or it may be made of fifty pounds of clean ſand, ſeventy of lead aſhes, thirty of wood aſhes, and twelve of ſalt.

Yellow GLAZING is prepared of red-lead, three pints; antimony and tin, of each two pounds. Theſe muſt be melted into a cake, then ground fine; and this operation repeated ſeveral times. Or it may be made of fifteen parts of lead ore, three parts of litharge of ſilver, and fifteen parts of ſand.

Citron-yellow GLAZING is made of ſix parts of red-lead, ſeven parts of fine red brick-duſt, and two parts of antimony. *Vid. Smith's Laboratory.*

GLAU'CIUM, *yellow horned poppy*, in botany, a genus of plants whoſe characters are:

The end of the pedicle is expanded into an orbicular placentula, terminated by a hollow ſpherical ſubſtance, to which it grows. The calyx conſiſts of two leaves, and is caducous: the flower is tetrapetalous, expanding in form of a roſe or poppy, and furniſhed with very numerous ſtamina, which, for the moſt part, fall off, after the opening of the flower. The ovary ariſes from the bottom of the placentula, with a hairy bifid apex; and ripens into a long, ſmooth, bivalve pod, the valves adhering to the intermediate partition, in ſuch a manner as to leave the whole capacity unicapſular, and full of roundiſh ſeeds.

Dioſcorides ſays, this plant is diuretic; and Galen looks upon it to be vulnerary and deterſive; but he conſiders not, that it muſt be uſed only to eat away the proud fleſh of ulcers. Nevertheleſs, in Portugal, they give the infuſion of half a handful of it, in white wine, to thoſe who are ſubject to the ſtone. In Provence, they uſe the ſame leaves, bruiſed, for ulcers; and, above all, for the wounds of horſes. *Martyn's Tournefort.*

GLAUX, in botany, the name of a plant, alſo called the milkwort of Dioſcorides.

It grows in hilly and chalky fields, and the herb is in uſe; which, boiled in barley water, is effectual, as Dioſcorides ſays, for renewing milk in women's breaſts, where it is loſt.

There is a diſpute among the botaniſts, about the Glaux of Dioſcorides. Anguillarius, Parkinſon, and Alpinus, will have it to be the lotus; Geſner, the onobrychis; Turner, the Glaux vulgaris (liquorice vetch) Dodonæus, Cordus, and C. Bauhine, a ſpecies of a certain ſmall marine plant; Lobel, Gerard, and Cluſius, the plant deſcribed by Dioſcorides, as follows: 'The Glaux has leaves like thoſe of the cytiſus or lentil, green on the upper ſide, and whitiſh underneath. The root ſends forth five or ſix ſlender ſtalks, a ſpan high; the flowers are of a purple colour, and reſemble thoſe of the leucoium (ſtock gilliflower) only ſmaller. *Dale.*

GLOBULA'RIA, *French daiſy*, in botany, a genus of plants whoſe characters are:

The floſcules are unilabiated, multifid, connected each to its proper calyculus, and collected very many together into one globoſe flowery head, ſurrounded with one common calyx.

 The

The calyculus, or little flower cup, of the flosçule becomes a capsule, which contains the seed, and is affixed to the common placenta.

It is to be found in the gardens of the curious, and flowers in summer. The plant is a vulnerary. *Dale.*

GLOW-*worm*, *cantharis*, in zoology, a class of insects, the antennæ of which are cetaceous, the exterior wings flexile, the thorax somewhat flatted, and the sides of the abdomen plicated and papillose.

The common Glow-worm is frequently met with under our hedges, and, if carefully taken up, may be kept alive many days on fresh turfs of grass; all which time it will continue to shine in the dark.

The light of this little insect is so strong, that it will shew itself through several substances, in which the creature may be put up; a thin pill-box easily shews it through, and even though lined with paper, the light is not impeded in its passage by both. The creature is sluggish, and appears dead in the day-time; and its light is not distinguishable, even if carried into a darkened room, unless the creature be turned upon its back, and disturbed, so as to be put in motion; and then it is but very faint: after sun-set the light begins to return, and with it the life and motion of the animal. The motion and light of this creature seem, in some measure, to depend upon one another: it never shines but when it is in some sort of motion; and, when it shines most, the body is extended to one third more than its length in the day-time. In the time of brightest shining, it will sometimes, of a sudden, turn its body about, and the light will not be larger than the head of a pin; and, on being touched, she will then immediately extend herself, and the light will become as large and as bright as ever. *Phil. Transf.* N°. 71.

Flying GLOW-*worm*, *cicindela volans*. In the warmer months of the year, this creature is sometimes caught in our houses flying to the flame of a candle; and, when examined in the dark, it is found luminous at these times, though perhaps less, or not at all so, at others; which may be a reason of its not being known, though caught in the fields; and to this it may be owing, that many who have described it, have thought it not a native of England.

Without wings it is frequently enough found in form of the common Glow-worm, and then always shines.

The male and female, in this winged state, both shine in hot weather, and their light is so vivid as to be easily seen, even while there is a candle in the room; the vibrations of it are irregular, and its colour greenish. The luminous parts are two small specks under the tail at the end, and the light continues in these some time after the tail is cut off, but then gradually goes out.

The parts of insects continue alive in some degree, for a considerable time after they are cut off; and probably the light in the tail of this animal continues just as long as that sort of life remains in it. *Moffett.*

The use of this light seems to be to direct the animal in its course, and in the taking of its prey, and to this purpose it is admirably placed. The tail is easily bent under the belly, and then throws the light full upon any object about, or under the head of the animal; and the eyes are placed, not on the upper part, but on the under-side of the head; so that they have all the advantages of it, while the light in this part is not offensive to the eyes, as it naturally would have been, if carried before the head. The creature can upon occasion cover this light so as not to be known, or pursued by it, by its enemies. *Thomas Barthol. de Luce Anim.*

GNATS, in natural history.—All the Gnats have a long cylindric body composed of eight rings; their corslet is short, but large in proportion to the size of the fly, and to this are fixed the legs, the wings, and the balancers; four stigmata are also found here, as is the case in other flies. The two first of these are placed near the head, and have been mistaken for ears.

When the Gnat is in a state of rest, it holds one wing somewhat crossed over the other, in such a manner, as that they cover the body. It has a multitude of little oblong scales on its wings, and not only there, but on its corslet and body; and they are so thick laid on the body, that one cannot touch it without rubbing them off, and leaving the part naked. Besides these, they have also very long and extremely fine hairs, and some of the species have ranges of these on each side of the body appearing like fringes. The antennæ of the Gnats are extremely worth observation, and differ much from one another. Some of them are elegantly feathered; these belong to the males of certain species, for the antennæ of the females are not so beautiful.

These feathered antennæ of the male Gnats, examined by the microscope, shew, at every junction of two of the rings, a small cluster of hairs in form of a pencil on each side; the hairs of which they are composed separate, and spread toward their extremities; these clusters of them grow shorter, as they approach the upper part of the antennæ; and, towards the extremity of each, there is a vacant space where they are wholly wanting; this part, however, is covered with single short hairs.

The antennæ both of the males and females of some species have also thin stalks covered with single hairs, and at certain distances; or at every articulation these have four hairs longer than the rest, and easily distinguishable by the naked eye.

The Gnats have no small or glossy eyes, as most other flies have, but, in recompence for the want of these, they have reticular eyes, so large as to surround, and, in a manner, cover the whole head. Those of many species are extremely beautiful, of a fine changeable green in some lights, and of a bright red in others.

Many of the species of Gnats have before their heads two small oblong cylindric bodies, something resembling the antennæ of the short-bodied flies; these we may not improperly call the beards of the Gnats, for immediately below them is placed the trunk, and they seem to have some analogy with the beards of the butterfly class, which are placed in the same manner. *Reaumur's Hist. Inf.* For the trunk and wings of the Gnat, see the articles TRUNK and WINGS.

GNAT-*worm*, in natural history, a small water insect, produced of the egg of a Gnat, and which is, after its several changes, transformed into a Gnat again.

GOAT, *capra*, in zoology, a genus of animals, the characters of which, according to Mr. Ray, are these: that it is covered with hairs, not with wool; that its horns are less crooked than those of the sheep, and that it has a beard hanging down from its chin, and is of a strong smell.

It is very singular, that this genus of animals are all able to run and climb about the rugged parts of mountains without falling, though their feet seem by no means contrived by nature for any such purposes.

Goats may be of great advantage to the farmers in some parts of the kingdom, as they will live in rocky barren countries, where nothing else can get a support for life. They will climb the steepest rocks, and there browse upon briars, heath, and shrubs of various kinds, which other creatures will not taste of. They will feed on grass in pastures, but, as they love browsing on trees much better, great care must be taken to keep them from valuable plantations.

The greatest advantage of these creatures is their milk, which they yield in large quantities; and which is accounted the best milk of all animals. They mix this and cows milk together in many parts of the kingdom, and a very valuable kind of cheese is made of it. Beside this, the kids or young Goats are very fine food, and the best kinds bring forth these two or three at a time, and that twice a year.

Goats hair also is of value; it may be sheared as the wool from the sheep, and is excellent for making ropes that are to be used in the water, as they will last a great while longer than those made the common way. A sort of stuff is also made of it in some places. The best kind of Goats for keeping to advantage should be chosen in this manner: the male should have a large body, his hair should be long, and his legs straight and stiff; the neck should be plain and short, the head small and slender, the horns large, the eyes prominent, and the beard long. The female should have a large udder, with large teats, and no horns, or very small ones. They should be kept in flocks, that they may not straggle; and they should have good shelter both in summer and in winter, the heat and cold being both prejudicial to them. They should be coupled in December. They should have no litter in winter, but only a paved floor kept clean. The kids are to be brought up for the table in the same manner as our lambs are. They are recommended to lie among horses, their smell, as is supposed, preventing many distempers in those cattle. *Mortimer's Husbandry.*

GOAT-*sucker*, in zoology, a name by which the caprimulgus is called in some parts of England, but its more usual name with us is the churn owl. It is a very beautiful bird, seeming rather to approach to the cuckow than the owl kind, and has had its common Latin name, and this English one, from an opinion, there seems to be no foundation for, of its sucking the Goats dugs in the night-time. *Ray's Ornithology.*

GOATS-*rue*, has many tall, hollow, striated branches, a yard or more in height, with long pinnated leaves growing alternately on the joints, consisting of six or eight pair of long oval pinnæ, smooth, and not indented about the edges, which are subject to be folded together. The flowers grow in long spikes, hanging downwards in the shape of pease blossoms, but less; of a pale, whitish, blue colour: the seed grows in long erect pods: the root is thick, spreading on the earth, and abiding long: it grows in several parts of Italy, by river-sides; but, with us, only in gardens; and flowers in June and July.

Goats-rue is accounted cordial, sudorific, and alexipharmic, and good against pestilential distempers, expelling the venom through the pores of the skin; and is of use in all kinds of fevers, the small-pox and measles; it likewise kills worms, and cures the bites of all kinds of venomous creatures. *Miller's Bot. Off.*

GOLD (*Dict.*)—It is the received opinion, that, whatever has been done to this metal, the common way of purifying it by the copel restores it easily to itself again; but this is not always so certain, or so easy, as is generally imagined. Mr. Homberg put into the copel an ounce of gold, which he had used in several chemical experiments, in order to restore it to its original state; but, after four times copelling it, he found, that,

that, whatever quantity of lead he used, ſtill the metal, though of the right and beautiful colour, was brittle, and not at all in the ductile ſtate of pure gold. Finding therefore that lead would not anſwer his purpoſe, he incorporated the gold with four times its quantity of ſilver, and, having performed the operation of the depart in the common manner, he fuſed it with borax; but after all this the Gold was as brittle as before, though ſtill of the ſame beautiful colour. He then melted it again without any addition, but ſtill it remained in the ſame brittle ſtate. His next trial was by antimony, not doubting but that the particles, whatever they were, that ſtood the operation of the depart, and of lead, would be abſorbed by this powerful ſemi-metal, and the Gold left in its natural malleable ſtate: he melted it twice to this purpoſe, with eight ounces of antimony; but, after ſeparating the antimony, and then melting the Gold ſeveral times with ſalt-petre, and many times without any mixture, it was found of the moſt perfect and beautiful colour imaginable; but ſtill brittle, and not in the leaſt malleable. Surprized to ſee all the common methods fail, he melted it again with ſix ounces of antimony, and afterwards melted this regulus with three times its own weight of lead, and ſet the whole in a copel in a proper degree of fire, to evaporate both the antimony and the lead. But, when the fire was out, he was ſurpriſed to ſee the Gold covered with a browniſh ſubſtance, reſembling a muſhroom, which fell to powder on being touched by the fingers. The Gold itſelf was become of a grey colour, and was full of wrinkles on the upper ſurface, from whence this fungous matter had been thrown out; but on the under ſurface, where it ſtuck to the copel, it was ſtill of a fine and beautiful Gold colour. He then melted ſeveral times the Gold and the fungous ſubſtance together, and every time there appeared the ſame ſort of fungous cruſt at the top. At laſt he gathered this fungous ſubſtance carefully off from the Gold, and then, melting the metal by itſelf, there was no more any fungous matter thrown out upon it, but only a thin layer of a powder of the ſame nature and colour with the former. Three times it was melted, and at every time threw off a quantity of this powder; and, after this, being fuſed with borax, it at length became perfect malleable Gold.

He then fuſed together the fungous matter, and all the quantities of powder which he had ſaved; there appeared a new fungus on the matter, and that for ſeveral times melting; but at laſt this diſappeared, and there was found a ſmall lump of pure Gold in the copel. It is not eaſy to gueſs at the cauſe of this obſtinate brittleneſs of the Gold, becauſe it had paſſed ſeveral experiments, and been mixed with ſeveral ſalts and ſeveral metals, particularly at laſt with iron and with emery. The emery ſeemed moſt to be ſuſpected as the cauſe, but this brittleneſs cannot be given to Gold by emery alone, and muſt have been owing to the mixed effect of ſome of the ſalts and emery together; as, by means of the ſalts, the particles of emery are thrown farther, and more intimately mixed with thoſe of the Gold, than they could otherwiſe be. We have been told of the degradation of Gold. This Gold would have been declared degraded, and robbed of one of its greateſt qualities, its malleability, had it fallen into any hands but thoſe of ſo great a chemiſt; and it is much to be doubted, whether Mr. Homberg would not have been able to reduce the degraded Gold of any other chemiſt, and reſtore it to its natural ſtate and purity, though the common methods of operating on it ſhould all have failed, as they did in this caſe. *Mem. Acad. Par.* 1693.

It is generally underſtood, that ſilver is the peculiar wealth of Peru; and the Spaniards have alſo Gold mines there.— There are alſo two waſhing-places for Gold in the ſouth part of Peru, near the frontiers of Chili. About the year 1709 there were two ſurpriſing large lumps of virgin Gold found in one of theſe places, one of which weighed 32 pounds complete, and was purchaſed by the Count de Monteloa, then viceroy of Peru, and preſented to the king of Spain: the other was ſhaped ſomewhat like an ox's heart; it weighed 22 pounds and a half, and was bought by the corrigidor of Arica.

To find theſe lavadores or waſhing-places, they dig in the corners of a little brook, where, by certain tokens, they judge the grains of Gold to lie. To aſſiſt in carrying away the mud, they let a freſh ſtream into it, and keep turning it up, that the current may ſend it along.— When they are come to the golden ſand, they turn off the ſtream another way, and dig with their mattocks; and this earth they carry on mules to certain baſons, joined together by ſmall channels: into theſe they let a ſmart ſtream of water, to looſen the earth, and carry all the groſs part away. The Indians ſtanding in the baſons, and throwing out all the ſtones; the Gold at bottom is ſtill mixed with a black ſand, and hardly to be ſeen, till it be farther ſeparated.

In theſe waſhing-places are found Gold grains, as big as bird-ſhot; and in one, belonging to the prieſts near Valparaiſo, ſome are found from two or three ounces to a pound and an half weight.— This way of getting Gold is much better than from the mines; here is no need of iron crows, mills, or quickſilver; ſo that both the trouble and expence are much leſs.

The moſt conſiderable port in Chili is that of Valparaiſo, which is eſteemed one of the beſt harbours in the ſouth-ſeas. It lies upon a river, fifteen leagues below St. Jago, the capital of Chili. To this port, all the riches of the Gold mines behind it, and on every ſide, are brought; particularly from thoſe of Tiltil, which are immenſely rich, and lie between this port and the city of St. Jago.

The Gold here is found in a very hard ſtone, ſome of which ſparkles, and betrays the incloſed treaſure to the eye; but moſt of it has not the leaſt ſign of Gold, but appears to be an hard harſh kind of ſtone, of very different colours, ſome white, ſome red, and ſome black. This ore, broken to pieces, is ground in a mill, by the help of water, into a groſs powder; with which quickſilver is afterwards mixed: to this paſte they let in a ſharp ſtream of water, which having reduced it to a kind of mud, the earthy particles are carried off by the current, and the Gold and quickſilver precipitated, by their own weight, to the bottom.— When this mud has ſettled a little, into a ſort of paſte, they put it into a linen bag, and ſtrain it very hard, by which operation the mercury is driven out, or, at leaſt, the greateſt part of it, and the remainder they evaporate by the help of fire; ſo that they have all the Gold together in a little wedge, like a pine-apple; whence it derives its name of pinna.— In order to clear the Gold from the ſilver it is firſt impregnated with, the lump muſt be run, and then the exact weight is known, and the true fineneſs; it is not done otherwiſe there.—The weightineſs of the Gold, and the facility of its amalgamation with mercury, makes the droſs eaſily ſeparate from it: this is an advantage the Gold-miners have over thoſe of ſilver; they every day know what they get, which is not the caſe of the ſilver-miners.

According to the nature of the mines, and the richneſs of the veins, every caxon, or 50 quintals, or 100 hundred weight, yields four, five, or ſix ounces.—When it yields but two, the miner does not make good his expence, which frequently happens; but he has ſometimes good amends made him, when he meets with rich veins; for the Gold mines are, of all mines, thoſe which produce metals the moſt unequally.— They follow a vein, which grows wider, then narrower, and ſometimes ſeems to be loſt in a ſmall ſpace of ground. This ſport of nature makes the miners live in hopes of finding what they call the purſe, being the ends of veins, ſo rich, that they have ſometimes made a man wealthy at once: and this inequality ſometimes ruins them; which is the reaſon that it is more rare to ſee a Gold-miner rich than a ſilver-miner, or of any other metal, though there be leſs expence in extracting it from the mineral. For this reaſon, alſo, the miners have peculiar privileges; for they cannot be ſued to execution on civil accounts, and Gold pays only one-twentieth part to the king, which is called covo, from the name of the perſon to whom the king made the grant; becauſe they uſed before to pay the one-fifth, as they do of ſilver.

On the deſcent of this mountain there runs, during the winter, or, rather, during the rainy ſeaſon, a pretty briſk ſtream of water, which, paſſing through the Gold ore, waſhes away abundance of that rich metal, as it ripens and breaks from its bed: and, therefore, for about four months in the year, this is accounted one of the richeſt lavadero's in Chili, ſince there are found pellets of pure Gold of an ounce weight.

At Palma, which is but four leagues from Valparaiſo, there is another rich lavadero; and, every-where throughout the country, the fall of a brook or rivulet is attended, more or leſs, with theſe golden ſhowers, the richeſt whereof fall into the laps of the Jeſuits, who farm, or purchaſe, abundance of mines and lavadero's, which are wrought, for their benefit, by their ſervants.

Yet it is agreed, that a great part of the inhabitants do not ſeem to abound in wealth; which, however, may be very well accounted for, if we conſider that ſuch as deal in cattle, corn, and other the product of the country, acquire but moderate fortunes; and ſuch as are concerned in mines are frequently ruined, by launching into too great expence about them. But, after all, ſuch as are eaſy in their circumſtances, and, in conſequence of that eaſe, retire to St. Jago, live in ſuch a manner as ſufficiently demonſtrates the riches of Chili, ſince all their utenſils, even thoſe that are moſt common, are of pure Gold; and it is believed that the wealth of this city alone cannot fall ſhort of 20,000,000 l.— Add to this, that the Gold mines are continually increaſing; and it is only for want of hands that they are not wrought to infinitely more advantage, thoſe already diſcovered, and neglected, being ſufficient to employ 40,000 men. It may be likewiſe obſerved, that the frauds, practiſed for deceiving the king, daily increaſe; and, as they meaſure the riches of the Spaniſh Weſt-Indies by the ſtandard of the king's revenue, this muſt neceſſarily make them appear poorer than they really are.

As the policy of the Spaniards has hitherto conſiſted chiefly in endeavouring, by all ways and means poſſible, to reſtrain the vaſt riches of theſe extenſive dominions from paſſing into other hands; ſo the knowledge that other nations have of the mighty wealth of theſe countries, on the one hand, and of the great demand for European manufactures among their inhabitants, on the other, has excited almoſt every nation in Europe to practiſe all methods poſſible, in order to gain a ſhare in them; and this with ſo good effect, that it is very doubtful whether any conſiderable part of the riches of the Weſt-Indies centers among the inhabitants of Old-Spain.

But the ſyſtem of Spain is now upon the change; and they ſeem determined to reap all the benefit in their power by the commerce of the Spaniſh Weſt-Indies, as well as by that in Europe.

The Gold trade of Brazil, belonging to the king of Portugal, being carried on in much the ſame manner as that of Spain, it is needleſs to ſay any more at preſent, than to obſerve, that, in order to judge of the true value of Gold belonging to the king of Spain, which there paſſes through the hands of the preſident and commiſſioners, it is all ſold upon condition to be aſſayed, and not judged of merely by the touch, as is done in ſeveral parts of the Eaſt-Indies. For Gold is ſo precious a metal, that any very ſmall difference, in the aſſay of ſilver or copper in every piece, will run up to a conſiderable ſum; and, therefore, the laws have ſettled the value of Gold and ſilver, not by the touch, but by trial of aſſay, and this ſo exactly and demonſtrably, that what a very ſmall ſcale decides, is afterwards made out and proved by arithmetic. And, becauſe not only money was to be made of this metal, but jewels, chains, utenſils, and other things, therefore the law appointed, that there ſhould be a head marker and toucher, to overlook and approve of the reſt of them, that, being expert at touching Gold and trying ſilver, they might judge of the fineneſs of the Gold-ſmith's work. And whereas, in order to make an aſſay, ſomewhat is to be taken of the ingot of Gold or ſilver that is to be aſſayed, which cannot be done with jewels, chains, or rings, without ſpoiling the faſhion; therefore the only and univerſal method has always been to touch the Gold, and mark the plate, relying only upon the exactneſs of the eye at certain times of the day, and on a ſtone, upon which the true fineneſs does not ſometimes appear ſuperficially, either becauſe the Gold is ill-coloured, or not ſo perfectly refined.

As for ſilver, they rely altogether upon the colour that appears after it is tried; both which methods are no better than conjectures or ſurmiſes, in compariſon of the certainty of the aſſays. For which reaſon, in criminal cauſes, againſt ſuch as do not work Gold or ſilver according to the ſtandard, no caſe has been decided by the head aſſayer, or judges to whom it belongs, without making experiment by aſſay; and, had the touch been ſecure, it would certainly have been relied on in ſome caſes; whereas, on the contrary, ſeveral perſons have been cleared by the aſſay, who have been ſuſpected for cheats by the touch. It follows, therefore, that merchants ought to be perſuaded it is much ſafer for them to diſpoſe of their Gold by aſſay, than by touch; for otherwiſe there might be a vaſt trouble ſaved in aſſaying all the king's Gold over again, as is done at Seville, though it has all been actually aſſayed in the Indies. This has been the practice of all times, in Spain, ever ſince Gold was brought from the Indies, and touching was never yet admitted of.

The purifying of GOLD *by cementation*, is to be performed in this manner: chuſe ſome tiles or bricks not vitrified by an exceſſive fire, nor too much tempered with ſand; the oldeſt alſo are the beſt; clean them well from lime and all other filthineſs, pound them in an iron mortar, and then ſift them through a coarſe ſieve; take four parts of this powder, and one part of colcothar not waſhed, and the ſame quantity of common ſalt; mix theſe thoroughly together, grind them in a mortar, and wet them with a little water or urine, ſo that they may cohere when preſſed between the hands. Then take a clean earthen veſſel of a proper ſize, it muſt be quite ſound, ſufficiently thick, and not glazed; ſtrew the bottom of this with the moiſtened powder, or cement, and diſtribute it evenly all over with a finger, and preſs it down very gently, ſo that the thickneſs of the cement may be half an inch all about; put upon this the Gold in ſmall pieces, and in thin plates, made perfectly clean by heating them red-hot in the fire; cover the ſurface of the cement with theſe pieces, then lay ſuch another bed of cement over theſe, and over that another of Gold, and ſo on alternately, till the veſſel is full within the breadth of a finger; let this laſt ſpace be filled with cement; lute well a tile upon the veſſel, and keep it moderately red-hot in a furnace for ſixteen or twenty hours, then open the pots and waſh the purified Gold. *Cramer's Art of Aſſaying.*

GOLD *colour*.—The manner of giving this colour to glaſs is this: take cryſtal frit two parts, and rochetta frit one part, both made with tarſo, not ſand; mix theſe well, and to every hundred weight of this add of tartar in lumps, but well powdered afterwards, and of manganeſe prepared, each one pound; mix theſe well together and put them into the frit; when this is done, put all into the furnace, and let it ſtand three or four days in a common fire not too violent, and at the end of this time work it. It will be thus very beautiful, but, if all cryſtal frit be uſed, it will be yet much finer. It may be made deeper or paler, by adding to, or diminiſhing the quantity of the ingredients, in proportion to that of the frit. *Neri's Art of Glaſs.*

GOLD *on China ware*.—The Gold on this ware is never laid on alone, but managed in the following manner: they grind it in water to a fine powder, and leave it to dry in the ſhade: They then mix with every ten grains of Gold one grain of ceruſs, and, incorporating the whole with gum water, they lay it on in the manner of other colours.

There have been many methods of imitating the colour and appearance of Gold in the baſer metals, but none of them come up to that of Mr. Homberg, which is performed in this manner: make an amalgame of one part pure copper and three parts quickſilver, boil this in river water for two hours, then diſtil off the quickſilver, and cohobate it once; take out the copper, and fuſe it, and it will be found of a beautiful Gold colour, and more ductile than common copper under the hammer, and is extremely fitted for watch work, gilding, and the finer machines and utenſils. *Shaw's Lectures.*

GOLD-*finch*. This bird is particularly fond of the buds of the gooſeberry-tree. They often come in whole droves at once into gardens, and will clear away the buds from the trees in a few days; they are eaſily ſhot, but the trees are uſually injured by this, ſo that it is better to lime the twigs. *Mortimer's Huſbandry.*

GOLD-*fiſh*, in zoology, a name by which ſome authors have called the alauſa or ſhad, from the yellow colour it frequently has on the covering of the gills. See a farther account of it under the article SHAD.

GOLD-*ſize*. The method of making Gold-ſize, or burniſhed gilding, or wood, is this: take a pound and a half of pipe clay, half an ounce of red chalk, a quarter of an ounce of black lead, forty drops of ſweet oil, and three drachms of pure tallow; grind the clay, chalk, and black lead, all ſeparately, very fine in water; then mix them together, and add the oil and tallow, and grind all to a due conſiſtence. This is the ſize now in uſe, and is accounted the better, the older it is.

GOLD *ſmith*, or, as ſome chuſe to expreſs it, ſilver-ſmith, the artiſt, who makes veſſels, utenſils, and ornaments in Gold or ſilver. The Gold-ſmith's work is either performed in the mould, or beat out with the hammer, or other engine. All works that have raiſed figures are caſt in moulds, and afterwards poliſhed and finiſhed; plates or diſhes of ſilver or Gold are beat out from thin flat plates, and tankards and other veſſels of that kind are formed of plates ſoldered together, and their mouldings are beat, not caſt. The buſineſs of the Gold-ſmith formerly required much more labour than it does at preſent, for they were obliged to hammer the metal from the ingot to the thinneſs they wanted: but there are now invented flatting mills, which reduce metal to the thinneſs that is required at a very ſmall expence. The Gold-ſmith is to make his own moulds, and for that reaſon ought to be a good deſigner, and have a taſte in ſculpture: he ought alſo to know enough of metallurgy to be able to aſſay mixed metals, and to mix the allay.

The Gold-ſmith in London employs ſeveral hands under him for the various articles of his trade. In this great city there are always hands that excel in every particular branch of the trade, and there is commonly employment for every one in his particular branch. The jeweller, the ſnuff-box and toy maker, the ſilver turner, the gilder, the burniſher, the chaſer, the refiner, and the Gold-beater, are all employed by and under the Gold-ſmith.

GO'LDEN *rod*, *virga aurea*, in botany, a very beautiful ſpecies of plants cultivated in our gardens, where they are very great and laſting ornaments, beginning to flower in May, and one kind or other of them continuing flowering till October.

They are all eaſily propagated by parting their roots in the ſpring, before they begin to ſhoot; they will grow in any ſoil, or ſituation; but they ſucceed beſt in a light freſh earth and an open expoſure, and ſhould be planted in the middle of large flower-beds: they are perennial plants, dying down to the ground, as ſoon as they have ripened their ſeeds, but riſing again the following ſpring. Theſe ſeeds ſown will very freely grow, and often produce varieties in the flower. *Miller's Gard. Dict.*

GOOSE, *anſer*, in the Linnæan ſyſtem of zoology, the term uſed to denote one of the orders of the feathered kingdom, the general character of which is that the mouth is dentated or toothed, and jagged or ſerrated.

Soland GOOSE, the Engliſh name of a large water fowl, called by authors anſer Baſanus.

It is of the ſize of the common Gooſe, and its wings are very long and capable of extending to a very remarkable breadth; its beak is long and ſtrait, and of a duſky grey, and a little hooked at the end. It has alſo, near the hooked part, two ſmall appendages like teeth. It is naked behind the eyes. Its mouth opens to a great width, and it ſeems to have no noſtrils; but, in the place of them, has a long furrow running nearly the whole length of the bill; it has alſo a row of ſerratures or indentings all along, provided by nature for its holding fiſh more firmly. Its feet are black, and all the four toes are connected by the ſame membrane. It is all over of a clear white, when full grown, except that the larger wing feathers have blackneſs, and the head with age is apt to become yellow. Its ſkin adheres but looſely to its fleſh, and the young are mottled with grey and brown. It flies well, but, if it fall on the ground, does not eaſily raiſe itſelf. They are a bird of paſſage, and build in the iſland of Baſs in Scotland, in vast numbers. Each female lays only one egg. The young Geese are esteemed a great delicacy, and sell at a great price. *Ray's Ornithology.*

GOO'SEBERRY-*bush.*—The Goosberry-bush is propagated either by suckers or cuttings, but the latter way is preferable, as the roots are less subject to shoot out suckers afterwards.

The best season for planting the cuttings is in February, just before the buds begin to open; observing always to take the handsomest shoots, and to pick them from such branches as produce the greatest quantity of fruit. The cuttings should be about eight inches long, and should be planted in a bed of light earth exposed to the morning sun; they must be planted about three inches deep, and watered to help their taking root. The shoots should all be rubbed off from these plants, as they put out, except those at the top, that there may be a regular stem. In the September following, they should be removed to a bed of fine light earth, and planted at two feet distance. They should remain here two years, and the cross branches at times be cut off, as also the lower ones, so as to keep a clean stem about a foot above the ground. They will then be fit to plant out where they are to stand; which should be in a light sandy loam. They should be kept from the shade of other trees; and, to have the fruit in its utmost perfection, should be set in an exposed place in rows of eight feet asunder, and each of the shrubs, six feet from the others in the rows. The best time for transplanting them is in October, after the leaves are fallen. *Miller's Gard. Dict.*

GOOSEBERRY-*galls*, in natural history, the name given by authors to a species of protuberances of the gall kind, found very frequently on the oak. They are of a roundish figure, and sometimes adhere to the tree by a short pedicle, but more frequently by a part of their spheric surface. They are usually found on the under side of the leaves of the oak, but sometimes on the pedicles of the leaves.

They are most frequent in spring, but they are found at all times when the leaves are upon the trees. These galls are greenish at first, and afterwards become yellowish, and finally red; in which last state they very much resemble the small red Goose-berry. They are very soft to the touch, and, when opened, are found to contain a juicy substance, with a cavity in the middle, in which there is lodged a single insect. This, according to the time in which the gall is opened, is found in the form of a white worm, or else of a white chrysalis, or finally of a small short-bodied four-winged fly of a black colour. For the creature does not leave the gall to go through any of its changes, put passes all its states in it. The gall, in all these cases, is found whole and unhurt; but, if one is opened in which there is a hole perceived, this is sure to be found empty, that being the passage by which the fly has made its way out. *Reaum. Hist. Inf.*

GOOSEBERRY-*worm*, in natural history, the name of an insect, found very frequently on the Gooseberry bushes, and usually supposed to be a caterpillar, but differing essentially from that genus of animals, and being one of those which the French call fauches chenilles. It has a round head, and has twenty-two legs, and finally becomes not a butter-fly, but a common four-winged fly. This worm is at first of a greenish colour, with some yellow variegations, and several black tubercles; but on the last change of its skin it becomes whitish or cream-coloured, and loses its tubercles. *Reaum. Hist. Inf.*

GRA'FTING (*Dict.*)—Mr. Du Hamel of the Academy of Sciences of Paris has observed that, in Grafting of trees, there always is found at the insertion of the graft a change in the directions of the fibres, and a sort of twisting or turning about of the vessels, which greatly imitates that in the formation of certain of the glands in animal bodies; and he very judiciously infers from thence, that, a sort of new viscus being formed by this means, the fruit may very naturally be so far influenced by it as to be meliorated on the new branch; but that no such sudden and essential changes can be effected by this means, as too many of the writers in agriculture pretend.

This author observes, however, that this anatomical observation alone would not have convinced him of the falsity of too many of these relations, had not experiment joined to confirm it; he tried many grafts on different trees, and, for fear of error, repeated every experiment of consequence several times; but all served only to convince him of the truth of what he at first suspected. He grafted in the common way the peach upon the almond, the plum upon the apricot, the pear upon the apple, the quince, and the white thorn; one species of plum on other very different species, and upon the peach, the apricot, and the almond; all these succeeded alike, the species of the fruit was never altered, and, in those which would not come to fruit, the leaves, the wood, and the flowers, all were the same with those of the tree from which the graft was taken.

Authors in agriculture have mentioned also a very different sort of Grafting, that is, the setting grafts of one tree on stocks of a different genus of trees; such as the Grafting the pear upon the oak, the elm, the maple, or the plum; the mulberry upon the elm, the quince, and the fig; the cherry upon the laurel; the peach upon the hazel; the vine upon the cherry-tree, and upon the hazel; and the like unnatural conjunctions. Mr. Du Hamel tried all these separately and carefully, and the event proved very plainly, that those who had mentioned them had never tried them; and a natural conclusion from this was, that there must be a natural alliance between the graft and the stock which receives it, otherwise it will never grow at all, or else very soon perish. *Memoirs Acad. Par.* 1727.

Tools necessary for GRAFTING. In order to Grafting, a person must be provided with the following tools: 1. A neat and small hand-saw to cut off the heads of large stocks. 2. A strong knife with a thick back to make clefts in the stocks. 3. A sharp penknife to cut the grafts. 4. A Grafting chissel and a small mallet. 5. Brass strings, or else woollen yarn, to fasten on the grafts with; and, finally, a quantity of clay, which should be prepared a month before it is used, and kept turned and worked about every day like mortar. The best mixture for this matter is: a quantity of strong fat and viscous loom must be got, and into this must be well beat and mixed some stone-horse dung and some chopped straw cut very short and small; finally, a quantity of common salt must be thrown in; this must be mixed up and beat together into a paste with water, but it must not be exposed to the frosts. This is equally proper to be employed for all the different sorts of Grafting. *Miller's Gard. Dict.*

GRAIN *of iron.* Even iron has its grain as well as wood, and that not the same in all iron, though all iron is very evidently the same species of body. The common cast iron has a Grain very different from that which has been hammered, or wrought; the granules, which compose the mass, being in this last state forced as it were into combinations with one another, by the repeated blows of the hammer; the tempering of iron into steel also alters its grain, partly by means of the salts and sulphurs, which are by that operation introduced into it, and partly by the stopping the effect of the fiery particles received into it at a certain time.

But besides these differences, the common wrought iron has, in its several pieces, or sometimes in the several parts of the same piece, different grains. First a laminated ore, secondly a granulated one, and thirdly a fibrose one. These, however, are not so different in reality, as they appear to be; for the laminæ, as they become smaller, become granules; and arrangements of these granules, in long lines, make the fibres of the thready kind. The artificers, however, know, by these marks of the Grain, what iron is fittest for tempering into steel, and they find the laminated pieces to be the worst of all, and the granulated ones the best. *Mem. Acad. Scien. Par.*

GRAIN *weight.* The Grain weight in use among jewellers is one fourth of a carat; and the carat is about the one hundred and fiftieth part of an ounce troy, according to Mr. Jeffries, in his treatise on Diamonds and Pearls.

Hence, the jeweller's Grain is to the troy Grain, inversely, as 600 is to 480, that is, directly as 4 to 5.

GRA'MEN, *grass*; see the article GRASS.

GRA'MPUS, in ichthyology, an English name given to one of the cetaceous fishes, properly of the genus of the delphinus, or dolphin, according to the new Artedian system, and distinguished from the others of that genus by the name of the dolphin, with the snout bending upwards, and with broad serrated teeth. This is the orca of almost all the antient as well as modern writers, and is called the loper and north caper by the people of Scotland. Sibbald gives it the name of the balæna, but he distinguishes it from the common whale by its smaller size, and having teeth in both the jaws. Paulus Jovius calls it also capidolius. These are all the names it is known by; and that of porpoise is sometimes ignorantly given to it, but properly belongs to another species of the same genus, the phocæna.

GRANADI'LLA, *passion-flower*, a beautiful flower, greatly propagated, in our gardens, by laying down their branches, which in one year's time will take good root, and may then be removed to the places where they are designed to remain; the best season for transplanting these plants is towards the latter end of October, or the end of March, or the beginning of April, just before they begin to shoot; for, if they are removed earlier, and it should prove dry frosty weather, with cold north-east winds (as it often happens in March) these plants will scarcely endure it, which is the occasion of the death of so many of them, as is often observed upon transplantation; but those which are removed early in the autumn, rarely fail.

The plants should be planted against a wall, or other building, which should face the south-east or south-west; or else intermixed amongst flowering shrubs in quarters; where, if they are regularly trained up to poles, they will flower extremely well, and have a very good effect in diversifying such plantations. The best season for pruning of these plants is in the spring, after the cold weather is past; for, if they are pruned very early, and it should happen to be frosty weather afterwards, it would endanger most of the young branches: therefore it is much the better way to let the whole plant remain untouched (suffering the rude part to hang down before the stem and branches) during the winter season, which will be of service in protecting them from the severity of the cold; and, if at Michaelmas you lay a little dung, or other mulch,

about a foot thick, upon the surface of the ground near the stems, it will effectually guard their roots from frost; which method should be constantly practised with such as are planted in open quarters. The manner of pruning is nothing more than to cut off all the small weak shoots, and shorten the strong ones to about three feet in length: or, if the building is high, against which they are planted, they may be left much longer, though you should be careful not to leave them too long; for, as they are vigorous growing plants, they will soon get above the building, and become troublesome.
Those that are planted in quarters, and trained to stakes, must be cut shorter, in order to have the flowers nearer the ground: these, when their season for flowering is past, should have a little mulch laid about their roots; and then their stakes may be taken away, suffering their branches to lie upon the ground, which will also be of service to protect the plants from the injuries of the winter; and in the beginning of April they may be trimmed, and staked up again: and, when the plants begin to shoot, they should constantly be kept trained up to the stakes, whereby they will not only appear handsome, but the place will be clearer to work in, as also to pass through.

The fruit-bearing kind may also be propagated, by sowing of the seeds in the spring of the year, in pots filled with light rich earth, which should be plunged into a moderate hot bed, to facilitate the growth of the seeds; and, when the plants are come up, you must harden them by degrees to bear the open air: in these pots they should remain till the succeeding spring, observing to shelter them in winter under a frame; or else place the pots into the earth under a warm wall, to prevent their roots from freezing through the pots; and the beginning of April you may shake them out of the pots, and divide the plants from each other, planting them in the places where they are designed to remain; or, if you have not the ground ready, they may be put each into a separate pot; so that they may at any time be turned out into the ground, without disturbing their roots; for they are difficult plants to remove, when old.

These plants may also be planted to cover arbours or seats in warm-situated places, where they will flower extremely well, and answer the purposes of those arbours, as well as any other plants which are at present made use of. *Miller's Gard. Dict.*

GRANA'DO (*Dict.*)—Granadoes of different kinds are represented, *plate* XXXV. *fig.* 17, in the Dictionary.

GRA'NARY, a building for preserving corn, &c.

Experimental philosophy has proved that the air is the great source of corruption; keep out that, and all is kept out; and the most corruptible substances, such as meal, butter, milk, and the like, have been preserved fresh four months in the exhausted receiver of an air-pump.

They have, near Grand Cairo, a magazine or Granary, defended with good walls, and called Joseph's Granaries. It is not probable that they are quite so old as the days of that patriarch, but they abundantly prove the utility of such storehouses, by the vast quantities of grain annually preserved in them.

Many parts of Africa abound with Granaries of this kind.

They are so many deep pits made in the solid rock; the descent into them is but just large enough for a man to go down into them by, but they grow larger, as soon as the person is in, and are usually square, from thirty to forty feet in diameter. In these the great men of the country preserve their corn; they first strew over the floor with straw, then they lay on the corn; still, as the heap rises, placing a thin bed of straw between the corn and the sides, as they did at the bottom. In this manner they proceed till the whole cavity is filled: when this is done, they cover the mouth of the entrance with a sort of hurdle of green boughs of trees, interwoven one with another. This they cover with about two feet thickness of sand, and over this raise a ridge of earth, well beat together, in order to throw off the rain both ways, that none may settle on the place and soak into the magazine.

The corn thus stored up always keeps three, four, or more years very good; and, not unfrequently, the proprietor being taken off by the severity of the eastern governments, under which they live, the magazine is forgotten, and, some accident discovering it many years afterwards, the corn is almost always found perfectly good in it. All the care they take, in regard to the corn, is to expose it two or three days to the sun's heat, to dry it thoroughly, before they carry it into the magazine.

In the dutchy of Lithuania and in the Ukraine, the people always preserve their corn in the same manner in wells or pits made in dry places; but in these countries great care is to be taken in the opening these store-rooms; for, if people descend into them, before they have had sufficient communication with the fresh air, they are often killed by the damps; this, however, is easily guarded against. By these, and numerous other instances of the practice of other countries, it appears evident, that the advantage of these subterranean Granaries over all others is very great.

Though these are to be recommended before all others, yet the common Granaries may, with proper care, be rendered greatly more useful than they are at present. The grand caution necessary to this purpose is to guard against the two great humidity, which there always is in places, where there is a great number of doors and windows. A too free access of the external air is also to be carefully guarded against; for this brings in with it the eggs of a vast number of different insects, which prey upon and destroy the corn. A third caution is, when the corn is the produce of the country, where it is preserved, not to fill the place with the crop of one place only, but to mix the harvests of two as different provinces as may be, the one dry, the other moist, or otherwise differing as much as may be; thus, the contrary qualities of the one will prevent the destruction of the other. These are the three great rules to prevent the corrupting of corn; but, when the mischief is once begun, it will prove very difficult to stop it: all the care that can be employed, should therefore be taken in regard to these.

The two great cautions to be observed in the erecting of Granaries are to make them sufficiently strong, and to expose them to the most drying winds. The ordering of the corn in many parts of England is thus: to separate it from dust and other impurities after it is thrashed, they toss it with shovels from one end to the other of a long and large room; the lighter substances fall down in the middle of the room, and the corn only is carried from side to side, or end to end of it. After this, they screen the corn, and, then bringing it into the Granaries, it is spread about half a foot thick, and turned from time to time about twice in a week; once a week they also repeat the screening it. This sort of management they continue about two months, and after that they lay it a foot thick for two months more, and in this time they turn it once a week, or twice, if the season be damp, and now and then screen it again. After about five or six months, they raise it to five or six feet thickness in the heaps, and then they turn it once or twice in a month, and screen it now and then. When it has lain two years, or more, they turn it once in two months, and screen it once a quarter, and, how long soever it is kept, the oftener the turning and screening is repeated, the better the grain will be found to keep.

It is proper to leave an area of a yard wide on every side the heap of corn, and other empty spaces, into which they turn and toss the corn, as often as they find occasion. In Kent they make two square holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and so up again, to turn and air it the better. Their screens are made with two partitions, to separate the dust from the corn which falls into a bag; and, when sufficiently full, this is thrown away, the pure and good corn remaining behind.

Corn has by these means been kept in our Granaries thirty years; and it is observed, that, the longer it is kept, the more flower it yields in proportion to the corn, and the purer and whiter the bread is, the superfluous humidity only evaporating in the keeping. At Zurich, in Swisserland, they keep corn eighty years or longer, by the same sorts of methods.

The public Granaries at Dantzick are seven, eight, or nine stories high, having a funnel in the midst of every floor to let down the corn from one to another. They are built so securely, that, though every way surrounded with water, the corn contracts no damp, and the vessels have the convenience of coming up to the walls for their lading. The Russians preserve their corn in subterranean Granaries of the figure of a sugar-loaf, wide below, and narrow at top: the sides are well plaistered, and the top covered with stones. They are very careful to have the corn well dried before it is laid into these storehouses, and often dry it by means of ovens; the summer dry weather being too short to effect it sufficiently. *Philosophical Transactions*, N°. 26.

There are nine Granaries built in a large subterraneous cavern, near the town of Ardres, a little strong place near Calais, designed to hold corn for the garrison in case of a siege; these are commonly called the poires D'Ardres; from their model, I have drawn the plan and profiles on *plate* XXI. *fig.* 12, 13, 14. They may be made bigger or less than these exhibited here, as occasion may require, or the convenience of the place affords opportunity. I have only given the draught of six, which will will be sufficient to shew their disposition: dig thirty feet deep in the ground, and build a first vault to have the cavern G, G, represented in the 14th figure, and at the same time raise the poires or stone cylinders F F, whose top terminating into a half sphere abuts on a second vault level with the ground floor; every poire must stand by itself, because the air circulating round freely will keep the corn drier; these might be built in other places, as between two floors, instead of subterraneous caverns, but they would not be so safe, in any other situation, from cannon.

Each poire has two apertures E and G, one on the top to take in the corn, the other at bottom to let it out; the first ought to be eighteen inches square, and is shut with a trap-door; the other which terminates in a pipe is shut by a clap-door which turns upon a hinge, and is fastened by a padlock.

All who know these poires agree nothing can be better contrived; I am of opinion they might be of excellent use to preserve ferve gunpowder, as they would contain larger quantities than the magazines made ufe of at prefent for that purpofe with equal fafety.

GRAPES.—Thofe kind of Grapes which are thin-fkinned, grow fooner ripe than others, and will thrive in a temperate climate where the others will not. If it happens that Grapes are ftruck with hail at the time that they are large and near ripening, they never become ripe at all, but harden and fo remain. *Portzius de Vin Rhen.*

We have in the Philofophical Tranfactions a remarkable account of the change of colour in Grapes of the fame tree. A mufcadine Grape tree was raifed from a cutting of a parent vine of this kind, whofe fruit was white; it was planted againft an eaftern wall, where it had the benefit of the fun, from its rifing, to half an hour after twelve. The foil a ftiff clay, but rendered fitter for the growth of this fort of tree, by a mixture of rubbifh of an old wall.

At about five years ftanding it was fo pruned, as to make it fhoot two principal branches, one to the right, the other to the left-hand; from hence it fhot twenty-two inches on each fide before it came to a joint. That on the right was a very luxuriant branch, as thick as the body of the tree; the other about half that bignefs. The leaves on the right-hand were alfo of twice the bignefs of thofe on the left, and indeed larger than the leaves of the parent tree; but what is moft fingular is, that the luxuriant branch produced annually fine black Grapes in large bunches, and the left hand branch white ones. But the white were often in the greateft quantity, though the black grew on the much ftronger branch. It is obfervable, that, in all thofe vines which bear black and blue Grapes, the leaves die red; but in this tree, whofe origin was from a white Grape, the leaves on that branch which bore black Grapes died white as well as thofe on the other. The fucceeding year, the number of the branches on the right-hand fhoot were greatly increafed in number, and the fucceeding year all bore fine deep-black Grapes in very large numbers. *Philofophical Tranfactions*, N°. 366.

GRASS, *gramen*.—There are a great variety of this tribe, which are divided into feveral genera by fome of the modern botanifts; but I fhall not inlarge fo far on this article, as to enumerate all the differences which they have made; but fhall beg leave to infert fome of the forts which are commonly found wild in England, or that have been introduced into the fields or gardens from abroad.

The beft feafon for fowing Grafs feed is the latter end of Auguft, and the beginning of September, that the Grafs may be well rooted before the froft fet in, which is apt to turn the plants out of the ground, when they are not well rooted. This feed fhould be fown in moift weather, or when there is a profpect of fhowers, which will foon bring the Grafs up; for, the earth being at that feafon warm, the moifture will caufe the feed to vegetate in a few days: but, where this cannot be performed in autumn, the feeds may be fown in the fpring; towards the middle of March will be a good time, if the feafon proves favourable.

The land on which Grafs feed is intended to be fown, fhould be well plowed, and cleared from the roots of noxious weeds, fuch as couch Grafs, fern, rufhes, heath, gorfe, broom, reftharrow, &c. which, if left in the ground, will foon get the better of the Grafs, and over-run the land. Therefore, in fuch places where either of thefe weeds abound, it will be a good method to plow up the furface in April, and let it lie fome time to dry; then lay it in fmall heaps, and burn it. The afhes fo produced, when fpread on the land, will be a good manure for it. The method of burning the land is particularly ufeful; (fee the article BURNING *of land*;) efpecially, if it is a cold ftiff foil; but where couch Grafs, fern, or reft-harrow, is in plenty, whofe roots run far under ground, the land muft be plowed two or three times pretty deep in dry weather, and the roots carefully harrowed off each plowing; which is the moft fure method to deftroy them. Where the land is very low, and of a ftiff clayey nature, which holds water in winter, it will be of fingular fervice to make fome underground drains to carry off the wet; which, if detained too long on the ground, will render the Grafs four. The method of making thefe drains is prefcribed under the article LAND, which fee.

Before the feed is fown, the furface of the ground fhould be made level and fine, otherwife the feed will be buried unequal. The quantity of Grafs-feed for an acre of land is ufually three bufhels, if the feed is clean, otherwife there muft be a much greater quantity allowed: when the feed is fown, it muft be gently harrowed in, and the ground rolled with a wooden roller; which will make the furface even, and prevent the feeds being blown in patches. When the Grafs comes up, if there fhould be any bare fpots, where the feed has not grown, they may be fown again, and the ground rolled, which will fix the feeds; and the firft kindly fhowers will bring up the Grafs, and make it very thick.

Some people mix clover and rye Grafs together, allowing ten pounds of clover, and one bufhel of rye Grafs, to an acre: but this is only to be done where the land is defigned to remain but three or four years in pafture, becaufe neither of thefe kinds are of long duration; fo that, where the land is defigned to be laid down for many years, it will be proper to fow with the Grafs-feed fome white trefoil, or Dutch clover; which is an abiding plant, and fpreads clofe on the furface of the ground, fending forth roots at every joint; and makes the clofeft fward of any, and is the fweeteft feed for cattle: fo that, whenever land is laid down to pafture, there fhould always be fix or eight pounds of this feed fown upon each acre.

The following fpring, if there fhould be any thiftles, ragwort, or fuch other troublefome weeds, come up among the Grafs, they fhould carefully be cut up with a fpaddle before they grow large; and this fhould be repeated two or three times in the fummer, which will effectually deftroy them; for, if thefe plants are fuffered to ripen their feeds, they will be blown all over the ground, their feeds having down adhering to them, which affifts their tranfportation; fo that they are often carried by the wind to a great diftance, and thereby become very troublefome weeds to the Grafs. For want of this care, how many paftures may be feen almoft over-run with thefe weeds, efpecially the ragwort; when a fmall expence, if applied in time, would have intirely extirpated them! for a man may go over feveral acres of land in one day with a fpaddle, and cut up the weeds juft below the furface of the ground, turning their roots upwards; which, if done in dry weather, they will foon decay; but this muft always be performed before the plants come to have their feeds formed; becaufe, after that, many forts will live long enough to nourifh their feeds after they are cut, fo as to ripen them: and there will be a fupply of weeds for fome years after, which cannot be extirpated without a much greater expence.

The proper management of pafture land is the leaft underftood of any part of agriculture: the farmers never have attended to this, being more inclined to the plough; though the profit attending that has not of late years been fo great, as to encourage them in that part of hufbandry: but thefe people never think of laying down land for pafture, to continue longer than three years; at the end of which time they plow it up again, to fow it with grain.

Their ufual method is to fow rye Grafs and trefoil with barley, when they intend to lay down the ground; or fometimes fow only clover with the barley; nor is it poffible to convince thefe people of their error in fowing corn with this Grafs; which they affirm to be ufeful, in fhading the Grafs; not confidering how much the corn draws away the nourifhment from the Grafs: but it is in vain to write to thefe people, who are not to be convinced, either by argument or experiment; fo much are they led by cuftom, as not to be led or driven out of their own methods; but, as their practice of hufbandry has greatly leffened the circumftances of the farmers, fo that the lands are daily falling into the hands of the owners, therefore, this part of hufbandry fhould by them be principally attended to, as it may be carried on with a much lefs expence: for pafture land requires but few hands to manage; whereas the fowing of corn is attended with great expence, and the profit is very precarious: but, when this is attended with fuccefs, and the grain at a moderate price, if the whole labour is to be paid for, there will be little coming to the owner for rent, when the balance is fairly ftated; but in this moft gentlemen deceive themfelves, and often fuppofe they gain by farming, when, perhaps, the whole rent of the land is loft: therefore, to avoid the trouble which attends this fort of hufbandry, it will be the beft method to turn as much of their land into pafture, as they can; which, by grazing and feeding of fheep, will be attended with little expence, and a fure profit. *Miller's Gard. Dict.*

GRA'SSHOPPERS.—Thefe animals are of the locuft kind, and fometimes come in fwarms to particular places, in the fame manner as that devouring creature does. They appeared fome years ago in Languedoc, and fome other places, in very formidable fwarms, and eat up all the harveft of feveral years. They took their flight like birds, and were about an inch long, and of a grey colour, in fhape only like the common Grafshoppers. They were found in many places covering the whole furface of the earth four or five inches deep, and ufed to lie quiet till towards noon; but, when the fun then fhone warmly upon them, they ufed to arife and take wing, and, fettling on the corn fields, they would in a few hours eat up the whole produce, ears, leaves, and even the more tender parts of the ftalks. When they had deftroyed one field in this manner, they ufed to take wing and fly to another. They ufually flew very high in the air, and directly againft the wind; but, as foon as they faw a new crop of corn, they dropped together in a fwarm, and cleared it as they had done the firft. This practice they continued the whole day, and towards evening they fettled upon the ground, where they remained quiet till the heat of the following day raifed them again. When they had deftroyed all the corn in the country, they feized upon the vines, gardenherbs, and willows, and at laft upon hemp, whole fields of which they eat up, notwithftanding its great bitternefs. Towards autumn, they left off feeding, and were found in copulation, and foon after this, the females every-where feen laying their eggs, which they depofited in the ground, making a hole with their tail large enough to receive a goofe quill.

In thefe holes every female would lay forty or fifty eggs, each of the fize of a millet feed, and when they had finifhed the laying, they covered up the hole to keep out the water; after this they died a-pace, and the multitudes of their carcasses stunk intolerably, poisoning the air. The next year they hatched in April, and from this one swarm there were such prodigious numbers hatched, that fifteen tons of them were destroyed, while no bigger than flies, and nine tons of their eggs before the hatching, and yet there remained enough of them to destroy, in a great measure, the succeeding harvest. After this, they gradually decreased for several years, till they were not more numerous there than elsewhere. This was attributed to the industry of the farmers in killing them; but it is more probable, that unfavourable seasons destroyed them. *Philosophical Transactions*, N°. 182.

GRAVEL, in gardening.—Gravel and grass are naturally ornaments to a country-seat, and are the glory of the English gardens, and things by which we excel all other nations, as France, Holland, Flanders, &c.

There are different sorts of Gravel, but, for those who can conveniently have it, I approve of that Gravel on Black-heath, as preferrable to most we have in England; it consisting of smooth even pebbles, which, when mixed with a due quantity of loam, will bind exceeding close, and look very beautiful, and continue handsome longer than any other sort of Gravel, which I have yet seen.

Some recommend a sort of iron-mould Gravel, or Gravel with a little binding loam amongst it, than which nothing, they say, binds better, when it is dry: but in wet weather is apt to stick to the heels of one's shoes, and will never appear handsome.

Sometimes loam is mixed with Gravel that is over sandy or sharp, which must be very well blended together, and let lie in heaps; after which it will bind like a rock.

There are many kinds of Gravel which do not bind, and thereby cause a continual trouble of rolling, to little or no purpose: as for such,

If the Gravel be loose or sandy, you should take one load of strong loam, and two of Gravel, and so cast them well together.

There are many different opinions about the choice of Gravel: some are for having the Gravel as white as possible; and, in order to make the walks more so, they roll them well with stone-rollers, which are often hewn by the masons, that they may add a whiteness to the walks: but this renders it very troublesome to the eyes, by reflecting the rays of light so strongly; therefore, this should ever be avoided; and such Gravel as will lie smooth, and reflect the least, should be preferred.

If it be an old walk, that only wants coating over, it will be sufficient to lay it two or three inches thick: but, where there is plenty of strong reddish loam, you may lay it the full depth.

Some screen the Gravel too fine, but this is an error: if it be cast into a round heap, and the great stones only raked off, it will be the better.

Some are apt to lay Gravel-walks too round; but this is likewise an error, because they are not so good to walk upon, and, besides, it makes them look narrow: one inch is enough in a crown of five feet; and it will be sufficient, if a walk be ten feet wide, that it lies two inches higher in the middle, than it does on each side; if fifteen feet, three inches; if twenty feet, four; and so in proportion.

For the depth of Gravel-walks, six or eight inches may do well enough; but a foot thickness will be sufficient for any; but then there should always be a depth of rubbish laid under the Gravel, especially if the ground is wet; in which case there cannot be too much care to fill the bottom of the walks with large stones, flints, brick-rubbish, or any other materials, which can be best procured; which will drain off the moisture from the Gravel, and prevent its being poachy in wet weather.

In the making of Gravel-walks, there must be great regard had to the level of the ground, so as to lay the walks with easy descents towards the two parts of the ground, that the wet may be drained off easily; for, when this is omitted, the water will lie upon the walks a considerable time after hard rains, which will render them unfit for use, especially where the ground is wet or strong: but where the ground is level, and there are no declivities to carry off the wet, it will be proper to have sink-stones laid by the sides of the walks, at convenient distances, to let off the wet; and where the ground is naturally dry, that the water will soon soak away, the drains from the sink-stones may be contrived so, as to convey the water in sesspools, from which the water will soak away in a short time: but, in wet land, there should be under-ground drains, to convey the wet off, either into ponds, ditches, or the nearest place to receive it; for, where this is not well provided for, the walks will never be so handsome, or useful.

The month of March is the properest time for laying Gravel: it is not prudent to do it sooner, or to lay walks in any of the winter-months before that time.

Some indeed turn up Gravel-walks in ridges in December, in order to kill the weeds: but this is very wrong; for, besides that it deprives them of the benefit of them all the winter, it does not answer the end for which it is done, but rather the contrary; for, though it does kill the weeds for the present, yet, it adds a fertility to them, as to the great future increase of both them and grass.

If constant rolling them after the rains and frost will not effectually kill the weeds and moss, you should turn the walks in March, and lay them down at the same time.

In order to destroy worms that spoil the beauty of Gravel or grass-walks, some recommend the watering them well with water, in which walnut-tree leaves have been steeped, and made very bitter, especially those places most annoyed by them; and this, they say, as soon as it reaches them, will make them come out hastily, so that they may be gathered: but, if in the first laying of the walks, there is a good bed of lime-rubbish laid in the bottom, it is the most effectual method to keep out the worms; for they do not care to harbour near lime.

Grounds that are gravelly and sandy, easily admit both heat and moisture: but they are not much the better for it; because they let it pass too soon, and so contract no ligature; or else, if they have a clayey bottom, they retain it too long, and by that means either parch or chill too much, and produce nothing but moss, or cancerous infirmities: but, if the bottom be a Gravel, and there are two feet of good earth upon the surface, it is preferrable to most other soils for almost any sort of fruit; for, though this soil will not produce the fruit planted thereon, so large as a loamy soil, yet they will be much better tasted, and earlier ripe. *Miller's Gard. Dict.*

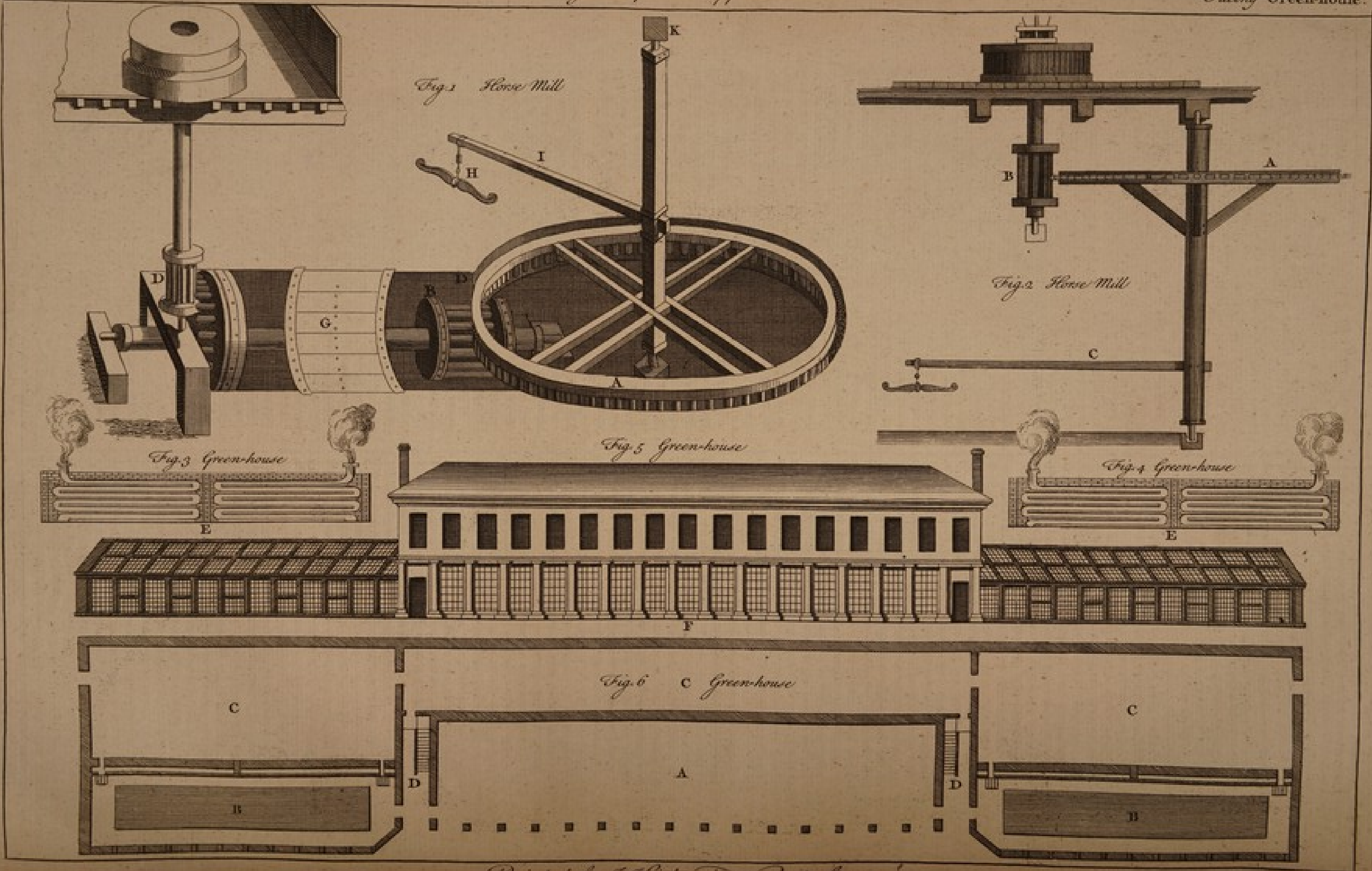
GREEN (*Dict.*).—The finest method of giving this beautiful colour to glass is this: take five pounds of crystalline metal, that has been passed several times through water, and the same quantity of the common white metal of polverine, four pounds of common polverined frit, and three pounds of red-lead; mix the red-lead well with the frit, and then put all into a pot in a furnace. In a few hours the whole mass will be well purified; then cast the whole into water, and separate, and take out the lead; then return the metal into the pot, and let it stand a day longer in fusion; then put in the powder of the residuum of the vitriol of copper, and a very little crocus martis, there will be produced a most lively and elegant Green, scarce inferior to that of the oriental emerald. There are many ways of giving Green to glass, but all are greatly inferior to this. *Neri's Art of Glass.*

GREEN-*house* (*Dict.*)—As, of late years, there have been great quantities of curious exotic plants introduced into the English gardens, so the number of Green-houses or conservatories has increased; and not only a greater skill in the management and ordering of these plants has increased therewith, but also a greater knowledge of the structure and contrivance of these places, so as to render them both useful and ornamental, hath been acquired: and, since there are many particulars to be observed in the construction of these houses, whereby they will be greatly improved, I thought it necessary not only to give the best instructions for this I was capable of, but also to give a design of one in the manner I would chuse to erect it, upon *plate* XXIV.

As to the length of these houses, that must be proportioned to the number of plants they are to contain, or the fancy of the owner; but their depth should never be greater than their height in the clear; which in small or middling houses may be sixteen or eighteen feet; but, for large ones, from twenty to twenty-four feet is a good proportion; for, if the Green-house is long, and too narrow, it will have a bad appearance both within and without; nor will it contain so many plants, if proper room be allowed for passing in front, and on the backside, of the stands on which the plants are placed: and on the other hand, if the depth of the Green-house is more than twenty-four feet, there must be more rows of plants placed to fill the house, than can with conveniency be reached in watering and cleaning; nor are houses of too great depth so proper for keeping of plants, as those of a moderate size.

The windows in front should extend from about one foot and an half above the pavement, to within the same distance of the ceiling, which will admit of a cornice round the building, over the heads of the windows. As it is necessary to have these windows so long, it will be impossible to make them in proportion as to their breadth; for, if in the largest buildings, the sashes are more than seven, or seven and an half feet broad, they will be so heavy and troublesome to move up and down, as to render it very difficult for one person to perform; beside their weight will occasion their soon decaying. There is also another inconvenience in having the windows too broad; which is, that of fixing proper shutters to them, in such a manner, as that they may fall back close to the piers, so as not to be incommodious; or, when open, to abstract any part of the rays of light from reaching the plants. The piers between these windows should be as narrow as possible to support the building; for which reason I should chuse to have them of stone, or of hard well burnt bricks; for, if they are built with fine rubbed bricks, those are generally so soft, that the piers will require to be made thicker, and the building will be in danger of falling in a short time; especially, if you have any rooms over the Green-house; which is what I would always advise, as being of great use to keep the frost out in very hard winters. If these piers are made of stone, I would advise them to be two feet and an half in front, and sloped off backward to about eighteen inches broad; whereby the rays of the sun will not be taken off or obstructed by the corners of the piers; which it would be, if they were square: but, if they are built with bricks, it will be proper to make them three feet in front, otherwise they

PLATE XXIV. *Engraved for the Supplement.* *Facing* Green-house.



Printed for J. Hinton in Newgate Street.

will be too weak to ſupport the building: theſe I would alſo adviſe to be ſloped off in the manner directed for the ſtone.

At the back of the Green-houſe, there may be erected an houſe for tools, and many other purpoſes; which will be extremely uſeful, and alſo prevent froſt from entering the houſe that way; ſo that the wall between theſe need not be more than two bricks and an half in thickneſs; whereas, were it quite expoſed behind, it ſhould be at leaſt three bricks in thickneſs; and, by this contrivance, if you are willing to make an handſome building, and to have a noble room over the Green-houſe, you may make the room over the tool-houſe, and carry up the ſtair-caſe in the back, ſo as not to be ſeen in the Green-houſe; and, hereby you may have a room twenty-five or thirty feet in width, and of a proportionable length: and, under this ſtair-caſe, there ſhould be a private door into the Green-houſe, at which the gardener may enter in hard froſty weather, when it will not be ſafe to open any of the glaſſes in the front. The floor of the Green-houſe, which ſhould be laid either with marble, ſtone, or broad tiles, according to the fancy of the owner, muſt be raiſed two feet above the ſurface of the ground whereon the houſe is placed; which, in dry ground, will be ſufficient: but, if the ſituation be moiſt and ſpongy, and thereby ſubject to damps, it ſhould be raiſed at leaſt three feet above the ſurface: and, if the whole is arched with low brick arches, under the floor, it will be of great ſervice in preventing the damps riſing in winter, which are often very hurtful to the plants, eſpecially in great thaws, when the air is often too cold to be admitted into the houſe, to take off the damps. Under the floor, about two feet from the front, I would adviſe a flue of about ten inches in width, and two feet deep, to be carried the whole length of the houſe, which may be returned along the back part, and be carried up in proper funnels adjoining to the tool-houſe, by which the ſmoke may paſs off. The fire-place may be contrived at one end of the houſe; and the door at which the fuel is put in, as alſo the aſh-grate, may be contrived to open into the tool-houſe, ſo that it may be quite hid from the ſight, and be in the dry; and the fuel be laid in the ſame place, whereby it will always be ready for uſe.

I ſuppoſe many people will be ſurpriſed to ſee me direct the making flues under a Green-houſe, which has been diſuſed ſo long, and by moſt people thought of ill conſequence; as indeed they have often proved, when under the direction of unſkilful managers, who have thought it neceſſary, whenever the weather was cold, to make fires therein. But, however injurious flues have been under ſuch management, yet, when ſkilfully managed, they are of very great ſervice: for, though, perhaps, it may happen, that there will be no neceſſity to make any fires in them for two or three years together, as, when the winters prove mild, there will not, yet, in very hard winters, they will be extremely uſeful to keep out the froſt; which cannot be effected any other way, but with great trouble and difficulty.

Withinſide of the windows, in front of the Green-houſe, you ſhould have good ſtrong ſhutters, which ſhould be made with hinges, to fold back, that they may fall back quite cloſe to the piers, that the rays of the ſun may not be obſtructed thereby. Theſe ſhutters need not to be above an inch and an half thick, or little more; which, if made to join cloſe, will be ſufficient to keep out our common froſt: and, when the weather is ſo cold as to endanger the freezing in the houſe, it is but making a fire in your flue, which will effectually prevent it: and without this conveniency it will be very troubleſome, as I have often ſeen, where perſons have been obliged to nail mats before their windows, or to ſtuff the hollow ſpace between the ſhutters and the glaſs with ſtraw; which, when done, is commonly ſuffered to remain till the froſt goes away; which, if it ſhould continue very long, the keeping the Green-houſe cloſely ſhut up will prove very injurious to the plants: and as it frequently happens, that we have an hour or two of ſun-ſhine in the middle of the day, in continued froſts, which is of great ſervice to plants, when they can enjoy the rays thereof through the glaſſes; ſo, when there is nothing more to do than to open the ſhutters, which may be performed in a very ſhort time, and as ſoon ſhut again when the ſun is clouded, the plants may have the benefit thereof, whenever it appears; whereas, where there is ſo much trouble to uncover, and as much to cover again, it would take up the whole time in uncovering and ſhutting them up, and thereby the advantage of the ſun's influence be loſt. Beſides, where there is ſo much trouble required to keep out the froſt, it will be a great chance if it be not neglected by the gardener: for, if he be not as fond of preſerving his plants, and as much in love with them, as his maſter, this labour will be thought too great by him; and, if he takes the pains to cover the glaſſes up with mats, &c. he will not care to take them away again, until the weather alters; ſo that the plants will be ſhut up cloſe during the whole continuance of the froſt.

There are ſome people who commonly make uſe of pots filled with charcoal to ſet in their Green-houſe in very ſevere froſts; but this is very dangerous to the perſons who attend theſe fires; and I have often known they have been almoſt ſuffocated therewith; and at the ſame time they are very injurious to the plants: nor is the trouble of tending upon theſe ſmall; and the many hazards, to which the uſe of theſe fires is liable, have juſtly brought them into diſuſe with all ſkilful perſons; and, as the contrivance of flues, and of the fires, are but ſmall charges, they are much to be preferred to any other method for warming the air of the houſe.

The back part of the houſe ſhould be either laid over with ſtucco, or plaiſtered with mortar, and white-waſhed; for otherwiſe the air in ſevere froſt will penetrate through the walls, eſpecially, when the froſt is attended with a ſtrong wind; which is often the caſe in the moſt ſevere winters. There are ſome perſons who are at the expence of wainſcoting their Green-houſes; but, when this is done, it is proper to plaiſter with lime and hair behind the wainſcot, to keep out the cold; and, when they are lined with wainſcot, they ſhould be painted white, as ſhould the ceiling, and every part withinſide of the houſe: for this reflects the rays of light in much greater quantity than any other colour, and is of ſignal ſervice to plants, eſpecially in the winter, when the houſe is pretty much cloſed, and but a ſmall ſhare of light is admitted through the windows: for, at ſuch times, I have obſerved, that in ſome Green-houſes which have been painted black, or of a dark colour, the plants have caſt moſt of their leaves.

Where Green-houſes are built in ſuch places as will not admit of rooms over them, or the perſon is unwilling to be at the expence of ſuch building, there muſt be care taken to keep out the froſt from entering through the roof. To prevent which, it will be very proper to have a thickneſs of reeds, heath, or furz, laid between the ceiling and the tiles: in the doing of which, there muſt be care taken in framing the joiſts, ſo as to ſupport theſe, that their weight may not lie upon the ceiling; which might endanger it: for theſe ſhould be laid a foot thick at leaſt, and as ſmooth as poſſible, and faſtened down well with laths, to prevent their riſing; and then cover it over with a coat of lime and hair, which will keep out the air, and alſo prevent mice, and other vermin, from harbouring in them; which, if left uncovered, they would certainly do. For want of this precaution, there are many Green-houſes built, which will not keep out the froſt in hard winters; and this is many times attributed to the glaſſes in front admitting the cold, when the fault is in the roof: for, where there is only the covering, either of tiles or ſlates, and the ceiling, every ſevere froſt will penetrate through them.

In this Green-houſe you ſhould have truſſels, which may be moved out and into the houſe; upon which you ſhould fix rows of planks, ſo as to place the pots or tubs of plants in regular rows one above another, whereby the heads of the plants will be ſo ſituated as not to interfere with each other. The loweſt row of plants, which ſhould be the forwardeſt towards the windows, ſhould be placed about four feet therefrom, that there may be a convenient breadth left next the glaſſes to walk in front: and the rows of plants ſhould riſe gradually from the firſt, in ſuch a manner, that the heads of the ſecond rows ſhould be intirely advanced above the firſt, the ſtems only being hid thereby: and, at the backſide of the houſe, there ſhould be allowed a ſpace of leaſt five feet, for the conveniency of watering the plants; as alſo to admit of a current of air round them, that the damps, occaſioned by the perſpiration of the plants, may be the better diſſipated, which, by being pent in too cloſely, often occaſions a mouldineſs upon the tender ſhoots and leaves; and, when the houſe is cloſe ſhut up, this ſtagnating rancid vapour is often very deſtructive to the plants: for which reaſon alſo, you ſhould never croud them too cloſe to each other; nor ſhould you ever place ſedums, euphorbiums, torch thiſtles, and other tender ſucculent plants, amongſt oranges, myrtles, and other ever-green-trees; for, by an experiment which I made anno 1729, I found that a ſedum, placed in a Green-houſe among ſuch trees, almoſt daily increaſed its weight, although there was no water given to it the whole time: which increaſe of weight was owing to the moiſture imbibed from the air, which, being replete with the rancid vapours perſpired from the other plants, occaſioned the leaves to grow pale, and in a ſhort time they decayed, and dropped off: which, I have often obſerved, has been the caſe with many other ſucculent plants, when placed in thoſe houſes which were filled with many ſorts of ever-green trees, that required to be frequently watered.

Therefore, to avoid the inconvenience which attends the placing of plants of very different natures in the ſame houſe, it will be very proper to have two wings added to the main Green-houſe; which, if placed in the manner expreſſed in the annexed plan, will greatly add to the beauty of the building, and alſo collect a greater ſhare of heat. In this plan, the Green-houſe is placed exactly fronting the ſouth; and one of the wings faces the ſouth-eaſt, and the other the ſouth-weſt; ſo that, from the time of the ſun's firſt appearance upon any part of the building, until it goes off at night, it is conſtantly reflected from one part to the other; and the cold winds are alſo kept off from the front of the main Green-houſe hereby: and, in the area of this place, you may contrive to place many of the moſt tender exotic plants, which will bear to be expoſed in the ſummer-ſeaſon: and, in the ſpring, before the weather will permit you to ſet out the plants, the beds and borders of this area may be full of anemonies, ranunculus's, early tulips, &c. which will be paſt flowering, and the roots fit to take out of the ground, by the time you carry out the

3 plants;

plants; which will render this place very agreeable during the spring season that the flowers are blown; and here you may walk and divert yourself in a fine day, when, perhaps, the air in most other parts of the garden will be too cold for persons not much used thereto, to take pleasure in being out of the house.

In the center of this area may be contrived a small bason for water, which will be very convenient for watering of plants, and add much to the beauty of the place: besides, the water, being thus situated, will be softened by the heat, which will be reflected from the glasses upon it; whereby it will be rendered much better than raw cold water for these tender plants.

The two wings of the building should be contrived so as to maintain plants of different degrees of hardiness; which must be effected by the situation and the extent of the fire-place, and the manner of conducting the flues; a particular account of which will be exhibited under the article of STOVES. But I would here observe, that the wing facing the south-east should always be preferred for the warmest stove; its situation being such, as that the sun, upon its first appearance in the morning, shines directly upon the glasses; which is of great service in warming the air of the house, and adding life to the plants, after having been shut up during the long nights in the winter season. These wings, being, in the draught annexed, allowed sixty feet in length, may be divided in the middle by partitions of glass, with glass doors to pass from one to the other. To each of these there should be a fire-place, with flues carried up against the back wall, through which the smoke should be made to pass, as many times the length of the house, as the height will admit of the number of flues; for, the longer the smoke is in passing, the more heat will be given to the house, with a less quantity of fuel: which is an article worth consideration, especially, where fuel is dear. By this contrivance, you may keep such plants as require the same degree of heat in one part of the house, and these will thrive in a much less warmth in the other part; but this will be more fully explained under the article of STOVES.

The other wing of the house, facing the south-west, may also be divided in the same manner, and flues carried through both parts, which may be used according to the seasons, or the particular sorts of plants which are placed therein: so that here will be four divisions in the wings, each of which may be kept up to a different degree of warmth: which, together with the Green-house, will be sufficient to maintain plants from all the several countries of the world: and, without having these several degrees of warmth, it will be impossible to preserve the various kinds of plants from the several parts of Africa and America, which are annually introduced into the English gardens: for, when plants from very different countries are placed in the same house, some are destroyed for want of heat, while others are forced and spoiled by too much of it; and this is often the case in many places, where there are large collections of plants.

In the building these wings, if there are not sheds running behind them, their whole length, the walls should not be less than two bricks thick; and, if they are more, it will be better; because, where the walls are thin, and exposed to the open air, the cold will penetrate them; and when the fires are made, the heat will come out through the walls; so that it will require a larger quantity of fuel to maintain a proper temperature of warmth in the house. The back part of these houses, having sloping roofs, which are covered either with tiles or slates, should also be lined with reeds, &c. under the covering, as is before directed for the Green-house; which will keep out the cold air, and save a great expence of fuel; for the closer and better these houses are built, and the glasses of the slope, as also, in front, well guarded by shutters or reeds in a hard frost, the less fuel will be required to warm the houses; so that the first expence of building these houses properly will be the cheapest, when the after expence of fires is taken into consideration.

The sloping glasses of these houses should be made to slide, and take off; so that they may be drawn down more or less, in warm weather, to admit air to the plants; and the upright glasses in front may be so contrived, as that every other may open as doors upon hinges; and the alternate glasses may be divided into two: the upper part of each should be contrived so as to be drawn down like sashes; so that either of these may be used to admit air, in a greater or less quantity, according as these may be divided into two: the upper part of each should be contrived so as to be drawn down like sashes; so that either of these may be used to admit air, in a greater or less quantity, according as there may be occasion.

But, besides the conservatories here mentioned, it will be proper to have a deep hot bed frame, such as is commonly used to raise large annuals in the spring; into which may be set pots of such plants as come from Carolina, Virginia, &c. while the plants are too small to plant in the open air; as also may other sorts from Spain, &c. which require only to be screened from the violence of the frosts, and should have as much free air as possible in mild weather; which can be no better effected than in one of these frames, where the glasses may be taken off every day when the weather will permit, and put on every night; and, in hard frosts, the glass may be covered with mats, straw, pease haulm, or the like, so as to prevent the frost from entering the pots to freeze the roots of the plants, which is what will, many times, utterly destroy them; though a slight frost pinching the leaves or shoots very seldom does them much harm: if these are sunk a foot or more below the surface of the ground, they will be the better, provided the ground is dry; otherwise they must be wholly above ground: the sides of this frame should be built with brick, with a curb of wood laid round on the top of the wall, into which the gutters, on which the glasses slide, may be laid: the back wall of this frame may be four feet high, and the front one foot and an half; the width about six feet, and the length in proportion to the number of plants.

Explanation of *Plate* XXIV. *fig.* 3, 4, 5, 6, representing a plan, elevation, &c. of a Green-house.

A, *fig.* 6, the ground plan of the Green-house.

B B, the ground plan of the two stoves.

C C C, the sheds behind the Green-house.

D D, the passage of communication between the Green-house and stoves, where the stairs are placed which lead to the rooms over the Green-house.

E E, *fig.* 3, 4, section of the flues in the back of the stoves.

F, *fig.* 5, the elevation of the Green-house.

GREE'NLAND *buck*, in natural history, a very thick and clumsy deer in comparison with our's in England, being, for proportion of its parts, more like a well grown calf than a deer; from the ground to the top of the shoulders, it is about three feet high, English measure; it hath a much shorter neck, and thicker legs, than is common in the deer kind; in summer time it is covered with smooth short hair of a mouse colour; against winter there springs from beneath this a second coat of long rough white hair, though it is a little brown on the back, and the lower part of the face; this long hair gives it a thick clumsy appearance; in the spring again, this rough winter cloathing is, as it were, thrust off by the succeeding summer's coat, which is smooth and short, and so it continues to change its coverings; what is most remarkable in this kind is the nose, which is wholly covered with hair in that part, which in other deer is bare skin, and moist: I suppose, had it been naked, it must necessarily have froze in those countries, so nature has given it this covering to defend it; the eyes are pretty large, standing a little out of the head; both male and female have horns, which is not common; its hoofs are not pointed, they part pretty much in the cleft, and are broad at the bottom, in order, I suppose, to keep them from sinking too far into the snow; it hath two small hoofs or claws behind the greater on each foot, placed pretty high; the hoofs are of a dark horn colour; the horns in this were not perfect, it being young; they were covered with a plush-like skin, of a brown colour, and shaped as in the figure.

I saw a head of perfect horns brought over with these deer, which had two large palmed branches over the eyes, conveniently placed as shovels, to remove the snow from the grass; a little above these were two other palms, but less, standing outward; above these, each horn spread itself into five round branches not at all palmed. A male and female of these deer were presented to Sir Hans Sloane, anno 1738, by captain Craycott, who brought them over. Sir Hans afterwards presented them to his grace the duke of Richmond, who sent them to his park in Sussex. I hear they are since dead, without any increase. This is by some supposed to be the rain-deer of the Laplanders and Russians. *Plate* XXV. *fig.* 3, represents it in its winter cloathing. *Edwards's History of Birds.*

GRENAI'LLE, a name given by the French writers to a preparation of copper, which the Chinese use as a red colour in some of their finest china; particularly for that colour which is called oil red, or red in oil. The china ware coloured with this is very dear. The manner in which they procure the preparation is thus: they have in China no such thing as silver coined money, but they use, in commerce, bars or masses of silver; these they pay and receive in large bargains, and, among a nation so full of fraud as the Chinese, it is no wonder that these are often adulterated with too great an alloy of copper. They pass, however, in this state in the common payments. There are some occasions, however, such as the paying the taxes and contributions, on which they must have their silver pure and fine: on this occasion they have recourse to certain people, whose sole business it is to refine the silver, and separate it from the copper and the lead it contains. This they do in furnaces made for the purpose, and with very convenient vessels. While the copper is in fusion, they take a small brush and dip the end of it into water; then, striking the handle of the brush, they sprinkle the water, by degrees, upon the melted copper; a sort of pellicle forms itself by this means on the surface of the matter, which they take off while hot with pincers of iron, and, immediately throwing it into a large vessel of cold water, it forms that red powder, which is called the Grenaille; they repeat the operation, every time they in this manner separate the copper; and this furnishes them with as much of the Grenaille as they have occasion for in their china works. *Observations sur les Coutumes de l'Asie.*

GROSSULA'RIA, *the gooseberry-tree*, in botany, a genus of plants whose characters are:

The leaves are laciniated, or jagged: the whole plant is set with prickles: the fruit grows sparsedly upon the tree, having

LATE XXV. *Engraved for the Supplement.* *Facing* Greenland *Buck*

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for the moſt part, but one fruit upon a footſtalk, which is of an oval or globular figure, containing many ſmall ſeeds ſurrounded by a pulpy ſubſtance.

There are ſeveral varieties of this fruit, which have been obtained from ſeeds in different parts of England, which differ either in the ſhape or colour of the berries: but, as theſe are only ſeminal variations, it is needleſs, in this place, to enumerate them, eſpecially ſince the number of theſe will be increaſed continually from ſeeds.

Theſe are propagated either by ſuckers taken from the old plants, or by cuttings; the latter of which I prefer to the former, becauſe thoſe plants which are produced from ſuckers are always more diſpoſed to ſhoot out a great number of ſuckers from their roots, than ſuch as are raiſed from cuttings, which generally form much better roots.

The beſt ſeaſon for planting theſe cuttings is in autumn, juſt before their leaves begin to fall; obſerving always to take the handſomeſt ſhoots, and from ſuch branches as generally produce the greateſt quantity of fruit; for, if you take thoſe which are produced from the ſtem of the old plants, which are commonly very luxuriant, they will not be near ſo fruitful as thoſe taken from bearing branches: theſe cuttings ſhould be about ſix or eight inches long, and muſt be planted in a border of light earth, expoſed to the morning ſun, about three inches deep, obſerving to water them gently, when the weather proves dry, to facilitate their taking root; and in the ſummer, when they put out, you ſhould rub off all the under ſhoots, leaving only the uppermoſt or ſtrongeſt, which ſhould be trained upright, to form a regular ſtem. In October following, theſe plants will be fit to remove; at which time you ſhould prepare an open ſpot of freſh earth, which ſhould be well dug, and cleanſed from all noxious weeds, roots, &c. and, being levelled, you ſhould proceed to take up your plants, trimming their roots, and cutting off all lateral ſide branches; then plant them at three feet diſtance row from row, and one foot aſunder in the rows, obſerving to place ſome ſhort ſticks to the plants, in order to train their ſtems upright and regular. In this place they may remain one year; being careful to keep them clear from weeds, as alſo to trim off all lateral ſhoots which are produced below the head of the plant, ſo that the ſtem may be clear about a foot in height above the ſurface of the earth, which will be full enough: and, as the branches are produced commonly very irregular in the head, you muſt cut out ſuch of them as croſs each other, or thin them where they are too cloſe; whereby the head of the plant will be open, and capable of admitting the air freely into the middle, which is of great uſe to all kinds of fruits.

After theſe plants have remained in this nurſery one year, they will be fit to tranſplant to the places where they are deſigned to remain; for it is not ſo well to let them grow in the nurſeries too large, which will occaſion their roots to be woody, whereby the removing of them will not only hazard the growth of the plants, but ſuch of them as may take very well, will remain ſtinted for two or three years, before they will be able to recover their check. The ſoil in which theſe plants thrive to the greateſt advantage, is a rich light ſandy earth; though they will do very well upon moiſt ſoils, which are not too ſtrong or moiſt, and in all ſituations: but where the fruit is cultivated, in order to procure it in the greateſt perfection, they ſhould never be planted in the ſhade of other trees, but muſt have a free open expoſure; the diſtance they ought to be planted is eight feet row from row, and ſix feet aſunder in the rows: the beſt ſeaſon for tranſplanting them is in October, when their leaves begin to decay; obſerving, as was before directed, to prune their roots, and trim off all lateral ſhoots, or ſuch as croſs each other; ſhortening all long branches, ſo as to make the head regular.

In the pruning of theſe ſhrubs, moſt people make uſe of garden-ſheers, obſerving only to cut the head round, as it is practiſed for ever-greens, &c. whereby the branches become ſo much crouded, that what fruit is produced, never grows to half the ſize as it would do, were the branches thinned, and pruned according to art; which ſhould always be done with a pruning-knife, ſhortening the ſtrong ſhoots to about ten inches, and cutting out all thoſe which grow irregular, and thinning the fruit-bearing branches where they are too thick; obſerving always to cut behind a leaf-bud: with this management your fruit will be near twice as large as thoſe which are produced upon ſuch buſhes as are not thus pruned, and the ſhrubs will continue in vigour much longer: but you muſt obſerve to keep the ground clear from weeds, and dig it at leaſt once a year; and every other year you ſhould beſtow a little rotten dung upon it, which will greatly improve the fruit.

It is a common practice with the gardeners near London, who have great quantities of theſe buſhes, in order to ſupply the markets, to prune them ſoon after Michaelmas, and then to dig up the ground between the rows, and plant it with coleworts for ſpring uſe, whereby their ground is employed all the winter, without prejudicing the gooſeberries; and in hard winters theſe coleworts often eſcape, when thoſe which are planted in an open expoſure are all deſtroyed; and theſe are generally pulled up for uſe in February or March, ſo that the ground is clear before the gooſeberries come out in the ſpring; which is a piece of huſbandry well worth practiſing where ground is dear, or where perſons are confined for room. *Miller's Gard. Dict.*

Gooſeberries, in the beginning, are green, and of an acid taſte, becauſe the acid ſalt, contained therein in a large proportion, is not yet encumbered with ſulphurs, and thus it can operate upon the nerves of the tongue very powerfully; inſomuch that this ſalt, being at that time united with nothing elſe but ſome proportion of earth, excites an aſtringent and ſtyptic ſenſation; whereas, afterwards, the little oil contained in the gooſeberries, which before was kept back by paſſive principles, gets looſe, riſes, and, by the help of fermentation, unites itſelf with the ſalts, and diveſts them partly of their ſtrength; then it is that gooſeberries are ripe, when they have a ſweet ſmell, and yellowiſh colour: from whence we may conclude, that, the riper gooſeberries are, they are ſo much the leſs aſtringent; and ſo, when you have a mind to have gooſeberries preſerved, the green are to be preferred before thoſe that are ripe.

The ſaid eſſential ſalt, wherewith gooſeberries abound, is the cauſe of the principal effects wrought by them. In ſhort, they would not create an appetite, were it not that this ſalt lightly pricks the little fibres of the ſtomach; they would not cool, and be good for people ſick of fevers, and be endued with the little virtues, but becauſe this ſalt, by imparting a little more conſiſtence to the humours, ſtops their violent and impetuous motion. *Lemery on Foods.*

GROTTO (*Dict.*)—A cement for artificial Grotto's may be made thus: take two parts of white reſin, melt it clear, and add to it four parts of bees wax; when melted together, add two or three parts of the powder of the ſtone you deſign to cement, or ſo much as will give the cement the colour of the ſtone; to this add one part of flower of ſulphur: incorporate all together over a gentle fire, and afterwards knead them with your hands in warm water. With this cement the ſtones, ſhells, &c. after being well dried before the fire, may be cemented. *Smith's Laboratory.*

Artificial red coral branches, for the embelliſhment of Grotto's, may be made in the following manner: take clear roſin, diſſolve it in a braſs pan; to every ounce of which add two drachms of the fineſt vermilion: when you have ſtirred them well together, and have choſen your twigs and branches, peeled and dried, take a pencil and paint the branches all over, whilſt the compoſition is warm; afterwards ſhape them in imitation of natural coral. This done, hold the branches over a gentle coal fire, till all is ſmooth and even, as if poliſhed.

In the ſame manner white coral may be prepared with white lead, and black coral with lamp-black.

A Grotto may be built with a little expence of glaſs, cinders, pebbles, pieces of large flints, ſhells, moſs, ſtones, counterfeit coral, pieces of chalk, &c. all bound or cemented together with the above deſcribed cement.

GROVES (*Dict.*)—Groves are the greateſt ornaments to a garden; nor can a garden be complete which has not one or more of theſe. In ſmall gardens there is ſcarce room to admit of Groves of any extent; yet, in theſe, there ſhould be at leaſt one contrived, which ſhould be as large as the ground will allow it: and, where theſe are ſmall, there is more ſkill required in the diſpoſition, to give them the appearance of being larger than they really are.

Groves are of two ſorts, viz. open and cloſe Groves; open Groves are ſuch as have large ſhady trees, which ſtand at ſuch diſtances, as that their branches may approach ſo near each other, as to prevent the rays of the ſun from penetrating through them: but as ſuch trees are a long time in growing to a proper ſize for affording a ſhade; ſo, where new Groves are placed, the trees muſt be placed cloſer together, in order to have ſhade as ſoon as poſſible: but, in planting of theſe Groves, it is much the beſt way to diſpoſe all the trees irregularly, which will give them a greater magnificence, and alſo form a ſhade ſooner, than when the trees are planted in lines; for, when the ſun ſhines between the rows of trees, as it muſt do ſome part of the day in ſummer, the walks between them will be expoſed to the heat, at ſuch times, until the branches of theſe trees meet; whereas, in the irregular plantations, the trees intervene, and obſtruct the direct rays of the ſun.

When a perſon, who is to lay out a garden, is ſo happy as to meet with large full grown trees upon the ſpot, they ſhould remain inviolate, if poſſible; for it will be better to put up with many inconveniencies, than to deſtroy theſe, which will require an age to retrieve; ſo that nothing but that of offending the habitation, by being ſo near as to occaſion great damps, ſhould tempt the cutting of them down.

Moſt of the Groves which have been planted either in England, or thoſe celebrated gardens in France, are only a few regular lines of trees; many of which join to the habitation, or lead to ſome building, or other object: but theſe do not appear ſo grand, as thoſe which have been made in woods, where the trees have grown accidentally, and at irregular diſtances; where the trees have large ſpreading heads, and are left at ſuch diſtance as to permit the graſs to grow under them, then they afford the greateſt pleaſure; for nothing is more noble, than fine ſpreading trees, with large ſtems, growing thro' grafs, efpecially if the grafs is well kept, and has a good verdure; befide, moft of thefe planted Groves have generally a gravel walk, made in a ftraight line between them; which greatly offends the fight of perfons who have a true tafte: therefore, whenever a gravel walk is abfolutely neceffary to be carried through thefe Groves, it will be much better to twift it about, according as the trees naturally ftand, than to attempt regularity: but dry walks under large trees are not fo ufeful, as in open places; becaufe the dropping of the trees will render thefe walks ufelefs, after rain, for a confiderable time.

Clofe Groves have frequently large trees ftanding in them; but the ground is filled under thefe with fhrubs, or underwood; fo that the walks which are made in them are private, and fcreened from winds; whereby they are rendered agreeable for walking, at fuch times when the air is too violent or cold for walking in the more expofed parts of the garden.

Thefe are often contrived fo as to bound the open Groves, and frequently to hide the walls, or other inclofures, of the garden: and, when they are properly laid out, with dry walks winding through them, and on the fides of thefe fweet-fmelling fhrubs and flowers irregularly planted, they have a charming effect: for here a perfon may walk in private, fheltered from the inclemency of cold or violent winds, and enjoy the greateft fweets of the vegetable kingdom: therefore, where it can be admitted, if they are continued round the whole inclofure of the garden, there will be a much greater extent of walk: and thefe fhrubs will appear the beft boundary, where there are not fine profpects to be gained.

Thefe clofe Groves are by the French termed bofquets, from the Italian word bofquetto, which fignifies a little wood: and in moft of the French gardens there are many of them planted; but thefe are reduced to regular figures, as ovals, triangles, fquares, and ftars: but thefe have neither the beauty or ufe which thofe have that are made irregularly, and whofe walks are not fhut on each fide by hedges, which prevents the eye from feeing the quarters; and thefe want the fragrancy of the fhrubs and flowers, which are the great delight of thefe private walks; add to this, the keeping of the hedges in good order is attended with a great expence; which is a capital thing to be confidered in the making of gardens. *Miller's Gard. Dict.*

GROUND *angling*, the art of catching fifh under water without a float, only with a plumb of lead, or a bullet. This method is moft expedient in cold weather, when the fifh fwim low. The bullet is to be placed nine inches from the baited hook; the top of the rod is to be very gentle, that the fifh may more eafily run away with the bait, and not be fcared with the ftiffnefs of it. The angler in this way is not to ftrike, as foon as he feels the fifh bite, but flacken his line a little, to give the fifh an opportunity to fwallow the hook.

The tackle here is to be fine and flender, ftrong and big lines being apt to fright the fifh. Morning and evening are the chief feafons for the Ground line for trout; but in a cloudy day, or a muddy water, you may fifh at Ground from morning to night. *Dict. Ruft.*

GROUND *plates*, in architecture, are the outermoft pieces of timber lying on, or near the Ground, and framed into one another with mortifes and tenifons. In thefe alfo, are mortifes made to receive the tenons of joints, the fummers and girders; and, fometimes, the trimmers for the ftair-cafe and chimney-way, and the binding joifts.

GROUND *timbers*, in a fhip, are thofe timbers which lie on her keel, and are faftened to it with bolts through the keelfon. They are fo called, becaufe the fhip lies at reft upon them, when fhe is aground.

GROUSE, in zoology, the name of the tetrao, or urogallus minor, called alfo the black game, and the heath-hen, and, by Turner, the moor-hen. It is a large bird of the gallinaceous kind. The male is all over black, but the edges of his feathers, efpecially on the neck and back, have a bluifh glofs mixed among the black, and its thighs very grey. The female is of the colour of the partridge, and is variegated with tranfverfe black lines on the back, and the breaft and belly are grey. Its beak is black and crooked. It is found in the mountainous and heathy parts of the kingdom, and is a very well tafted bird. The male and female differ fo much in colour, that fome very accurate writers on thefe fubjects have been deceived into an opinion of their being two different fpecies of birds; and Gefner has diftinguifhed them in this manner, calling the female of this the grygallus minor, and that of the great urogallus or cock of the mountain, the grygallus major. *Ray's Ornithol.*

GRO'WAN, in natural hiftory, a word ufed by the miners in Cornwall to exprefs a fort of coarfe and gritty ftone, which they are ufually obliged to dig through before they come at the veins of ore. This is ufually grey or whitifh, but fometimes it is of various colours, often yellowifh, and fometimes fpotted with iron colour, and an inky black; and often its texture is fo loofe and fpongy, that there are holes in it of the fize proper to receive a pea, or a horfe-bean; thefe are fometimes empty, but more ufually they are filled up either with chalk, or with fpar. Befide the ftrata of this ftone that lie over the ore, there is alfo a large quantity of it often placed by its fide. They have this, and two other forts of ftone, lying in their way to the tin ore in Cornwall. The firft of the others they call moor-ftone; a very uncertain name, as it is alfo given by fome to the common white granate of that country; but the miners only mean by it a loofe fort of freeftone, fomewhat fofter than that ufually employed in building. The other ftone is called killos. This is a grey ftone of the flate kind, eafily fplitting into thin plates, and is very full of talcky flakes. This killos is, however, a very indeterminate name, as well as the other; for the fame people fometimes ufe it alfo to fignify a white earth, common among them; this laft, however, they fometimes diftinguifh by the epithet white. The word Growan feems the only name they have kept to any determinate fignification, for they never exprefs by this word any other fubftance, than the ftone above defcribed.

GRUB, the Englifh name of the hexapode worms, or maggots, hatched from the eggs of beetles. Grubs are an excellent bait for many kinds of fifh. In angling for the grayling, the afh Grub is to be preferred to all others. This is plump, milk-white, but round from head to tail, and has a red head. There is alfo another Grub, which is very common, and is longer and flenderer than the afh Grub. It is yellower and tougher, and is known by having a red head, and two rows of legs along the belly. The trout and grayling ufually frequent the fame places, and it is not uncommon to take the trout, while fifhing for the other. Thefe Grubs are to be kept in bran, in which they will grow tougher than they were at firft; but the afh Grub is always fo tender, that it is difficult to make a good bait of it. The beft method is to wrap it in a piece of ftiff hair with the arming, leaving it ftanding out about a ftraw's breadth at the head of the hook, fo as to keep the Grub from totally flipping off, when baited. The horfehair that the hook is faftened to fhould be as white as poffible, that it may refemble the colour of the bait, and not be fufpected.

GRUB *of the box, or box puceron*, in natural hiftory, a name given to a fort of infect approaching to the nature of the puceron of the elder and other trees, but differing from that animal in fome effential characters, and being more properly of the fame genus with the fig-infect or falfe puceron.

GRU'BBING, a term ufed by our farmers, to exprefs the taking up the roots of trees out of the ground. Several occafions offer for the doing this; as, when trees are old and paft growing to any ufe, the roots muft be taken up, that young trees may be planted in their places. This is a chargeable operation in moft places, but, in fome countries, the farmers have devifed a machine, which does a great part of the work in a much fhorter time than in any other way can be done. It is a hook of iron, of about two feet and a half long, with a large iron ring faftened to its ftreight end or handle. The whole inftrument may be made for about three or four fhillings, and is to be ufed in this manner: the ground is firft to be cleared away about the root, and any ftraggling fide roots found running horizontally are to be cut off. Then they faften the point of the hook to fome part of the ftump or root, and, putting a long and ftrong lever through the ring, two men at the end of it go round forcing it every way, till they tear the root out, twifting the top roots off at fome diftance under ground. The digging down to which, in the common way, is one great article of the expence. It is very effectual in ftubbing up the roots of the underwood, but, when large tree roots are to be taken up by it, it is beft to cleave them firft with wedges into feveral pieces, and then pull them out feparately. *Mortimer's Hufbandry.*

GRYLLOTA'LPA, *the mole cricket*, in natural hiftory, a creature approaching to the locuft kind, and very properly called by this name by Moffet, as it has much of the form of the cricket, and makes a noife like it in the evening; and is, like the mole, continually employed in the digging the ground. It is an infect of a very unpleafant form. It is of the length and thicknefs of a man's little finger, and is of a brown colour; which is darker in the male than in the female. There are on each fide of the anus two hairy proceffes, refembling the tails of mice; its belly is compofed of eight joints, and is covered with as many fcales, which are of a pale flefh colour, and are covered with fhort hair. The back is covered by a pair of pointed wings, along each of which there runs a black ftreak or line. Thefe wings fold any way at the creature's pleafure, and, when fully expanded, are very large. Over thefe lie the antennæ; thefe are variegated alfo with black, and reach about half the length of the wings. It has only four legs; the hinder pair are long and fit for hopping; the anterior pair are fhort, and furnifhed with a fort of hands for digging in the manner of the mole. The breaft is covered with a cruftaceous fubftance which is blackifh, and hairy on the outfide, and fmooth and pale within. The eyes are very bright and black, and are very hard, and the mouth is wide, and has two tonfils, and teeth in both jaws. This creature lives under ground, and is principally found in damp and boggy places. There has for many years been a breed of them in the gardens of Lord Burlington, at Chifwick, under the grafs walk toward the lower end of the canal, where they are now very numerous. They come out in the dusk of the evening, and make a very loud noise, of the nature of that of the cricket.

GRY'LLUS, *the cricket*, in natural history, the name of a genus of insects nearly allied to the locust class. The two principal kinds are the house and field cricket. The first of these is smaller, and is of a brown colour spotted with black. The latter is more than an inch long, and has a great head and very large eyes. The antennæ in this species have no articulations.

GRY'PHIUS *pes*, *the griffon's claw*, a name of a chirurgical instrument described by Ambrose Parèy, and used for extracting moles from the uterus.

GRY'PHUS, in surgery, a sort of crooked pincers used by surgeons.

GUA'DUM, *woad*. See ISATIS.

GUAI'ACUM (*Dict.*)—*Analysis of* GUAIACUM.—Fill a clean glass retort, almost up to its neck, with the small raspings of the best, green, close, ponderous, and fresh Guaiacum, with care to prevent any of it from falling through the neck into the receiver. Set the retort in a sand furnace; apply a very large receiver, and lute the juncture close, with a luting of linseed meal. Distil, first, with a degree of heat not exceeding that of boiling water; and continue this carefully, so long as any moisture will be thereby driven from the wood. A liquid, tart, and sharply odorous water will thus come over, which is to be poured out, and kept apart. The receiver being now, again, luted on, increase the fire, by slow degrees; and, again, a considerably limpid, but somewhat more acid, unctuous, and reddish liquor will come over, which must carefully be urged with the same degree of heat, so long as it rises. This, also, may be kept separate, as being considerably strong, odorous, and smelling almost perfectly like red herrings. The fire, being now raised and kept up, drives over a red, unctuous, and highly acid liquor, together with a red oil floating in a considerable quantity therein: at length increase the fire to the utmost, that the bottom of the iron pot may begin to be red-hot; there will now ascend a smoke, and a thick, black, viscid oil, which sinks to the bottom of the former liquor. And, if this fire be continued as strong as the glass will endure without melting, the same fume will constantly continue to rise, how long soever the fire be kept up. In the last place, apply live coals upon the sand, all round and above the retort, which is called a fire of suppression; and keep this up, also, for some time, till no more oil comes over. Now suffer all to cool spontaneously, and, by this last extremity of the fire, a little very thick, black, and ponderous oil, like pitch, will be driven over.

Make a little filtre of cap-paper, put it into a glass funnel, and pour therein the water which first came over, without any oil, that the strainer, being thus well moistened, may transmit this pure water of the Guaiacum, which is to be kept separate. This water will be tartish, limpid, and penetrating, but have little of the smell or taste of the Guaiacum; but a somewhat burnt odour, a little resembling that of smoaked herrings. Then put the second water into the same filtre, and this will come through a little reddish, transparent, but more acid, and smelling stronger of smoaked herring; so as to prove somewhat empyreumatic, and much sharper than the former. And, if any oil was lodged in the second water, it will remain in the filtre; which, having been moistened by the preceding liquor, will not permit the oil to pass. Into the same filtre pour, likewise, the vinegar, and third spirit, together with its light oil; the vinegar will immediately pass through red, pellucid, sharp, acid, and empyreumatical, but leaves its oil behind, floating upon the liquor, in the filtre: for which purpose the filtre must always be kept filling up with more of the oily liquor, to prevent the oil from ever touching the lower part of the paper; for, thus, nothing of the oil will come through with the acid liquor. When, now, nearly all the liquor is come through, immediately remove the funnel, with the filtre, to another glass, before the oil begins to sink through the paper; which would happen, when the paper begins to grow dry. At this time, therefore, the light and thin oil may be poured, out of the filtre, into a vessel apart.

Pour the oil, which came over last, along with its highly acid, fetid, and unctuous liquor, into the same filtre, whilst it remains still wet with the former liquor; there will now come through a red, acid, transparent fluid; and a gross, black, pitchy, ponderous oil remains in the paper: this, also, is to be poured out, and kept separate.

If these acid liquors be preserved in clean glasses, they deposit, at the sides and bottom thereof, a small oily crust, which gradually increases, whereby the liquor gradually becomes less unctuous; whence it appears, that this distilled vinegar is a compound of water, acid, and oil, and may, therefore, properly be called a volatile, acid, oily, saponaceous salt. If this acid liquor, when become perfectly limpid, and affording no more visible oil, be poured upon clean chalk, it effervesces therewith, deposits its acid in the chalk, and becomes a water, which immediately throws the oil, before latent in it, to the surface, in a visible form: or, if the same liquor be again distilled with a gentle fire in a clean vessel, it also presently manifests its latent oil, and separates it from itself, and thus becomes pure and clear acid liquor.

If the oils be required in greater perfection, let a quantity of them be collected, and distilled by boiling water; whereby the purer part will be raised, and the grosser left behind; and, by often repeating this operation, these oils gradually come nearer to the perfection of the essential kind, and, by losing their more unactive and terrestrial part, become liquid, bright, beautifully red, penetrating, pure, thin, and not fetid. When thus all that is volatile has been drawn over from the subject, by the violent and long continued action of the fire, extremely black, light, insipid, and almost inodorous, and very brittle shavings remain in the retort, being the coal mentioned by Helmont, which can never, by the most continued force of fire, be calcined into white ashes, whilst the vessel remains close, but always continues black, and therefore inflammable; because this blackness is the fixed oil, tenaciously adhering to the earth, and subtly extended upon its surface; whence the coal becomes subject to take fire, and burn, so long as this oil remains unconsumed, for, if these black raspings be now put into a large open pan, and a small live coal be thrown into the middle of them, they will immediately burn and flame all over, till the whole blackness be ignited, after which the subject presently falls into white ashes; so that, in a short time, the whole body of the shavings may, by means of the smallest spark, be perfectly converted into ashes: nor could the wood itself be so easily and so readily fired, with a small spark, unless, by a like preparation, it were first brought to a coal, and then broke to powder. The white ashes, thus obtained from Guaiacum, are insipid, inodorous, and almost without any salt; though, if the wood were recent, they prove considerably rich in alcaline salt.

In making decoctions of Guaiacum, for medicinal uses, it is to be remarked, that the raspings of the fresh and green wood are much preferrable to those of that which is old and dry; and that, the longer it is boiled, the better.

Tincture of GUAIACUM.— Take the raspings of fresh, green, and ponderous Guaiacum wood, or the bark thereof, in powder; and put it into a tall chemical glass; pour thereon rectified spirit of wine, so as to float four inches above it, without any other addition: boil them together, in the manner abovementioned, for four hours, often shaking the glass; the liquor will thus become red, which is to be strained, after it is clarified by rest, through a linen strainer, to separate it from any impurities; then, pouring fresh spirits upon the remains, boil them again, and preserve the several tinctures pure. The liquor, thus obtained, will be of a pungent, aromatic, acrid, hot taste, and odour; but, if the alcohol, employed, was perfect, the tincture will always be the better.

If this tincture, prepared with pure alcohol, be distilled in a tall body, with a gentle fire, till only one fourth part be left behind, this will be a very rich tincture, fully impregnated with the virtue of the Guaiacum. But, if the spirit employed contained any water, the rosin would begin to fall, if the tincture was inspissated so high. But, when pure alcohol is used, the tincture will easily bear to be thickened, and thus increase in virtue, without growing turbid.

This tincture of Guaiacum, externally applied, is a wonderful remedy in malignant venereal ulcers, whether in the skin, fat, mouth, jaws, or throat.

When this tincture of Guaiacum, prepared with pure alcohol, and inspissated to an half, is mixed with four times its quantity of the syrup of the five opening roots, and taken upon an empty stomach, in the morning, lying in bed, it presently distributes itself over the whole body, which it thus warms, and promotes a copious sweat; and hence it is commended in the venereal disease, when it has seized upon the subcutaneous parts. *Boerhaave's Chemistry.*

GU'AJAVA, *the guava*, in botany, a genus of plants whose characters are:

The extremity of the pedicle passes into an ovary, of an oval figure, crowned, quinquefid, and like a calyx. The flower is rosaceous, pentapetalous, growing on the ovary within the crown, and furnished with numerous stamina. The ovary is furnished with a long tube, and becomes a fleshy fruit, full of very numerous small seeds.

The tree grows to the height of twenty feet, or more, in the West-Indies, and has a trunk as big as a man's thigh: in England it is preserved in stoves, and is rarely seen above six or seven feet high. *Miller's Dict.*

The fruit resembles our pears, with an umbilicus full of chaps, and covered with a thin whitish green rind. The pulp is of a pale bloody colour, in some whitish, and, when ripe, of a sweet and grateful taste, and a pleasant smell. The fruit has three different sorts of taste, according to its season. In the time of its ripening, before it is soft and yellow, it is austere and astringent, and is then good, when boiled, for the stomach; when it becomes a little riper, it is of a middle nature, and in its best state; but it is more adviseable, for health, to eat it either boiled or preserved in sugar, than raw; besides, it is of a more grateful taste and smell, when thus prepared. When it is come to perfect maturity, and is intirely soft and yellow, it has the taste and smell of raspberries, loosens the

belly,

belly, and is not so wholesome to be freely eaten, because it is easily corrupted, and breeds worms. The root, with its astringent bark, boiled in water, and drank, is an excellent remedy for the dysentery, where astriction and strengthening are indicated. The leaves are acid and astringent, and proper to be used in bathing. F. Hernandez adds, that the leaves used in lotions cure the itch, and that a decoction of the bark is good for swelled legs; that it cures fistulous ulcers, helps deafness, and removes pains in the belly: a syrup, also, made of the leaves, is very effectual against a flux of the belly. *Raii Hist. Plant.*

The fruit is refrigerating, and somewhat astringent: the roots are astringent, and therefore good for the dysentery, and to comfort the stomach: the leaves are vulnerary, resolvent, and used in bathing. *Hist. Plant. ascript. Boerh.*

GUAINU'MBI. See HUMMING *bird*.

GUANA'BANUS, *the custard apple*, in botany, a genus of plants whose characters are:

The empalement of the flower consists of three small pointed leaves: the flowers of some sorts have only three, but in others six petals; in the latter, three are alternately less than the others: from the empalement arises the pointal, which afterwards becomes an oval or round fleshy soft fruit, inclosing several oblong smooth hard seeds.

All these plants which are natives of the warm parts of America, are too tender to live in this country, if they are not preserved in warm stoves: they come up very easily from the seeds which are brought from America, if they are fresh: but the seeds must be sown on a good hot bed, or in pots of light earth, and plunged into an hot bed of tanners bark. These seeds should be sown as soon as possible when they arise, unless it is very late in the autumn, or in winter; in which case, they should not be sown till February; because, if the seeds receive much damp in the winter, they will rot; and, if the plants should come up at that season, it will be very difficult to preserve them till spring; so that, when these seeds come to England, pretty early in the spring, it is by much the best time; because the plants come up early, and will have time to get strength, before the cold comes on.

If these plants are kept in the bark stove, and carefully managed, they will make great progress; but in warm weather, they should have plenty of fresh air admitted to them; for, when the air is excluded from them too much, they are apt to grow sickly; when they will soon be attacked by vermin, which will multiply and spread over the whole surface of the leaves, and cause them to decay: but, if the plants are carefully managed, their leaves will continue green all the winter, and make a very good appearance in the stove at that season.

There are some of these plants in England, which are upwards of twelve feet high, and have produced flowers; so that they may probably produce fruit here. As these plants advance in their growth, so they become more hardy, and should have a greater share of air admitted to them, especially in the summer: but there should be great care taken, not to let them remain in the bark bed too long unremoved; because they are very apt to root through the holes of the pots into the tan; and then these roots will be torn off, whenever the pots are removed, and the plants seldom survive this; and, when they do, it is generally a long time before they perfectly recover their former vigour. These plants, when young, will require to be kept in the same degree of warmth with ananas; but, as they get more strength, so they will thrive with less warmth.

GUA'ZUMA, *bastard cedar-tree*, in botany, a genus of trees whose characters are:

It hath a regular flower consisting of five leaves, which are hollowed like a spoon at their base; but at their tops are divided into two parts, like a fork; the flower cup consists of three leaves, from whence arises the pointal, which afterward becomes a roundish warted fruit, which has five cells inclosing many seeds.

These plants may be propagated by seed, which should be sown early in the spring, in small pots filled with fresh light earth, and plunged into an hot-bed of tanners bark. When the plants appear above ground, they must be carefully cleared from weeds, and often refreshed with water; and the glasses must be raised to admit fresh air to them, otherwise they will draw up too weak: and, when they are about three inches high, they must be shaken out of the pots, and parted carefully, planting each into separate small pots filled with light fresh earth; and then plunge them into the hot-bed again, being careful to screen them from the heat of the sun, until they have taken new root. In this bed the plants may remain all the summer, being careful to keep them clear from weeds; and, when the plants have filled the small pots with their roots, they should be shaken out, and their roots trimmed, and then put into pots a size larger. About Michaelmas the plants must be removed into the stove, and plunged into the tan in a warm part of the stove. During the winter season, they will not require so much water as in summer: if their leaves should contract filth, it must be carefully washed off with a sponge; for, if it is suffered to remain on them, it will greatly injure the plants. These plants being very tender, they must constantly remain in the stoves, giving them a good share of fresh air in the summer; but in winter, they must be kept very warm, otherwise they will not live in this country; but, if they are carefully managed, they will thrive very well, and afford an agreeable variety in the stove, amongst other tender exotic plants of the same countries. *Miller's Gard. Dict.*

GU'DGEON, in ichthyology, the English name of the fish called by authors the gobio, and gobius fluviatilis. According to the new Artedian system, the word gobius is made the name of another genus of fishes, and the Gudgeon is reduced to the genus of the cyprini, of which, according to the distinctions and characters of that author, it is a true species.

GUDGEONS, *in a ship*, is used for the eyes driven into the stern-post, into which the pintles of the rudder go, to hang it on.

GUI'NEA *Pig*, the name given by our common people to a sort of animal, distinguished by authors by the name of mus porcelli pilis et voce, the rat with the hair and voice of a hog.

It is a very singular kind of animal, and there are three sorts of it, all very different from one another. 1. The porcellus Indicus, or common Guinea pig. 2. The aguti; and 3. The paca of the Americans. This creature seems to partake of the nature of several animals. Its hair and voice are like the hog's; its teeth and head resemble the rabbit's, as does also its general size; and its ears are wholly like those of the mouse and rat kind.

GUITA'RRA, *in the Italian music*, the name of a musical instrument of the string kind, with five double rows of strings, of which, those that form the bass, are in the middle, unless it be one for the burden, an octave lower than the fourth.

This instrument was first used in Spain, and the Italians give it the particular denomination of Spagnuola. It is found in Italy, and other countries, but more frequently in Spain. *Brass. Mus. Dict.*

GUM-*apples*, in Languedoc, and some other parts of France. The juice of apples will sometimes exsudate through their rind, and congeal all about them in form of a clear white gum, hard like ice, by reason of its being soon dried in the sun into a thin cake. The people call such an apple, pomme gelée, or a frozen apple. It is very common to see apples covered in part with this Gum in several specks; but it is more rare to meet with them wholly so. The Gum is insipid to the taste.

We have one plant cultivated in some gardens, which yields, in the heat of summer, such another white icy and tasteless Gum. This is the common rhubarb, of the stalks of the leaves of which tarts are made. The ribs of the larger leaves of this plant, in June and July, are covered with large transparent drops of this Gum, and an ounce of it may be sometimes collected from a single plant. *Phil. Trans.* N°. 224.

GUM-*boils*, a morbid affection of the Gums called by the writers of surgery parulides. These are of different degrees, and usually arise from pains in the teeth. They are to be treated by discutients or other inflammatory tumors, but if these fail, or the disorder is neglected, it usually terminates in an abscess or fistula. Sage, camomile, and elder flowers, boiled in milk and water, make a good gargarism to be held in the mouth, and the remaining herbs may be sewed up in a bag to be kept hot to the cheek. A half roasted fig is a very good internal application, and, when the softness of the tumor shews that the matter is suppurated, it ought immediately to be opened with the lancet, to prevent the matter's lodging there, and eroding the bone, and producing a fistula or caries. After it is opened, the matter should be gently pressed out with the fingers, and the mouth frequently washed with red wine mixed with a decoction of vulnerary herbs till it is well. When the ulcer has penetrated deep, it will be necessary to inject the same liquors with a syringe, and compress the part by a proper external bandage, to make the bottom part heal first; and, when it is already become fistulous, and has callous edges, it may then often be cured by injecting tincture of myrrh, and elixir proprietatis, continuing this for some time. If all these prove ineffectual, the fistula must be laid open by incision, and the caries removed by medicines, caustics, or the actual cautery. If this proceeds, as sometimes it does, from a carious tooth, this is first to be drawn before any thing else can be done; and it is a good rule in these cases always to be rather too soon than too late in laying them open. *Heister's Surg.*

GUN is also a name given by the miners to an instrument used in cleaving rocks with gun-powder. It is an iron cylinder of an inch and a quarter thick, and about six inches long, and having a flat side to receive the side of a wedge, and a hole drilled through it to communicate with the inside of the hole in the rock. The hole is made of about eight inches deep, and in the bottom of it are put about two or three ounces of Gun-powder; then this Gun is driven forcibly in, so as to fill up the hole, and the wedge is driven in on its flat side to secure it. The priming at the hole is then fired by a train, and, the orifice being so well stopped by this Gun, the force of the powder is determined to the circumjacent parts of the rock which it splits.

GUN-*room*, in a ship, is the apartment under the great cabbin, where the master gunner and his crew rendezvous, get ready their cartridges, &c. and do all things belonging to their business.

 GU'NNERY,

GUNNERY (*Dict.*)— Mr. Robins, from the experiments related in his New Principles of Gunnery, having concluded, that the force of fired gun-powder, at the instant of its explosion, is the same as that of an elastic fluid of a thousand times the density of the common air, and that the elasticity of this fluid, like that of air, is proportionable to its density, proposes the following problem:

The dimensions of any piece of artillery, the weight of its ball, and the quantity of its charge being given, to determine the velocity which the ball will acquire from the explosion, supposing the elasticity or force of the powder at the first instant of its firing to be given.

In the solution of this problem he assumes the two following principles: 1. That the action of the powder on the bullet ceases, as soon as the bullet is got out of the piece. 2. That all the powder of the charge is fired, and converted into an elastic fluid, before the bullet is sensibly moved from its place.

These assumptions, and the conclusions before-mentioned, make the action of fired gun-powder to be entirely similar to that of air condensed a thousand times; and from thence it will not be difficult to determine the velocity of the ball arising from the explosion. For the force of the fired powder diminishing in proportion to its expansion, and ceasing when the ball is out of the piece; the total action of the powder may be represented by the area of a curve, the base of which represents the space through which the ball is accelerated, and the ordinates to which represent the force of the powder at every point of that space. And these ordinates being in reciprocal proportion to their distance from the breech of the gun, because, when the spaces occupied by the fired powder are as 1, 2, 3, 4, &c. the force of the powder, or the ordinates representing it, will be as 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. it appears that the curve will be a common hyperbola, and that the area intercepted between it, its asymptote, and the two ordinates representing the force of the powder at the first explosion, and at the muzzle of the piece, will represent the total action of the powder on the ball. But, if the ball were urged through the same space, by an uniform force equal to its gravity, the total action of this force would be represented by a rectangle, the base of which would be the base of the curve or intercepted portion of the asymptote before-mentioned, and the height of which would represent the uniform force of gravity. Hence the square of the velocity of the ball, resulting from the action of the gun-powder, will be to the square of the velocity resulting from the action of gravity, as the area of the hyperbolic space is to the area of the rectangle. But the velocity of the ball resulting from gravity is given, being the velocity it would acquire from a height equal to the space through which the powder accelerates it; and the proportion between the hyperbolic and the rectangle is also given, from the analogy of the hyperbolic spaces and logarithms; therefore the velocity of the ball arising from the action of the fired gun-powder will be given.

Mr. Robins has also given us an ingenious way of determining, by experiments, the velocity which any ball moves with, at any distance of the piece it is discharged from.

This may be effected by means of a pendulum made of iron, having a broad part at bottom, covered with a thick piece of wood, which is fastened to the iron by screws. Then having three poles joined together by their tops and spreading at bottom, such as are vulgarly used in weighing and lifting heavy bodies, and called by workmen triangles; on two of these poles, towards their tops, are screwed on sockets, on which the pendulum is hung by means of a cross piece, which becomes its axis of suspension, and on which it ought to vibrate with great freedom. Something lower than the bottom of the pendulum there should be a brace, joining the two poles to which the pendulum is suspended; and to this brace there is fastened a contrivance made with two edges of steel, something in the manner of a drawing pen; the strength with which these edges press on each other being diminished or increased at pleasure, by means of a screw. To the bottom of the pendulum should be fastened a narrow ribbon, which, passing between the steel edges, may hang loosly down by means of an opening cut in the lower piece of steel.

The instrument being thus fitted, if the weight of the pendulum, the respective distances of its center of gravity, and of its center of oscillation, from its axis of suspension, be known, it may from thence be found, what motion will be communicated to this pendulum by the percussion of a body of a known weight moving with a known degree of velocity, and striking it in a given point; that is, if the pendulum be supposed at rest before the percussion, it will be known what vibration it ought to make in consequence of such a blow; and if the pendulum, being at rest, is struck by a body of a known weight, and the vibration which the pendulum makes after the blow is known, the velocity of the striking body may from thence be determined.

Now, the extent of the vibration, made by the pendulum, may be measured by the ribbon. For if the pressure of the steel edges on the ribbon be regulated by the screw, so as to be free and easy, though with some minute resistance to hinder its slipping of itself: then, setting the pendulum at rest, let the part of the ribbon between the pendulum and the steel edges be drawn straight, but not strained, and fixing a pin in the part of the ribbon contiguous to the edges, the pendulum, swinging back by the impulse of the ball, will draw out the ribbon to the just extent of its vibration, which will be determined by the interval on the ribbon between the edges and the place of the pin.

The computation by which the velocity of the ball is determined from the vibration of the pendulum after the stroke, is founded on this principle of mechanics: that if a body in motion strikes on another at rest, and they are not separated after the stroke, but move on with one common motion, then that common motion is equal to the motion with which the first body moved before the stroke: whence, if that common motion and the masses of the two bodies are known, the motion of the first body before the stroke is thence determined. On this principle it follows, that the velocity of a bullet may be diminished in any given ratio, by its being made to impinge on a body of weight properly proportioned to it; and hereby the most violent motions, which would otherwise escape our examination, are easily determined by the retarded motions which have a given relation to them.

It is to be observed, that the length, to which the ribbon is drawn, is always near the chord of the arch described by the ascent; it being so placed, as to differ insensibly from those chords which most frequently occur; and these chords are known to be in the proportion of the velocities of the pendulum acquired from the stroke. Hence it follows, that the proportion between the lengths of the ribbon, drawn out at different times, will be the same with that of the velocities of the impinging bullets.

Now, from the computations delivered by Mr. Robins, it appears, that the velocity of the bullet was 1641 feet in one second of time, when the chord of the arch described by the ascent of the pendulum, in consequence of the blow, was $17\frac{1}{4}$ inches. Therefore, by the proportion of any other lengths of ribbon drawn out, by any percussion, to $17\frac{1}{4}$, the proportion of the velocity with which the bullets impinge, to the known velocity of 1641 feet in 1″, will be determined.

GUN-SHOT *wounds* are attended with much worse consequences than wounds made by sharp instruments, for the parts are more shattered and torn, especially when the shot falls upon the joints, bones, or any considerable part. Wounds of this kind have an eschar formed upon them, and are therefore attended with little or no hæmorrhage at first, unless some considerable vessel is wounded; but, as soon as this eschar falls off, the hæmorrhage is sometimes so violent, as to endanger the life of the patient, unless the ready assistance of a surgeon can be had. For the five or six first days there is little or no discharge of matter from these wounds; there is therefore no wonder that Gun-shot wounds exceed all others in violence of symptoms, such as inflammation, pain, gangrene, &c.

The eschar which is formed upon these wounds, is not occasioned so much by the heat of the bullets, as by the rapidity with which they destroy the parts; and the violence of the symptoms is owing chiefly to this manner of wounding. Neither is there any thing poisonous in these wounds, as has been by some imagined; for nothing poisonous enters the composition, either of powder or ball.

Gun-shot wounds are some deeper than others, and in some, the muscular parts alone are hurt; in others, the vessels, bones, or viscera, are wounded. Sometimes the ball passes clear through, and sometimes it remains fixed in the wound, and frequently carries part of the cloths or wadding with it. From the difference of these circumstances very different symptoms arise.

Gun-shot wounds in the cranium, even the lightest of them, are attended with very great danger, and frequently bring on terrible symptoms, by the concussion of the internal parts, which they occasion; insomuch that it is surprising to see how small an external wound upon this part will bring on death, if not prevented by the trepan. Internal wounds of this sort are also extremely dangerous; but if no large vessel is wounded, they are frequently cured.

When they are inflicted on the bones or joints, they are attended with very bad symptoms; for, in this case, it is next to impossible to escape inflammation, gangrene, caries, and dangerous fistulæ, which either require amputation of the limb, or leave it without sense or motion.

If any part of the cloths, wadding, or any other extraneous body, be forced into the wound, it must be removed before you can attempt to heal the wound; and the same caution is to be observed in regard to any splinters of bone: when these are removed, the hæmorrhage is to be stopped, then suppuration is to be promoted, and new flesh encouraged, and care taken to procure an even cicatrix.

Extraneous bodies are much easiest to be removed at first; for after some delay the tumor, and inflammation of the part, render it difficult and painful: besides, the bullets will by degrees work themselves deeper, and be buried under the muscles, which will occasion fistulæ, rigidity of the limb, and other inconveniencies. In extracting balls that lie deep, you

must

must take great care not to lay hold of blood-vessels or nerves; which accident will be best avoided, by introducing the forceps shut, and not opening them till you feel the ball.

Sometimes the orifices of these wounds are so narrow, that it is impossible to come at the body you are to extract, without making a larger opening; this then must be done on the most convenient side, always observing that no nerve, blood-vessel, tendon, or ligament, lies in the way. When the parts are very much inflamed and swelled, an opening of this kind is frequently of service; for by this means the obstructed blood is discharged, and the bad consequences of the inflammation are prevented. When the extraction of the ball is attempted, the patient must be put into the same posture and situation that he was in when he received the wound. When the ball has penetrated so deep, that it may be easily felt with the finger on the opposite side, it is sometimes better to make an incision there, and take it out in that place, than to attempt the getting it back the other way. If the wound cannot safely be inlarged, nor the ball extracted at first, without great pain and danger, it must be left in the wound, either till the pain is abated, or the wound is so inlarged by suppuration, that it either can work itself out, or be extracted with less danger. On the other hand, all other extraneous bodies are instantly to be removed, where there is danger of their bringing on pain, inflammation, and convulsions, by being left behind. If a ball has passed into the cavities of the body, it is best not to attempt to extract it, but to heal the wound, leaving it there. Persons have carried a ball in them thus, for many years, without inconvenience; and, at one time or other, it frequently happens that it will work itself into some part of the body, out of which it may be extracted with safety.

If a large artery is wounded by the ball, either in the arms or legs, which will be known by the loss of blood, the tourniquet must be applied, and, the blood being stopped, the vessel must be taken up by a crooked needle; but, if this cannot be done, or little hopes of a cure appear from future dressings, it will be prudent to take off the limb just above the wound.

When wounds of this kind have been well cleaned, and the blood stopped, the first intention is to use the utmost endeavours to prevent, or asswage the tumor and inflammation. The wound should be dressed with lint dipped in warm spirits of wine, and covered with a compress wetted with the same liquor; or with camphorated spirits of wine, either alone, or diluted with lime water. Having done this, the next intention is to forward the suppuration of the bruised and torn parts; to which end, it is common to use the common digestive made of turpentine dissolved in the yolk of an egg, or a mixture of basilicon and Arcæus's linament, softened with spirits of wine and oil; and, where there is a very great corruption of the parts, a little myrrh and aloes are to be added, as also Venice treacle, the brown ointment, and, where the occasion requires it, and the nerves do not lie bare, a little of the red precipitate.

In deep wounds, where the ball has gone quite through, a skein of thread being drawn through the eye of a blunt needle, and well saturated with the digestive ointment, is to be passed through the wound in the manner of a seton, and kept there till the wound is found in a condition to heal, and then the common methods are pursued to heal and cicatrize. *Heister's Surgery.*

GUNTER'S *Scale* (*Dict.*)— The line of numbers on these scales consists of two equal lengths, commonly called two radii; the first containing the logarithms of numbers from 10 to 100; and in the second are inserted those between 100 and 1000, or such of them as can conveniently be introduced.

These divisions are taken from a scale of equal parts; such, that 100 make the length of one radius; and from this scale the divisions for the sines, tangents, and versed sines, are also taken. Now, from this construction of the line of numbers, it is plain, that, as the numbers in one radius exceed those in the other, by one place in the scale of numeration, therefore the differences of their indices must also be unity: so that such numbers only, whose index differs by 1, can be estimated in a length of two radii: but, in a length of three radii, numbers, whose indices differ by 2, may be read; and a difference of 3 may be reckoned in a length of 4 radii, &c. The tables of logarithmic sines, tangents, secants, and versed sines, are generally computed for a circle, whose radius is 10,000,000: therefore,

	°	′	″		°	′	″	
In the sines, the index 9 belongs to all between	90	0	0	and	5	44	36	
The index 8	5	44	36	and	0	34	23	
The index 7 to all between	0	34	23	and	0	3	27	
6	0	3	27	and	0	0	21	&c.

	°	′		°	′	″
In the tangents, the index 9 belongs to all between	45	0	and	5	42	10

And the indices, 8, 7, 6, &c. fall as in the sines.

	°	′		°	′	
In the versed sines, the index 10 belongs to all between	180	0	and	90	0	
9	90	0	and	25	51	
8 belongs to all between	25	51	and	8	7	
7	8	7	and	2	34	
6	2	4	and	0	45	&c.

Now, as the length of the Gunter's scale admits of no more than two radii, or of such numbers only, whose index differs by unity; therefore, within this length, no more of the sines, tangents, or versed sines, can be introduced, than those whose index differs by unity: and as not only the greatest number among the sines and tangents, but also those more generally wanted, have the indices 9 and 8 differing by unity; therefore all the sines from 90° to 0° 34′, and all the tangents from 45° to 0° 34′, are those only, which are put on these scales; the divisions answering to the lesser sines and tangents being omitted for want of room. And this is the reason, why the sine of 90°, and the tangent of 45°, are limited by the same termination as the second radius on the line of numbers.

To construct the line of logarithmic sines on GUNTER'S *Scale*—From the scale of equal parts, take the numbers expressing the arithmetical complements of the log-sines of the successive degrees, and parts of degrees, intended to be put on the scale, descending orderly from 90°: then these distances, successively laid from the mark representing 90° at the right-hand end of the scale, will give the several divisions of a scale of logarithmic sines.

For, the ends of any scale being assigned, the progressive divisions of that scale are laid thereon from that end, which represents the beginning of the progression: or the same divisions may be laid from the other end, by taking the complements of the terms to the whole length of the scale.

Consequently the arithmetical complements of the sines are to be laid from the division representing 90 degrees.

To construct the line of logarithmic tangents on GUNTER'S *Scale.*— These are laid down in the same manner, and for the same reasons, that the sines were; the tangent of 45° standing against the sine of 90°.

The divisions for the tangents above 45° are reckoned on the same line from 45° towards the left hand; or any tangent and its cotangent are expressed by the same division.

Thus one mark serves for 40° and 50°, and the division at 30° serves also for 60°; that at 20° serves for 70°, &c. and the like is to be understood for the intermediate divisions.

For as the tangent of an arc is to a radius;

So is radius to the co-tangent of that arc.

Therefore the tangent is equal to the square of radius divided by the co-tangent.

And the co-tangent is equal to the square of radius divided by the tangent.

Now, the radius being unity, its square is also unity.

Therefore the tangent and co-tangent of any arc are the reciprocals one of the other.

But the reciprocals of numbers are correlatives to the arithmetical complements of their logarithms.

Therefore the logarithms of a tangent and its co-tangent are arithmetical complements one of the other, and consequently will fall at equal distances from 45 degrees.

Therefore, in the line of logarithmic tangents, the divisions to degrees under 45 serve also for those above, both being equally distant from 45 degrees.

To construct the line of logarithmic versed sines on GUNTER'S *Scale.* —As the greatest number of degrees will fall within the limits of the scale by beginning at 180°, therefore the termination of this line is at 180°, which is put against 90° on the sines: and, although the numbers annexed to the divisions increase in the order from right to left, yet they are only the supplements of the versed sines themselves.

Now subtract the logarithmic versed sines of such degrees and parts of degrees as are intended to be put on the scale, from the logarithm versed sine of 180°; then the remainder taken from the foresaid scale of equal parts, and laid successively from the termination of this line, will give the several divisions sought.

The following table to every 10 degrees was constructed in the foregoing manner, and are the numbers to be taken from the scale of equal parts, for the degrees they stand against.

Deg.	Supplements. of Versed Sines.	Deg.	Supplements. of Versed Sines.	Deg.	Supplements. of Versed Sines.
180	0,00000	120	0,12494	60	0,60206
170	0,00331	110	0,17327	50	0,74810
160	0,01330	100	0,23149	40	0,93190
150	0,03011	90	0,30103	30	1,17401
140	0,05402	80	0,38387	20	1,52066
130	0,08545	70	0,48282	10	2,21941

From this table it appears, that the least versed sine which can be introduced within the length of a double radius, falls between 10° and 20°, where the index changes from 1 to 2; which will happen about 11° 28′.

If a table of logarithm versed sines to 180° are wanting, they are easily made by the following rule:

"Take the logarithm sine of 30 degrees from twice the logarithm sine of (N) any number of degrees; the remainder is the logarithm versed sine of (2 N, or) twice those degrees."

For it is a well known geometrical property, that the sine of any arc (A) is a mean proportional between radius (R) and half the versed sine of twice that arc.

Therefore, puting *v* for the versed sine, and *s* for the sine;

The $v\,2\,A = \left(\frac{2\,s\,s\,A}{R} = s\,s\,A \times -\frac{2}{R} = s\,s\,A \times \frac{2}{10} = \right) s\,s\,A \times \frac{1}{5}$; radius being 10.

Or the log. $v\,2\,A = 2$ log. $s\,A$ — log. 5.

But, when radius is 10, the sine of 30° is 5.

Therefore the log. $v\,2\,A = 2$ log. $s\,A$ — log. sine of 30°.

Most of the writers on this subject give the following rule for laying down the divisions of this line:

"From the line of logarithmic sines, take the distance between 90° and any arc; that distance being twice repeated, from the termination of the line of versed sines, will give the division for twice the complement of that arc."

Thus the distance between 90° and 20° on the sines twice repeated gives the versed sine of 140°; or twice 70°, the complement of 20°. For the divisions, to be laid on this line, are the differences between the logarithm versed sine of 180°, and the logarithm versed sines of the successive arcs.

Now the difference between the logarithm versed sines of 180°, and of any arc 2 A, is log. ver. sine 180 — 2 log. sin. A + log. sin. of 30°.

Or, 10,30103 + 9,69897—twice log. sin. of A.

Or, 20,00000 — twice logarithm sine of A.

Or the arithmetical complement of twice logarithm sine of A.

That is, the difference between the logarithm versed sine of 180°, and the logarithm versed sine of any arc, is equal to double the arithmetical complement of the logarithm sine of half that arc, rejecting the indices.

But, as the differences give the divisions to the supplements of the real versed sines, therefore the arithmetical complement of the logarithm sine of any arc, being doubled, will give the distance of the division for the supplement of twice that arc on the line of versed sines.

Thus, for 70°, the logarithm sine is 9,97299.

The arithmetical complement is 0,02701.

Its double is 0,05402

Which is the number in the foregoing table standing against 140°, and is the supplement versed sine of twice 70 degrees.

Now, as the arithmetical complement of the log. sines of arcs are the distances on the line of sines between 90°, and the divisions to those arcs; therefore the distances between 90° and any arc, being twice repeated, will give the division of the supplemental versed sine to twice the co-sine of that arc. *Phil. Trans.* Vol. XLIX.

GU'NWALE, *or gunnel* of a ship, is that piece of timber which reaches on either side of the ship, from the half deck to the forecastle, being the uppermost bend, which finishes the upper works of the hull in that part, and wherein they put the stanchions which support the waste trees. This is called the Gunwale, whether there be guns in the ship or not. The lower part of any port, where any ordnance are, is also termed the Gunwale.

GUR, in minerology, a word used to express a fluid matter looking like milk, but reduced sometimes, by evaporation, to the consistence of honey, and appearing in form of a white sediment. It always contains more or less silver, and is common in the mines of Sweden, and in some other places.

GUTTA *rosacea*, in medicine, denotes a red or pimpled face; a distemper, which, though not always owing its original to hard drinking, is nevertheless most incident to tipplers of strong beer, wines, spirits, &c.

As to the cure, besides making a revulsion by bleeding, blistering, cupping, issues, &c. the diet ought to be moistening and cooling, as lettuce, purslain, sorrel, and spinach: the drink may be an emulsion of the cold seeds, milk and water, clarified whey, &c.

In the use, however, of this cooling regimen, great caution is necessary; for, if a person be taken off at once from his strong liquors, and allowed nothing but whey, or milk and water, it may cost him his life, by hastening a sudden decay of heat, palling his appetite, and bringing on a leucophlegmatia, or dropsy.

As for what concerns topics, much caution is likewise to be used. If there be only redness without pimples, and the disease recent, refrigerants and repellents take place: but, if pustules appear, discutients must be mixed; and if these pustules seem hard, and the disease be of long standing, there may be reason for emollients to ripen and digest the tough and viscid matter, which is afterwards to be let out.

If the disease be stubborn, and the tubercles grown hard, we are to begin with emollients, both fotus and ointment: such are the decoction of mallows, vervain, Solomon's seal, and linseed, also a cerate of sperma ceti, or Bates's white cerate. *James's Med. Dict.*

GYMNO'PYRIS, in natural history, the name of a genus of fossils, the characters of which are these: they are of the class of the pyritæ, and are compound, inflammable metallic bodies, found in detached masses, of no determinately angular figure; of a simple internal structure; not striated; and are naked, or not covered with any investient coat, or crust, in which they differ from the pyriplaces. *Hill's Hist. of Fossils.*

GYNA'NDRIA, in botany, a class of plants, in which the male and female parts of the flower are joined at their origin, the stamina or male parts of which grow to the pistillum or female part, and not to the receptacle of the seed.

The word is formed of the Greek γυνὴ female, and ἀνὴρ male. Among the plants of this class are the passion-flower, birthwort, &c.

The general character of this class of plants is very obvious: they are distinguished at first sight from all others, by the stamina being placed upon the style; or, in other words, the receptacle is elongated into the form of a style, and bears on it both the pistil and stamina.

H.

HADE, in mining, is where any ſhaft or turn goes deſcending like the ſide of a houſe, or like the deſcent of a ſteep hill. It is then ſaid to Hade. *Houghton's Compl. Miner.*

HALLE'RIA, African fly honey ſuckle, in botany, a plant ſo named by Dr. Linnæus, in honour to Albertus Haller, profeſſor of botany at Gottingen. The characters are:

The empalement of the flower is of one leaf, which is cut into three ſegments, the upper one being much broader than either of the others: the flower conſiſts of one leaf, and is in ſhape like the ſnap-dragon, having a tube, and the upper part joined, and reflexed, and at the brim is divided into four parts: in the center of the flower is ſituated the pointal, attended by four ſtamina, two of which are longer than the others: the pointal afterwards changes to a round berry having two cells, each having one ſeed.

This plant grows to the height of ſix or eight feet, having a woody ſtem, which is well furniſhed with branches: theſe have oval ſawed leaves, which are placed oppoſite by pairs, and continue green through the year: the flowers come out ſingly, and are of a red colour; but, being intermixed with the leaves, make but ſmall appearance: yet, as the leaves are green in winter, the plants make a variety in the green-houſe during that ſeaſon.

It may be propagated by cuttings, which, if planted in pots filled with light earth in the ſpring, and plunged into a gentle hot bed, will ſoon take root. Theſe plants may be expoſed in ſummer, and will require plenty of water: in winter they muſt be houſed with myrtles, and other hardy exotic plants.

HAMA'MELIS, *witch hazel*, in botany, a genus of trees whoſe characters are:

The empalement of the flower is of one leaf, which is cut into four ſegments to the bottom: the flower conſiſts of one leaf, which is cut into four narrow ſegments to the bottom, and turn backwards: the pointal is ſituated in the center of the flower, which is hairy, and attended by four ſtamina: the pointal afterwards changes into a capſule or huſk, having two cells, each containing one oblong ſmooth ſhining ſeed.

This is propagated by laying down the young branches in the autumn, which will take root in one year, provided they are duly watered in dry weather: but moſt of the plants which are in the gardens, have been produced from ſeeds which came from America. Theſe ſeeds always remain a whole year in the ground; ſo they ſhould be ſown in pots, which may be plunged into the ground in a ſhady part of the garden, where they may remain all the ſummer, and require no other care than to keep the pots clear from weeds, and in very dry weather to water them now and then: in autumn, the pots may be moved to a warmer ſituation, and plunged into the ground under a warm hedge; and, if the winter ſhould prove very ſevere, they ſhould have ſome light covering thrown over the pots, which will ſecure the ſeeds from being deſtroyed. In the ſpring the plants will come up; therefore, as the ſeaſon grows warm, the pots may be removed where they may have the morning ſun till eleven o'clock; and, if they are duly watered in dry weather, the plants will have made good progreſs by the autumn; when they ſhould be tranſplanted, either into ſmall pots, or in a nurſery bed; where in one, or at moſt two years time, they will be ſtrong enough to plant where they are deſigned to grow.

HÆMA'NTHUS, *blood-flower*, in botany, a genus of plants, whoſe characters are:

The empalement of the flower is large, compoſed of ſix oblong leaves, which grow in form of an umbel, and do not fall off: the flower is of one leaf, which is cut into ſix ſlender parts at top; but the bottom is tubulous and angular: in the center of each flower is ſituated the oblong pointal, attended by ſix ſtamina, which are inſerted at their baſe into the petals of the flower, but are ſtretched out much longer at the top: the pointal afterwards changes to a roundiſh berry, having three cells, each containing one triangular ſeed.

It is propagated by off-ſets, which ſhould be taken of in May, at which time theſe plants begin to loſe their leaves; for they are ready to put out new leaves in July, and continue growing all the autumn and winter; but, towards the end of May, the leaves begin to decay; at which time the plants ſhould be new potted; and, if they have any off-ſets which are ſufficiently rooted, they muſt be taken off, and planted in pots filled with light rich earth. In tranſplanting of theſe plants, there muſt be particular care to lay ſome ſtones and rubbiſh in the bottom of the pots to let the moiſture paſs off; for, if the wet is detained in the pots, it will ſoon cauſe the roots to periſh. During the ſeaſon of their inactivity, which is commonly from the beginning of May to the beginning of July, they muſt not have too much water, leſt it rot their roots; but, when they are in vigour, they will require a little more wet.

These plants muſt be conſtantly kept in the dry ſtoves; for they do not thrive well, if they are ſet abroad, even in the warmeſt part of the ſummer; ſo that it is much the better method to let them remain in the ſtove, with euphorbiums, and other tender ſucculent plants, which require a large ſhare of free air in warm weather; in which ſituation they will thrive exceeding well, and will annually produce their beautiful flowers, which make a fine appearance among other rare plants. During the winter ſeaſon, they muſt be kept in a moderate temperature of heat, and ſhould be frequently refreſhed with water; but it muſt not be given to them in large quantities, leſt it rot them. This plant is not conſtant in the time of its flowering, but the moſt uſual ſeaſon is in July or Auguſt; but, when it flowers in the ſpring, it frequently perfects ſeeds in this country; which, if ſown ſoon after they are ripe, and preſerved in the ſtove till ſpring, and then placed in an hot-bed of tanners bark, will grow very well; and, by this method, a much greater increaſe of the plants may be obtained in a year or two, than could be by off-ſets in many years.

HÆ'MORRHOIDS (*Dict.*) *Chirurgical treatment of the* HÆMORRHOIDS.—Though, ſome are deſirous of having this flux moderated or ſtopped, a ſkilful ſurgeon will be ſo far from complying, that he will lay before them many inconveniencies which muſt attend ſuch a practice. If, however, they perſiſt, or the flux is exceſſive, then he may, at the ſame time applying other proper remedies, ſtop up ſome of the mouths, leaving one or two open, according to the direction of Hippocrates. He muſt proceed in the following manner: firſt, bleed plentifully, then give gently cooling purges, and, laſtly, a clyſter, five or ſix hours before the operation.

The patient muſt be laid on his belly, either upon a bed, or table, ſo that his feet may touch the ground; or, according to ſome, on the ſide of a bed, as, for a clyſter; then, his legs and nates muſt be ſo diſtended, by two aſſiſtants, that the ſurgeon may have free acceſs to, and inſpection of the parts. Next, if there are no tubercles, he is to tie up the bleeding veins with a crooked needle and thread; if there are, he is to take hold of the parts preternaturally tumefied with his forceps, and cut them off, tying them up likewiſe; but he muſt be ſure to leave one vein, and that the ſmalleſt, ſtill open. Laſtly, if the profuſion does not ſtop ſpontaneouſly, in a ſhort time, he may apply ſtyptics, ſcraped lint, and compreſſes, with the T bandage. In the ſubſequent dreſſings he may uſe cicatrizing medicines; and, if any thing foreign ſtill remains, he muſt remove it by the ſciſſars, or a cauſtic. When theſe bleeding tubercles were ſeated very high in the rectum, the ancients recommended an actual cautery; but this was ſevere and dangerous: I, therefore, prefer the ſpeculum ani, which dilates the parts, in ſuch a manner, that the tubercles may be tied, or the open veins ſtopped by lint, impregnated with aſtringents: this, with the application of proper internal medicines, will reſtrain a profuſe Hæmorrhage in theſe parts; though it is ſeldom neceſſary to come to the laſt operation.

Sometimes the veins, diſperſed about the rectum and anus, are ſo much dilated with blood, as to be very painful, and raiſe tubercles as large as peas, grapes, or eggs; ſometimes, too, they extend to a finger's length. Theſe we call the blind piles, and diſtinguiſh them from other tubercles of the anus by their colour, and reſiſtance to the touch; for they appear livid, or black, from the ſtagnation of a thick blood; and, when preſſed by the fingers, feel like a bladder filled with liquor; which circumſtances are not obſerved in the others. Theſe diſtended veſſels vary; for ſome are ſoft, giving little or no pain; others hard, very painful, and inflamed, rendering the patient unable to ſit, ſtand, or walk, and ſometimes even bring on fainting-fits.

The blind piles generally occur in men of a coſtive, plethoric habit, and ſuch whoſe conſtitutions incline them to the bleed-

ing

ing piles; and women are moſt ſubject to them from a difficult labour, a ſuppreſſion of the menſes, geſtation, or a ſanguine habit. In all theſe, the veins ſometimes become ſo turgid as to diſcharge their blood, and from blind become bleeding piles, with ſo profuſe an hæmorrhage as to endanger the patient's health. The blind Hæmorrhoids are ſometimes attended with ſuch intenſe pains as to cauſe a ſpaſm of the anus, and a difficulty of ſitting, even to that degree as not to admit of the adminiſtration of a clyſter; ſometimes they produce troubleſome itching ulcers, eſpecially, if they do not burſt within three or four days; and very often give birth to an abſceſs, or ſtubborn fiſtula.

When the blind piles are neither large, nor troubleſome, they may be left to nature; but when they encompaſs the anus like a bunch of grapes, ſo that the patient can neither ſit, ride, nor go to ſtool without difficulty; if they do not ſubmit to ſpirits of wine, the moſt ſpeedy remedy is gradually to remove thoſe which are full and large, by a ligature; but, if there is a violent inflammation, it is proper, firſt, to bleed and give, internally, temperating and laxative medicines, preſcribing a regular diet, while diſcutient and emollient fomentations are externally applied. The ſame end is anſwered by the unguentum nutritum, unguentum linariæ, freſh butter, oil of ſweet almonds, and the like, applied to the parts.

But linen, dipped in warm ſpirits of wine, and emollient clyſters, are frequently of infinite ſervice; and, when they are not effectual, leeches may be applied to exhauſt the blood; if they are not at hand, or the parts inflamed, the lancet muſt be uſed; and, after bleeding in proportion to the patient's ſtrength, the dreſſings muſt be made of lint with compreſſes and the T bandage: theſe are to be renewed, till the diſorder is completely cured. Sometimes, the piles are ſo high in the rectum, as to render the uſe of the ſpeculum ani neceſſary. When the anus is properly dilated by this inſtrument, they muſt be ſcarified with a lancet, or divided with ſciſſars; for thus the inſpiſſated noxious blood will be diſcharged, and the pains relieved. Sometimes theſe wounds are ſo far from healing, that, of blind, they become bleeding piles, and the patients, eſpecially, if they are cauſtic, always, or very often at leaſt, diſcharge blood with their excrements; which flux, though not entirely free from trouble, ſhould not be ſuppreſſed while it is moderate, as it leſſens the pains, conduces to the patient's health, and prevents or removes many diſtempers, as the hypochondriac melancholy, diſorders of the kidnies and bladder, gout, and iſchiadic pains. For this reaſon, many moderns recommend and excite this evacuation. But, as this often induces many inconveniencies, and diſeaſes, I prefer other methods of cure.

The beſt method of preventing theſe piles is a regular, temperate diet, with bleeding twice or thrice in a year, and oftener, if required; for theſe evacuations will leſſen the quantity of blood, and conſequently remove the cauſe. Internally may be taken ſome temperating powder, or a decoction of yarrow, drank like tea, carefully avoiding all heating and aſtringent medicines, ſuch as aloes, myrrh, and ſaffron, and all aliments of the like quality, wine overloading the ſtomach, anger, violent exerciſe, profuſe venery, and riding. If, notwithſtanding this regimen, the hæmorrhoidal veins ſhould begin to ſwell, reſolvent and temperating medicines ſhould be given internally, while, externally, fomentations and cataplaſms may be applied; if the pains are acute, then recourſe muſt be had to leeches, or the lancet, as before directed. *Heiſter. Inſtitut. Chirurg.*

HÆ'MORRHOUS, *the blood-ſnake*, the name of a peculiar ſpecies of ſerpent; ſo called, becauſe it was ſuppoſed, that on a perſon being bit by it the blood flowed out of every part of the body. It is a ſmall ſerpent, ſeldom ariſing to more than a foot long; its eyes are remarkably vivid, bright, and ſparkling; its ſkin is very gloſſy, and its back variegated with a great number of black and white ſpots; its neck is very ſlender, its tail extremely ſharp, and it has a ſort of ſmall horns placed over its eyes; it is found in Egypt. There is alſo an American kind of this found in the ſouthern parts, and called by the natives a hucyatli, which is larger than the other, and reſembles the rattle-ſnake in many particulars, but wants the diſtinguiſhing characters of the rattle in the tail.

HAIR-*weed*, *conferva*, in botany, the name of a genus of moſſes, the characters of which are theſe: it is a water plant, deſtitute of flower and ſeed, ſo far as hitherto been obſerved, and compoſed only of ſimple and uniform filaments, which uſually extend to a great length, and are often branched, and uſually of a cylindric figure. The generality of authors have ſuppoſed that theſe are not produced of ſeeds, but are formed of ſome viſcous or gelatinous matter floating in the water, by mere oppoſition of parts; but this ſeems erroneous, and probably will be hereafter confuted by the diſcovery of their ſeeds, as has been already the caſe in the ſea-fucus's, and in many other genera of plants ſuppoſed formerly to want them. The confervæ are uſually divided into ſeveral orders, according to the nature of the filaments they conſiſt of. Some conſiſt of equable and even threads, others are knotted or jointed in the manner of a worm, or other ſuch inſect. Theſe are called the geniculated confervæ, to diſtinguiſh them from the other ſimple ones; and, finally, others are compoſed as it were of ſeveral globules joined one to another; theſe laſt are called the knotted confervæ. *Dillen. Hiſt. Muſc.*

HAND-*barrow*, in the military art, is commonly made of hard light wood. It is of great uſe in fortification, for carrying earth from one place to another, and in a ſiege, for carrying bombs, or cannon ball, along the trenches, and for ſeveral other uſes.

HAND-*ſpike*, a lever, or piece of aſh, elm, or other ſtrong wood, five or ſix feet long, cut thin like a wedge at one end, that it may get the eaſier betwixt things which are to be ſeparated, or any other thing that is to be raiſed; it is better than a crow of iron, becauſe its length allows a better poiſe.

HAND-*ſpikes* are frequently uſed in ſhips, as to traverſe the ordnance, to heave withal in a windlaſs, to weigh up the anchor, &c.

HANDLES *of a plough*, the name given by farmers to the two pieces of the plough faſtened to the earth-board, and to the ſheat, and ſerving the plough-man to reſt his force upon in the guiding of the plough. When they are conſiderably long, the plough is always guided the better, and the land is better tilled; but the lazy plough-men are apt to cut them off ſhorter, that, by bearing their whole weight upon them, they may, in a manner, ride, inſtead of walking. If they ſhould ride, in this manner, on the long handles, they would tilt up the end of the beam, and raiſe the plough out of the ground. *Tull's Huſbandry.*

HA'RBOUR (*Dict.*)—*A machine for cleanſing and deepening* HARBOURS, *and clearing ſea-ports*, &c.

There are a great variety of machines of this kind, but the following will be ſufficient for us, being that made uſe of at Toulon for this occaſion. See *plate* XXVI. *fig.* 1.

This machine conſiſts firſt of a barge, fifty-three feet in length from ſtem to ſtern; about eighteen feet and a half wide in the middle, and four feet and a half deep. Secondly, of two wheels, the firſt of twenty-two feet and a half diameter, the ſecond only twelve feet diameter. Thirdly, of two ſpoons which dig the bottom, and are filled alternately with ſand or gravel by the help of the wheels before-mentioned, which men turn different ways by the following method:

To the axis of the great wheel, are faſtened two iron chains CE and F, going on the wheels of the cranes CF; from thence, they come to the ſpoons, which they ſet at work. Obſerve the chain CE paſſes under the axis, and the other F G paſſes above it, that is, one lengthens, the other takes up and ſhortens, alternately, according to which ſide the great wheel turns, to oblige one ſpoon to deſcend while the other aſcends: the leſſer wheel contributes to this by the means of the two ropes Z Y, S D, called draw-backs, acting oppoſite, to the chains; each ſpoon is fixed to a long handle M N, which ſometimes bears againſt the roller H, ſometimes againſt the other I; and it is impoſſible this ſhould ſlip aſide, becauſe it is confined within the frame K L, where it acts in the following manner:

The men turning both wheels together, as in the draught, the chain AFG ſhortens, as it rolls round its axis, while the draw-back DS lengthens; then a boy placed at R catches the rope and twiſts it round a cleet, to check the ſpoon, and prevent it from ſliding over the ſurface, inſtead of biting at the bottom; the maſter and director of the machine at Q conſpires in the ſame intention, by holding the rope O H P, called the loader, in his hand, tied to the pole N M; from thence it paſſes over the roller H, under which the maſter twiſts it round the cleet P, to veer it out by degrees, as he draws it towards him, to make the ſpoon A dig itſelf in, ſo that it may fill itſelf, as it works, by the action which is communicated to it by the great wheel; the boy at R looſens his rope gradually, ſo as to let the handle become vertical, after which it falls upon the other roller I. The maſter immediately lets go the loader, and goes to T, to wait till the ſpoon A comes into the ſituation repreſented by the ſpoon B, in order to open the door of it, which he performs with the hook X by lifting up the catch which kept it ſhut; this being emptied into a lighter placed below for that purpoſe, the door of the ſpoon is ſhut again with the extremity of the hook. After this operation, the men who were placed at *a*, paſs on to V, to turn the wheels in a contrary motion to the preceding, which lets out the chain F G to lower the ſpoon which is emptied, and the rope D S draws it towards itſelf, as it winds up on its own axis; on the contrary Z Y veers out, as the chain C E draws in to bring the ſpoon B back to the ſituation in which A is exhibited, which fills in the ſame manner as deſcribed before, and the two ſpoons are worked alternately by the two contrary motions of the wheels.

To work the machine, it muſt be moored to ſix poſts anſwering to the bites Æ, and four anchors diſpoſed as in figure 2. in order to move aſide backwards or forwards, as there may be occaſion.

The maſter ſtiffens or looſens the loader, with which he governs the ſpoons according to the reſiſtance of the bottom, becauſe in ſome caſes, if this rope be held too tort, he would be in danger of breaking ſome part of the machine by the force which the great wheel communicates; and, if he holds it too ſlack, the ſpoon does not bury itſelf deep enough to fill: he likewiſe ſhortens or lengthens the chains according to the different depths of the bottom: the chains and handles are made of a ſufficient length to dig thirty feet beneath the ſurface of the water.

The

The alternate motion of the ſpoons makes two trenches on each ſide of the barge, which muſt be ſhifted to make ſeveral ſimilar trenches, which afterwards form one only, and clean out the Harbour completely, which the maſter will judge of by frequent ſoundings.

HA'RDENING *of timber*. The Venetians are famous for the ſoundneſs of their ſhips, which do not rot as thoſe of other nations, but will endure many times the common period. Tachenius tells us, that the whole ſecret of this conſiſts in the manner of their Hardening of their timber intended for this ſervice; and that this is done by ſinking it in the water while green, and leaving it there many years. This prevents the alkali, or that ſalt which furniſhes the alkali in burning, from exhaling afterwards; and by this means the timber becomes almoſt as incorruptible as ſtone. It is evident that the exhaling of this ſalt, and the rotting of wood, have ſome very great connection with one another, ſince, the more ſound any piece of timber is, the more ſalt it proportionably yields; and the wood which is rotten is found on trial to contain no ſalt at all. See the article TIMBER.

HA'RDY *ſhrubs*. The two hardeſt ſhrubs we are poſſeſſed of, are the ivy and box; theſe ſtand the ſeverity of our ſharpeſt winter unhurt, while other ſhrubs periſh, and trees have their ſolid bodies ſplit and torn to pieces. In the hard winter of the year 1683, theſe two ſhrubs ſuffered no injury any where; though the yews and hollies, which are generally ſuppoſed very Hardy, were this winter in ſome places killed, and, in others, ſtripped of their leaves, and damaged in their bark. Furze buſhes were found to be ſomewhat harder than theſe, but they ſometimes periſhed, at leaſt down to the root. The broom ſeemed to occupy the next ſtep of hardineſs beyond theſe; this lived where the others died; and, where even this died, the juniper ſhrubs were ſometimes found unhurt. This laſt is the only ſhrub that approaches to the hardineſs of the box and ivy, but even this does not quite come up to them; for, while they ſuffer nothing in whatever manner they are expoſed, the juniper, though it bears cold well under the ſhelter of other trees, yet cannot bear the viciſſitudes of heat and cold, inſomuch that ſome juniper ſhrubs were found half dead, and half vigorous; that ſide, which faced the mid-day ſun, having periſhed by the ſucceſſive thawings and freezings of its ſap; while that which was not expoſed to the viciſſitudes of heat, had bore the cold perfectly well. Such ſhrubs as are not Hardy enough to defy the winter, but appear half dead in the ſpring, may often be recovered by Mr. Evelyn's method of beating their branches with a ſlender hazel wand, to ſtrike off the withered leaves and buds, and giving a free paſſage to the air to the internal parts. Where this fails, the method is to cut them down to the quick; and, if no part of the trunk appears in a growing condition, they muſt be taken off down to the level of the ground. *Phil. Tranſ.* N°. 165.

HARE.—The ſportſmen diſtinguiſh four ſorts of this animal: the one lives in the mountains; the ſecond kind in open fields; and a third kind in marſhy grounds; and the fourth is a rambler, having no particular fixed ſpot of reſidence. It is eaſy to ſee that theſe are no diſtinctions in the eye of the naturaliſt; but they have their ſeveral properties according to theſe differences of place, which are of conſequence to the ſportſman. Thus the mountain Hares are the ſwifteſt of all, and the marſh Hares the ſloweſt; the field Hares have a middling degree of ſwiftneſs between theſe; and the rambling Hares are the moſt difficult of all to hunt, for they are not only conſiderably ſwift, but they generally know all the coverts and thickets, and have the art to make a thouſand doublings and eſcapes that the others would not think of.

Hares and rabbits are very miſchievous to new planted orchards, by peeling off the barks of the tender young trees for their food; they do alſo the ſame ſort of miſchief to nurſeries; for the prevention of which, ſome bind ropes about the trees to ſuch a height as they are able to reach; ſome daub them with tar; but, though this keeps off the Hares, it is itſelf miſchievous to the trees; but this hurtful property of it is in ſome degree taken off by mixing any kind of fat or greaſe with it, and incorporating them well over the fire. This mixture is to be rubbed over the lower part of the trees in November, and will preſerve them till that time the next year, without any danger from theſe animals. It is only in the hard weather in the winter ſeaſon, when other food is ſcarce, that theſe creatures feed on the bark of trees.

People who have the care of warrens, pretend to an odd way of making Hares fat, when they get them there. This is the ſtopping up their ears with wax, and rendering them deaf. The Hare is ſo timorous a creature, that ſhe is eternally liſtening after every noiſe, and will run a long way on the leaſt ſuſpicion of danger; ſo that ſhe always eats in terror, and runs herſelf out of fleſh continually. Theſe are both prevented by her feeding in a ſafe place, and that without apprehenſion; and they ſay ſhe will always readily be thus fattened.

HART.—Harts at one year old have no horns, but only bunches; and at two years they are very imperfect, being ſtraight and ſingle; at three years old they grow out into two ſpears; at four into three; and ſo increaſe every year in number of branches, till they are ſix years old; but after that their age is not to be known by their heads. February and March are the months in which they caſt their horns; and in general the old ones caſt them ſooner than the young ones. Thoſe that have been injured at rut, or which have been gelded, never caſt them at all; if they are gelded while young, they never have any horns; if, after their horns are grown, they keep thoſe which they had on at the time, as long as they live. The horns of ſome are reddiſh, thoſe of ſome black, thoſe of others are finally white. The red horns are generally largeſt and ſtrongeſt, the black are uſually ſhorter, and the white are worſt of all, being the leaſt ſolid or ſtrong.

This animal is the moſt cunning in its care of itſelf of all the deer kind. It is the moſt timorous of any, and by its windings and turnings and other ſubtleties, as the running among the herds of cattle, often deceives the huntſman, and puts a foil upon the dogs. In the chace, which is generally a long one, he takes over hedge, ditch, or river, or whatever comes in his way, nothing ſtopping him.

This creature loſes its horns in the ſpring time, as the other deer do; but, during the time that it is without them, does not appear, but abides in the thick woods, and only comes out in the night-time for food.

HA'RVEST-*fly*, *cicada*, in natural hiſtory, the name of a large fly, remarkable for the noiſe which it makes in the ſummer months, and particularly about the time of Harveſt. The generality of authors have very improperly tranſlated cicada by the Engliſh word graſhopper; but this is extremely erroneous, the cicada having not the leaſt reſemblance to the graſhopper. It is called the cigale in France, in the provinces of Languedoc, &c. it is very common in that country; Italy and all the hot countries abound with it; and it is in moſt of theſe places called by the common people by a name expreſſing the Harveſt-fly; but in England we have not the inſect, and few of us have any notion of what it is. It is probable, that people who found the cicada, according to the deſcription of the ancients, very noiſy, fancied the graſhopper muſt be the ſame creature, this being of all our inſects the moſt noiſy in the ſummer months.

The cicada is a large four-winged fly; its body is ſhort and thick, and its wings long and large: the great or common cicada is by far the largeſt of all the known ſpecies of ſhort-bodied flies, and the ſmaller kinds are larger than the hornet. The head of the cicada is ſhort and obtuſe; the eyes are reticulated as thoſe of other inſects of the winged kind, but they are ſmaller, in proportion to the ſize of the body, than thoſe of moſt other ſpecies; they are placed at the two ſides of the back part of the head, and leave a very large naked ſpace of forehead between them; the breadth of this plain ſpace is not leſs than that of the breaſt of the animal, and it therefore makes a very ſingular figure. The reticulated eyes are of an oblong figure, and are cut into a vaſt number of faces, and between theſe there are in the plain ſpace of the forehead three other ſmall and ſhining eyes, reſembling thoſe of ſpiders, and placed in a triangle. The corſlet, or breaſt of this fly, is divided into two; the head is fixed to the anterior diviſion, and the body to the other; the anterior has a triangular figure delineated upon it in creux, and the poſterior to which the body is fixed has a ridge in the middle, riſing above the reſt of the ſurface. *Reaumur's Hiſt. Inſ.*

HASINE'LLAS, in the glaſs-making trade, are a number of hooks faſtened to the ſides of the working furnace, by means of which the workmen are able to reſt and turn their veſſels, as they ſcald them. *Neri's Art of Glaſs.*

HA'STING *pear*, a name given, by the gardeners, to a ſpecies of pear, called alſo, by ſome, the green chiſſel pear. This is a moderately large pear, and is longiſh toward the pedicle; its ſkin is thin, and of a whitiſh green; the pulp is melting, and of a ſugary flavour. It ripens in July.

HAT (*Dict.*)—Under this article in the Dictionary we have given the whole proceſs of Hat-making, and in order to elucidate that deſcription, we ſhall give a perſpective view of the whole operation on *Plate* XXVII. Where

A, is a man bowing the ſtuff, or compoſition for Hats.

B, the bow.

C, the ſtuff.

D, a man rolling a Hat on the plank, or ſloping ſide of the baſon.

E, a man putting a piece on a thin part of a Hat.

F, a man ſhaping a Hat on a block.

G, a lamp for giving light when they work in the night.

H, the plank, or ſloping ſide of the baſon.

I, a flue which carries of the ſmoak from the fire under the baſon.

K, a man ſtiffening the Hats.

L, the ſteaming baſon.

M, a furnace containing the fire which heats the ſteaming baſon.

HA'TCHES, in mining, a term uſed, in Cornwall, to expreſs any of the openings of the earth, either into mines, or in ſearch of them. The fruitleſs openings are called eſſay Hatches; the real mouths of the veins, tin Hatches; and the places where they wind up the buckets of the ore, wind Hatches. See the article WIND-HATCH, &c.

Coamings of the HATCHES, in a ſhip. When the Hatches are raiſed up higher than the reſt of the deck, thoſe planks, or

pieces

Engraved for the Supplement.

Facing Hat.

Printed for T. Hinton in Newgate Street.

pieces of timber, which raiſe and bear them up, are called coamings of the Hatches.

HA'TCHING (*Dict.*)—The artificial method of Hatching eggs, as practiſed in Egypt, has been mentioned in the Dictionary; and Mr. Reaumur has diſcovered, that the heat, neceſſary for this purpoſe, is nearly the ſame with that marked 32 upon his thermometer or that marked 96 on Fahrenheit's. If, therefore, eggs be kept in this degree of heat, they will as certainly hatch, as if the parent hen had ſat upon them; and indeed, it is impoſſible it ſhould be otherwiſe, ſince this heat anſwers nearly to that of the ſkin of the hen, or even of mankind; ſo that the empreſs Livia, as Pliny relates, might truly hatch a chicken in her boſom, if ſhe had but the patience to keep an egg there, for the ſame number of days that it ought to have continued under a hen.

After many experiments, Mr. Reaumur, found, that ſtoves, heated by means of a baker's oven, ſucceeded equally well with thoſe made hot by layers of dung. The furnaces of glaſs-houſes, and thoſe of the melters of metals, might, no doubt, be made to anſwer the ſame purpoſe. If, therefore, an eaſy method could be found to regulate the heat of the ſtove, it would be extremely convenient for bakers or paſtry-cooks to hatch, with little or no expence, a very great number of chickens; which they might diſpoſe of to the country people to be reared up till marketable. Should a thermometer be judged neceſſary for this purpoſe, it will be ſufficient to mark on it only ſuch degrees as are abſolutely neceſſary; by which means the inſtrument will not only come cheaper, but be the more readily underſtood by the ignorant people, for whoſe uſe it is deſigned.

Such an inſtrument, however, may be wholly diſpenſed with; a lump of butter, of the ſize of a walnut, melted with half as much tallow, ſerving to indicate the heat of the ſtove with ſufficient exactneſs. When the heat is too great, this mixture, which is to be kept in a phial, will become as liquid as oil; and, when the heat is too ſmall, it will remain fixed in a lump; but it will flow like thick ſyrup, upon inclining the bottle, if the ſtove be of a right temper. Great attention, therefore, ſhould be given to keep the heat always at this degree, by letting in freſh air, if it be too great, or ſhutting the ſtove more cloſe, if it be too ſmall.

But this is not all. That all the eggs in the ſtove may equally ſhare the irregularities of the heat, it will be neceſſary to ſhift them from the ſides to the center, and vice verſa; thereby imitating what the hens themſelves do by thoſe upon which they ſit; for hens are frequently ſeen to make uſe of their bills, to puſh to the outer parts thoſe eggs that were neareſt to the middle part of their neſts, and to bring into that middle part ſuch as before lay neareſt to the ſides of the ſame.

As to the form of the ſtoves, no great nicety is neceſſary. A chamber over an oven will do very well; only, in order to aſcertain the due degree of heat, it will be neceſſary to have phials of butter, as directed above, in ſeveral parts of the room; and, when the heat wants to be either increaſed or diminiſhed, it is ſufficient to diminiſh or increaſe the communication between the air in the room and that abroad, by opening or ſhutting ſome of the openings made in the wall for that purpoſe.

In order to cheriſh the new hatched chickens, capons may be taught to tend them in the ſame manner as hens do. Mr. Reaumur tells us, that he has ſeen above two hundred chickens, at once, all led about and defended, by only three or four ſuch capons; which clucked like hens, to call in the chickens that had ſtrayed too far off; and even redoubled their call, when they found any nice bits, to invite the young brood to come and pick them up. Nay cocks may be taught to do the ſame office, which they, as well as the capons, will continue to do all their lives afterwards.

But Mr. Reaumur, not ſatisfied with the aſſiſtance he could thus procure from cocks and capons, has invented a ſort of low boxes without bottoms, and lined with furs. Theſe, which he calls artificial parents, not only ſhelter the chickens from the injuries of the air, but afford a kindly warmth; ſo that they preſently grow fond of them, and take the benefit of their ſhelter as readily as they would have done under the wings of a hen.

For a few weeks after Hatching, it will be neceſſary to keep the chickens in a room artificially heated, and furniſhed with theſe boxes; but afterwards they may be ſafely expoſed to the air in the court-yard, in which it may not be amiſs to place one of theſe artificial parents to ſhelter them, ſhould there be any occaſion.

As to the manner of feeding the young brood, they are generally a whole day after being hatched, before they take any food at all; and then a few crumbs of bread may be given for a day or two, or millet-ſeeds mixed with the crumbs; after which they will begin to pick up inſects and graſs for themſelves. People in the country, who have plenty of conveniencies for the raiſing of poultry, will hardly give themſelves the trouble to hatch chickens in this artificial manner. It is in villages near great towns, and principally in the neighbourhood of the capital city, that it would be of the greateſt importance to promote the eſtabliſhment of this kind of ſtoves. Vid. Mr. Trembley's abſtract of the art of Hatching domeſtic fowls, tranſlated from the original treatiſe of Mr. Reaumur, where he explains every difficulty.

HAUSTI'LIA *ſuccina*, in natural hiſtory, a term uſed to expreſs that kind of amber, or, more properly ſpeaking, thoſe maſſes of amber which are obtained by dragging the bottoms of the ſea near Pruſſia, or found on the ſhores, in diſtinction from thoſe pieces which are found foſſile in the ſame or other kingdoms.

HA'ZLE, *corylus*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the amentaceous or catkin kind, being compoſed of a number of leaves affixed in a ſquamoſe order to an axis; under each of theſe there are placed a number of apices. Theſe flowers are barren, and the embryo fruits are placed in different parts of the tree; theſe finally become a hard and roundiſh ſhell, containing a ſingle kernel, and ſurrounded by a callous fimbriated cup.

HAZLE-*earth*, in agriculture, a moderately compact earth, much approaching to the nature of the chiefly ſoil, and indeed properly a ſpecies of it, but always containing a large quantity of a reſin-coloured ſand. *Morton's Northampt.*

HAY.—Whatever uplands are deſigned to be mowed for Hay, are to be ſhut up in the beginning of February, and no cattle ſuffered to come upon them afterwards; but the meadows and marſh lands, where the graſs grows quicker, need not be ſhut up till April, except the ſpring be bad; and many farmers feed thoſe meadows which are in danger of overflowing till the firſt of May, and then ſhut them up for mowing.

In ſpring, the ſtones, ſticks, and all other kinds of foulneſs that lie upon the land, are to be picked up, and the mole-hills all levelled and ſpread, becauſe they hinder the mowers. If the meadows lie any thing uneven, or if they have been trodden down in winter, they ſhould be rolled all over with a large wooden roller; the mowers will then be able to cut much cloſer; for this, and the quantity of the Hay, will very well anſwer the trouble.

The time of mowing the graſs muſt be proportioned to its ripeneſs; nothing can be more prejudicial to the crop, than the cutting it too ſoon, becauſe the ſap is not then fully come out of the root; and ſuch graſs, when dried into Hay, ſhrinks up almoſt into nothing. It is very wrong alſo to let it ſtand too long, for, when the ſeed has been ripened, and is ſhed, the moiſture of the ſap all dries away out of the ſtalks, and they become no better than ſo much ſtubble; as is plainly ſeen in thoſe graſſes which grow in hedges, and, not being mowed, die away after they have perfected their ſeeds, and become taſteleſs and very different from Hay. The middle or latter end of June is the general ſeaſon for mowing; and the red flowers of the honey-ſuckle, beginning to wither, generally give the farmer notice that the time is coming on. But he may be more aſſured of this, by the tops or heads of the graſs looking full, bending downward, and looking brown: it is then in the proper ſtate to be cut down.

If there is great plenty of the Hay, and it lie thick in the ſwarth, the Hay-makers ſhould follow the mowers, and turn the ſwarths, as they cut them, unleſs there ſeems danger of wet weather; but in that caſe it is better to let them lie in the ſwarth. At night it muſt be made up into little cocks, and theſe in the morning muſt be ſpread again and turned, ſo that the other ſide may wither. After this it is to be made into ſmall cocks again, and the next day it is to be ſpread again, and drawn into long rows, which they call winrows. From theſe it is to be made up into large cocks after a little drying; and theſe large ones, if any wet comes, are to be ſpread open once again before they are carried in.

Mowing of land too often, or continuing it too long, is a very great prejudice to it, unleſs it have the advantage of being fed and renewed by land-floods at times. The farmer who has not this advantage to his lands, ſhould feed them once in two or three years, inſtead of making Hay from them, unleſs he chuſes to lay on manure conſtantly to keep them in heart. Feeding the Hay lands is the ſame ſort of reſpite that fallowing is to corn lands, both very neceſſary and advantageous.

HEAD-*ſails*, in a ſhip, thoſe which belong to the foremaſt and boltſprit; for it is by theſe that the head of the ſhip is governed, and by which it is made to fall off, and keep out of the wind. And theſe in quarter winds are the chief drawing ſails.

HEAD-*tin*, in metallurgy, is a preparation of tin ore toward the fitting it for working into metal. When the ore has been pounded and twice waſhed, that part of it which lies uppermoſt, or makes the ſurface of the maſs in the tub, is called the Head-tin; this is ſeparated from the reſt, and after a little more waſhing becomes fit for the blowing-houſe. *Ray's Engliſh Words.*

HEART-*ſhells*, *conchæ cordiformes*, in natural hiſtory, the name of a genus of ſhells, by ſome authors referred to the pectunculus or cockle kind, but by later writers juſtly diſtinguiſhed into a ſeparate genus. The characters are theſe: it is a bivalve ſhell-fiſh of a globoſe elated form, furrowed in deep lines, and in ſome ſpecies imbricated, in others prickly, never auriculated, and always expreſſing what we call the figure of a heart. *Hiſt. Nat. Eclairc.*

HEAT (*Dict.*)—The learned Dr. Knight, after ſuppoſing a repellent

repellent fluid every where disseminated through the universe, accounts for the effects of Heat, in the following manner:

If light in a sufficient quantity enters the pores of a solid or fluid body, the quantity of repellent matter will be thereby increased, the body expanded, and the common effects of Heat produced.

Light is nothing but the repellent fluid put into very violent vibrations. When these vibrations are continued in a right-line, till they arrive near the surface of a body, they will begin to be acted upon by the repellent and true atmosphere surrounding that surface, and either be repelled thereby, or have force sufficient to penetrate within those atmospheres: if the latter, the same vibrations will be continued through the repellent atmosphere, only the direction will be changed towards the perpendicular; because the repellent particles will be acted upon by two forces, in different directions; except when the light falls perpendicular to the surface, for within the atmosphere of bodies the repellent matter it attracted towards the surface. Light will therefore move within the atmosphere of bodies, in the diagonal of the projectile and attracting force; and by the continuation and increase of that attracting force, will be made to describe a curve, and come nearer the direction of a line drawn perpendicular to the surface; where, when it arrives, it will either fall upon a pore or solid part: if the former, it will enter among component corpuscles of the body, and increase the repulsive force betwixt those corpuscles, which must make them recede farther from each other, and consequently the body will be dilated. The greater the quantity of light that thus enters amongst the component corpuscles of bodies, the greater will be their expansion: Heat therefore will be most produced, where the greatest number of repellent particles are in a vibratory motion without the body. Nor is it necessary that those vibrations should be always so violent as to excite in us the sensation of light. A very small vibration will be sufficient, when the direction of it is perpendicular to the surface. Hence we see the difference betwixt light and Heat: the first may be produced by a few vibrating rays, provided that those vibrations are brisk enough; the latter may be produced by much weaker vibrations, provided the rays are sufficiently numerous.

HEAT, in medicine.—Great Heats are not so much the immediate, as the remote cause of a general sickness, by relaxing the fibres, and disposing the fibres to putrefaction; especially among soldiers, and persons exposed the whole day to the sun; for the greatest Heats are seldom found to produce epidemic diseases, till the perspiration is stopped by wet cloaths, fogs, dews, damps, &c. and then some bilious or putrid distemper is the certain consequence, as fluxes and ardent intermitting fevers. Nevertheless, it must be allowed, that Heats have sometimes been so great, as to prove the more immediate cause of particular disorders. As when centinels have been placed without cover, or frequent reliefs, in scorching heats; or when troops march, or are exercised in the heat of the day: and when people imprudently lie down and sleep in the sun: all these circumstances are apt to bring on distempers, varying according to the season of the year. In the beginning of summer, these errors produce inflammatory fevers; and, in the end of it, or in the beginning of autumn, a remitting fever or dysentery.

To prevent, therefore, the effects of intemperate Heat, commanders have found it expedient so to order the marches, that the men come to their ground before the Heat of the day; and to give strict orders, that none of them sleep out of their tents; which in fixed encampments may be covered with boughs, to shade them from the sun. It is likewise a rule of great importance to have the soldiers exercised before the cool of the morning is over; for, by that means, not only the sultry Heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the Heat of the day. Lastly, in very hot weather, it has been found proper to shorten the centinel's duty, when obliged to stand in the sun. *Pringle's Observations on the Diseases of the Army.*

HEATH-*moss*, *coralloides*, in botany, the name of a genus of the mosses; the characters of which are these: they are composed of stalks often branched in the manner of corals, and composed of parts of a different figure and appearance, not simple and uniform as the byssi and confervæ. On the summits of the branches there grow a sort of fleshy tubercles, which Micheli calls the receptacles of flowers; and the little atoms, which are seen adhering to the different parts of the stalks, he calls the seeds.

HE'DERA, *ivy*, in botany, a genus of plants, whose characters are:

The parasitic tendril sends forth fibres, or roots, into any thing they come near, capable of sustaining them: the leaves are angular; the flower rosaceous, and, generally, hexapetalous; the ovary, at the bottom of the flower, becomes a round berry, pregnant with seeds, which are gibbous on one side, and flat on the other.

The leaves of ivy, while they run upon the ground, are more angular and cornered; but, when the stalks rise up, and are fastened to a wall or tree, they become rounder, ending in one point: whence most of the old botanic writers have made two species; that with the cornered leaves, because it bore no fruit, while it lay on the ground, they called helix, or barren ivy; and the other corymbosa: the leaves of both are of a firm texture, and a dark green colour; those of the first frequently full of small white veins: the branches insinuate themselves, by short cirrhi, into a wall, or body of a tree, that it climbs on: the flowers grow in corymbi or umbels, consisting of small six-leaved yellowish flowers, followed by round umbilicated berries, black, when ripe; including several angular seeds: ivy grows every-where in hedges, and flowers late in the year; the berries being not ripe till January, or later.

The leaves are seldom or never used inwardly; but, outwardly, they are applied to issues, to keep them cool, and free from inflammations; as, also, to scabs, and sores, and scald heads. Mr. Boyle, in his Usefulness of Experimental Philosophy, commends a large dose of the full ripe berries, as a remedy against the plague; though Schroder says, they purge upwards and downwards. The gum of ivy is somewhat caustic, and commended to take away spots and freckles out of the face. *Miller's Bott. Off.*

The gum is a resinous, dry, hard, and compact substance; of a bay colour, inclining to that of gold, shining like glass, but not pellucid; of a subacrid and subastringent taste, and fragrant smell.

Geoffroy says, it is neither caustic nor depilatory, as the ancients imagined; but a powerful resolvent and discutient, in which intentions it is an ingredient in several plaisters.

HEDERA *terrestris*, *ground-ivy*; see the article GROUND-IVY, in the Dictionary.

HEDGE (*Dict.*)— The hawthorn is allowed to be the best of all the English shrubs for quick-set Hedges. The best method of raising this for use, is to put the haws into the ground as soon as ripe, and cover them with earth; and, by the spring twelvemonth, the young shoots will be of due size to transplant from the seed-plot into Hedge-rows. The crab-tree is a common mixture with the hawthorn in Hedges; but grows faster than the hawthorn, and requires cutting to keep the Hedge even. The young hawthorns raised from seed always thrive better than those picked up wild in the fields. *Moreton's Northampt.*

The great consideration, in making quick-set Hedges, is to bring the plants from a worse soil than that in which it is intended to set them. They must be about the thickness of one's thumb, well rooted and strong, and must be planted about four or five inches out of the ground. If there be a ditch to the Hedge, it should be three feet wide at the top, one at the bottom, and two deep; and, if wider, then deeper in proportion.

If the bank be without a ditch, the plants should be set in two rows at a foot distance below one another. The turf is to be laid with the grass side downward on that side of the ditch on which the bank is designed to be made, and some of the best mould must be laid upon it to bed the quick; then the quick is to be laid upon it a foot asunder, so that the end of it may be inclining upwards; and at equal distances of thirty feet, plant an ash, oak, crab, or elm, to grow with the quick. When the first row of quick is laid, it must be covered with mould, and the turf laid upon it as before, and some more mould upon that; so that when the bank is a foot high, another row of sets may be laid against the spaces of the lower quick. These must be then covered as the former, and the bank is to be then topped with the bottom of the ditch, and a dry or dead Hedge laid, to shade the under plantation. There should then be stakes driven into the loose earth quite down to the firm ground, at about two feet and a half distance from each other; oak stakes are accounted the best of all for this use, and, the next to this, those of black-thorn or sallow. Small bushes are to be laid below, but not too thick, only to cover the quick from being injured, as it shoots. *Miller's Gard. Dict.*

HE'GEN, Arabian name of the camel which has only one bunch on its back. Its hairs are soft to the touch, and are shorter than those of our oxen, except that there are some longer on the head, the throat and the top of the neck; and on the middle of the back, there are hairs of a foot long, and these though very soft and flexile, yet naturally standing in an erect posture, they make the most visible part of the bunch. For when these are removed by the hand, the flesh scarce appears more prominent, than that of the back of a hog, and there is not the least fleshy or callous excrescence there. See DROMEDARY.

The head is small in proportion to the body; the upper lip is divided as in the hare; the feet are not hoofed; but each terminated by two small claws; the sole of the foot is broad and very fleshy; and seems soft to the touch, though the skin is very hard and callous; the feet are indeed cloathed as it were with living shoes, which are of very great service to it in travelling over the sandy countries. It has six callous hardnesses on the knees and shoulders of the fore legs, and one on each of the hinder ones. And, beside these, there is another much larger, which adheres to the breast, on an eminence which is there, as if made to support it; this is usually eight inches long,

long, six inches broad, and about two thick. The use of these is to sustain the weight of the creatures body on occasion of his stooping to rest, or to be loaded.

Its stomach is very large, and divided into four parts as in other ruminating animals, but of a singular structure; in that at the upper part of the second ventricle, there are several square holes, which are the orifices of a great number of a sort of bags placed between the membranes which compose the stomach, and these seem to be the receptacles of water kept for the time of necessity, for the creature always drinks a vast quantity at once, and will then live a great while without drinking again. It is yet a question to be decided, whether this creature is of the retromengent kind, and whether it copulates backwards? This has been affirmed by some, but it is greatly doubted by others. See *Plate* XXVIII. *fig*. 3. *Ray's Syn. Quad.*

HELE'NIA, *bastard elecampane, or willow-leaved sun-flower*, in botany, a genus of plants whose characters are:

It hath a compound radiated flower, consisting of many florets, which are hermaphrodite, and of semi-florets, which are female: the ovaries stand on a naked placenta, each leaving an antient crown: all these parts are included in a simple empalement, which expands, and is cut almost to the bottom in several parts.

The best season to transplant the old roots, and to part them for increase, is in October, or the beginning of March, just before they begin to shoot; but, if the spring should prove dry, they must be duly watered, otherwise they will not produce many flowers the same year. These plants should not be removed oftener than every other year; for as they do not spread their roots very wide, they will very well continue two years within due compass. They delight in a soil rather moist than dry, provided it be not too strong, or hold the wet in winter: but if they are planted in a dry soil, they must be often and plentifully watered in dry weather, to make them produce plenty of flowers.

These plants generally rise about three feet and an half, or four feet high; therefore should be planted in the middle of large borders, intermixed with flowers of the same growth, where they will make a pretty variety, because they continue a long time in flower: and as they require very little care to cultivate them, they deserve a place in every large garden.

Their flowers resemble those of the smaller kinds of sunflower, and have been by some botanists ranged in that genus. The time of their flowering is from July until the frost stops them.

HE'LIOTROPE, *heliotropium*, among the ancients, an instrument or machine, for shewing when the sun arrived at the tropics and the equinoctial line. *Hoff. Lex.*

White HE'LLEBORE (*Dict.*)—The characters are:

The flower is naked, consisting of six leaves, which expand in form of a rose; in the middle of which arise the pointal, surrounded by six stamina or threads, which afterwards turn to a fruit; in which, for the most part, three membranaceous sheaths are gathered into a little head, and are full of oblong seeds, resembling a grain of wheat, and encompassed, as it were, by a leafy wing.

These plants are very pretty ornaments, when planted in the middle of open borders of the pleasure garden; for if they are placed near hedges or walls, where generally snails harbour, they will greatly deface the leaves, by eating them full of holes; and as a great part of the beauty of these plants consist in their broad folded leaves, so, when they are thus defaced, the pleasure is almost lost.

The leaves of these plants are very broad, especially if the ground is good where they grow, and are plaited somewhat resembling those of the palms; but are of a much thinner consistence. From each head of the root is generally produced a flower stem, about three feet high, having a spike of flowers about a foot in length at their top. The flowers of the first kind, being green, make not much appearance; but those of the second, which are of a dark red, or purple colour, are generally preferred by those persons who cultivate them in the pleasure garden.

They may be propagated either by parting their roots in autumn, or towards the latter end of February, or the beginning of March, just before they begin to shoot, and should be planted in a light fresh rich soil; in which they will thrive exceedingly, and produce strong spikes of flowers. These roots should not be removed oftener than once in three or four years; by which time, if they like the soil, they will be very strong, and afford many heads to be taken off; but, if they are frequently transplanted, it will prevent their increasing, and cause them to flower very weak.

You may also propagate these plants by seeds, which should be sown as soon as ripe, either in a bed or box filled with fresh light earth, and the ground kept constantly clear from weeds. In the spring the plants will appear, at which time, if the season be dry, you should now and then refresh them with water, which will greatly promote their growth; and you must carefully clear them from weeds, which, if permitted to grow, will soon overspread and destroy these plants while young. The spring following, just before the plants begin to shoot, you should prepare a bed of fresh light earth, and carefully take up the young plants, observing not to break their roots, and plant them therein about six inches square, where they may remain until they are strong enough to flower, when they should be transplanted into the borders of the pleasure garden. But as these plants seldom flower in less than four years from seeds, so this method of propagating them is not very much practised in England. See *Plate* XXV. *fig*. 2. where *e* is the flower, *f* the fruit, *g* the seed.

HE'NBANE *louse*, in natural history, a name given by some to a peculiar insect found very frequently on that plant in the summer months. It is one of the cimices of authors, and is very well described by Lister in the Philosophical Transactions. It is a very large cimex, of a fine red, spotted with black; it feeds on the juices of the Henbane, whose leaves and stalk it pierces with its trunk. It is very remarkable that the juices of this stinking plant acquire a very agreeable and aromatic flavour in the body of this insect, and on trial it may perhaps be found, that the mischievous narcotic quality of the plant may be rendered wholesome, and a good medicine, in the body of this insect. *Phil. Transf.* N°. 71.

HE'PAR *sulphuris*, brimstone melted with half the quantity of a fixed alkali. A like substance may also be produced by tartarum vitriolatum, sandiver, or other of the neutral salts containing the vitriolic acid, if, when they are red-hot in the fire, there be added to them powder of charcoal, or any other more fixed phlogistic; but the hepar sulphuris is not so strong, as otherwise, when it is made with nitre fixed with coals, or with the alkali composed of tartar and nitre, or with neutral salts with an addition of sulphur already containing the vitriolic acid. The Hepar sulphuris runs earths and stones into fusion over the fire; and when melted with the metals it makes them easily fuse, but renders them brittle, and in some degree soluble in water. *Hoffman's Observ. Phys. Chem.*

HEPA'TICA *trifolia, noble liverwort*, in botany, a genus of plants, whose characters are:

The root is fibrous and perennial; the pedicles of the leaves arise from the root; the leaves consist of three lobes, the stalks are naked, florigerous, or flower-bearing, simple, and spring from the root. The perianthium or calyx is monophyllous, deeply cut, commonly into three, rarely into four lobes, and permanent. The flower is rosaceous, polypetalous, naturally pentapetalous, and furnished with numerous stamina. The fruit is globular, and has every one of its cells furnished with a crooked tube: in other respects it resembles the lesser celandine.

The flowers of this liverwort arise out of the ground early in the spring, before the leaves; they grow on long, slender, and somewhat hairy foot-stalks, four or five inches long, inclosed in a three-leaved green calyx: they are made up of six blue roundish-pointed leaves, set about a small green head, with several whitish-blue chives in the middle; the green head afterwards is inlarged into several small naked seeds. The leaves come up when the flowers are past, consisting each of a leaf of three equal lobes, round, and somewhat pointed at the end, of a dull green colour, growing on long foot-stalks. The root is small and stringy. It is usually planted in gardens, and flowers in March.

The leaves are used, though but very rarely, here in England; but they are commended by some foreign authors, as a very good vulnerary, and useful in distempers of the liver.

It is cultivated in gardens, and flowers in the spring. As to its virtues, it corroborates the stomach by its astringent quality, and is, therefore, proper in all disorders proceeding from relaxation, and where astriction is required: hence it is of service in vulnerary drinks, in a diabetes, spitting of blood, or making of bloody urine. It is much commended in an hernia; and the leaves, pulverized, are excellent in the dysentery. A decoction of the leaves is effectual against the jaundice, itch, fetid ulcers, and the quinsey. The whole plant is of service in obstructions of the kidneys, bladder, and liver. *Boerhaave.*

These plants are some of the greatest beauties of the spring: their flowers are produced in February and March in great plenty, before the green leaves appear, and make a very beautiful figure in the borders of the pleasure-garden; especially the double sorts, which commonly continue a fortnight longer in flower than the single kinds, and the flowers are much fairer. I have seen the double white kind often mentioned in books, but could never see it growing; though I do not know but such a flower might be obtained from the seeds of the single white, or blue kinds. I have sometimes known the double blue sort produce some flowers in autumn which were inclining to white; and thereby some people have been deceived, who have procured the roots at that season, and planted them in their gardens; but the spring following their flowers were blue, as before: and this is a common thing, when the autumn is so mild as to cause them to flower. But, whether the double white sort, mentioned in the books, was only this accidental alteration in the colour of the flower, I cannot say; though it seems very probable it was, since I never could hear of any person who ever saw the double white sort flower in the spring. *Miller's Gard. Dict.*

HEPTA'NDRIA, in botany, a clafs of plants with hermaphrodite flowers, and feven male parts or ftamina in each.

* The word is formed of the Greek, ἑπτὰ, feven, and ἀνὴρ, male.

Of this clafs are the horfe chefnut, finitelis, &c.

HE'RBA *paris*, *herb paris*, in botany, a genus of plants, whofe characters are:

The calyx confifts of four leaves, which expand in rays. The flower is tetrapetalous; the petals difpofed in the form of a crofs, furnifhed with four ftamina. The fruit is foft, globular, furnifhed with four tubes, divided into four cells, and full of oblong feeds.

The roots of this herb run creeping along on the furface of the earth, being flender and of a brown colour, fhooting up here and there, being long round ftalks half a foot high; having ufually four, though, fometimes, five or fix leaves, which are pretty broad and roundifh, narroweft next the ftalk, and ending in a fharp point. From among thefe arifes a flender ftalk, two or three inches high, bearing one fingle flower, compofed of four long green leaves, with as many very narrow ones under them, of the fame colour, having feveral ftamina among them; in the middle of thefe grows a roundifh blackberry, about as big as a grape, of an infipid tafte. It is found in moift fhady woods, which have a good foil; the neareft place to London, that I know of, where it grows, is Chifelhurft in Kent, in a wood by the bog, at the entrance of it next the town.* It flowers in April and May, and the berry is ripe in July.

Though this plant was formerly accounted of a poifonous nature, being reckoned among the aconites, Fuchfius calling it aconitum pardalianches; yet authors, who have wrote fince, attribute to it quite contrary effects, efteeming it to be a counterpoifon, and an alexipharmic, and good in malignant and peftilential fevers.

Parkinfon fays, the roots, boiled in wine, help the cholic; and the leaves, applied outwardly, reprefs tumors and inflammations, efpecially in the fcrotum and tefticles, and ripen peftilential tumors.

HERNA'NDIA, in botany, the name of a diftinct genus of plants, the characters of which are thefe: the petals of the flower are multifid, and placed in a circular order; the male and female flowers ftand on diftinct plants. There is no pericarpium, but the cup of the flower is very large, fwelled, and roundifh; containing a plicated oval nut, with only one cell, and a globofe nucleus. *Linnæi Gen. Plant.*

We know only one fpecies of this genus, which is the Hernandia, with a large umbilicated ivy-like leaf, commonly called, in the Weft-Indies, Jack in a box.

HE'RON, *ardea*, in zoology, the name of a large genus of birds, the diftinguifhing character of which is, by Mr. Ray, fixed in their inteftines; they having only one inteftinum cæcum, or blind gut, as is the cuftom of nature in quadrupeds, moft other birds having two.

This bird is a great devourer of fifh, and is of more mifchief to a pond than even an otter: fome fay, that a Heron will deftroy more fifh in a week, than an otter will in three months; but that feems carrying it too far. People who have kept Herons, have had the curiofity to number out the fifh they fed them with into a tub of water, and counting them again afterwards, it has been found that they will eat fifty moderate-fized dace and roaches in a day. It has been found that in carp ponds, vifited by this bird, one Heron will eat up a thoufand ftore carp in a year, and will hunt them fo clofe as to let very few efcape. The readieft method of deftroying this mifchievous bird, is by fifhing for him in the manner of pike, with a baited hook. When the haunt of the Heron is found out, three or four fmall roach or dace are to be procured, and each of them is to be baited on a wire, with a ftrong hook at the end, entering the wire juft under the gills, and letting it run juft under the fkin to the tail; the fifh will live in this manner five or fix days, which is a very effential thing; for, if it be dead, the Heron will not touch it. A ftrong line is then to be prepared of filk and wire twifted together, and is to be about two yards long; tie this to the wire that holds the hook, and to the other end of it there is to be tied a ftone of about a pound weight; let three or four of thefe baits be funk in different fhallow parts of the pond, and, in a night or two's time, the Heron will not fail of being taken by one or other of them.

HE'SPERIS, in botany, a genus of plants, whofe characters are:

It has a long, fmooth, cylindrical, bivalve pod, divided into two capfules or cells, which are feparated by an intermediate partition, and furnifhed with cylindrical or globular feeds.

Boerhaave mentions four and twenty fpecies of this plant.

This plant is antifcorbutic and diaphoretic, and very ferviceable in the afthma, coughs, and convulfions. The outward ufe of it is recommended againft inflammations, cancers, a gangrene, fphacelus, and contagious difeafes. Bruifed, it very potently refifts putrefaction; and, applied to peftilential buboes under the arm-pits, ripens and foftens them. It is highly commended by Hildanus, in his treatife of Inflammations, Sphacelus, and Gangrene; and I myfelf have had experience of its virtues, in the following inftance: there was a ftudent, who, being on a journey, had the misfortune, not only to break, but very much bruife, both the tibia and fibula; and, before the furgeons could be ready with their affiftance, the parts were feized with a gangrene. When the furgeons were come, and had viewed the place, they fent for me, becaufe they defpaired of a cure: I bruifed this herb in wine, and applied it to the leg, which perfectly cured the patient of his gangrene. *Hiftoria Plantarum, afcribed to Boerhaave.*

HETERO'STROPHE, an epithet applied to certain fhells, the wreaths of which turn a contrary way from thofe of other fhells of the fame genera.

HEXAEDRO'STYLA *, in natural hiftory, the name of a genus of fpars.

* The word is derived of the Greek ἕξ, fix, ἕδρα, fide, and στύλος, a column.

The bodies of this genus are fpars of a columnar form, adhering to fome folid body at the bafe, and terminated at the point by a pyramid; the pyramid and column being both hexahedral, or compofed each of fix fides. Of this genus there are three known fpecies: 1. A flender one with a long pyramid; this is compofed of fo pure and clear a fpar, that it refembles cryftal, and is found in Ockey hole, on Mendip hills, and in fome other parts of England. 2. A fomewhat thick one, with a long irregular pyramid, found in the mines of Cornwall and Devonfhire, and common alfo in thofe of Germany. 3. One with a very fhort pyramid; this is found in the Derbyfhire lead mines, and in great plenty on thofe of the Hartz foreft in Germany. *Hill's Hift. of Foff.*

HEXA'NDRIA*, in botany, a clafs of plants with hermaphrodite flowers, and fix ftamina or male parts in each, which are in fome plants all of the fame length, and in others are alternately one fhorter and another longer.

* The word is derived from the Greek ἕξ, fix, and ἀνὴρ, male.

The plants of this clafs are garlic, hyacinth, meadow faffron, &c. See *Plate* XXVIII. *fig.* 1.

HEXAPYRAMI'DES *, in natural hiftory, the name of a genus of fpars.

* The word is derived from the Greek ἕξ, fix, and πυραμὶς, a pyramid.

The bodies of this genus are fpars formed into pyramids, compofed of fix fides or planes, and affixed to no column, but adhering to fome folid body by their bafes. Of this genus there are only two known fpecies. 1. A fhort one with a broad bafe; this is a very rare fpecies, and found only, fo far as is yet known, in the great mine at Goffelar in Saxony. And, 2. A long pointed one, with a narrow bafe; this is found in the figures of the alabafter quarries of the Hartz foreft. *Hill's Hift. of Foff.*

HILLS are of great ufe in a garden.

1. They ferve as fcreens to keep off the cold and nipping blafts of the northern and eaftern winds.

2. The long ridges and chains of lofty mountains, being generally found to run from eaft to weft, ferve to ftop the evagation of thofe vapours towards the poles, without which they would all run from the hot countries, and leave them deftitute of rain.

3. They condenfe thofe vapours, like alembic heads, into clouds; and fo, by a kind of external diftillation, give origin to fprings and rivers; and, by amaffing, cooling, and conftipating them, turn them into rain, and by that means renders the fervid regions of the torrid zone habitable.

4. They ferve for the production of a great number of vegetables and minerals, which are not found in other places.

It hath been found by experiment and calculation, that Hills, though they meafure twice as much as the plain ground they ftand upon, yet the produce of the one can be no more than the other; and, therefore, in purchafing land, the Hills ought not to be bought for more than their fuperficial meafure; i. e. to pay no more for two acres upon the fide of an hill, than for one upon the plain, if the foil be equally rich.

It is true, that thofe lands that are hilly and mountainous, are very different, as to their valuable contents, from what are found in flat and plain ground, whether they be planted, fown, or built upon; as for example:

Suppofe an Hill contains four equal fides, which meet in a point at the top; yet the contents of thefe four fides can produce no more grain, or bear no more trees, than the plain ground on which the Hill ftands, or than the bafe of it; and yet by the meafure of the fides there may be double the number of acres, rods, and poles, which they meafure on the bafe or ground-plot.

For, as long as all plants preferve their upright method of growing, hilly ground can bear no more plants in number than the plain at the bafe.

Again, as to building on an Hill, the two fides of an Hill will bear no more than the fame number of houfes that can ftand in the line at the bafe.

And as to rails, or park-pailing over an Hill, though the meafure be near double over the Hill to the line at the bottom, yet both may be inclofed by the fame number of pales of the fame breadth. *Miller's Gard. Dict.*

HIPPOPOTAMUS, in zoology, the name of a very singular quadruped, called in English the river horse, and by some, though less properly, the sea-horse. It approaches in figure partly to the buffalo, and partly to the bear. It is larger than the buffalo, and its legs are very much like the bear's. The full grown animal is thirteen feet long from its head to its tail, and four feet and an half in the diameter of its body, and its belly is rather flat than ridged; the circumference of its body is usually equal to its whole length; and its legs three feet and a half long, and three feet round; and its feet a foot broad; its head is very large in proportion to its body, and its mouth is capable of opening a foot wide; its eyes are small, its ears also small and thin; its teeth are as hard as flint, and will readily give fire with steel; it is usually very fat; its hoofs are black, much like those of the common cloven-footed beasts, but divided into four claws instead of two; its upper jaw is moveable in the manner of the crocodile's. Its tail is more like that of a bear or tortoise, than a hog's, to which it has usually been compared; it is very thick at its insertion, and tapers away to the end; it is not above six inches long, and so thick that it cannot twist about. Its skin is extremely hard and tough, and in colour black; and its nose is furnished with stiff hairs or whiskers, in the manner of a cat's, several stiff hairs growing from the same hole; and these are the only hairs the creature has, its whole body being naked. It has two large teeth in the lower jaw, somewhat resembling the tusks of the boar, and a little crooked, but not standing out of the mouth like the boar's tusks; these are much larger than the other teeth, and sometimes grow to a foot in length.

It is found in the Nile and Niger, and many other great rivers; it comes out of the water to bring forth its young, and feeds upon rice, herbs, and the roots of the colocasia. Its feet, being not webbed, shew that it is not intended for swimming, and probably it spends its time in walking about at the bottom of the rivers. It is very plainly proved by Bochart, that this is the creature mentioned under the name of the behemoth in the book of Job. *Ray's Syn. Quad.*

HIRUDO, *the leech.*—These are small black animals, destitute of legs, variegated with lines and points, and living in watery places. The small leeches are preferred to the large, as being less hurtful; and, among the small ones, such as are marked with lines on the back.

Leeches are a species of aquatic worms or insects, which, being applied to the body, bite through the skin, extract blood out of the veins, and are very conducive to health; for which reason they were used, in very early times, by the Greek and Roman physicians. Since there are various kinds of them, it will be proper to give some direction for the choice. Those, then, taken out of clear rivers and brooks are best; for the others from lakes, fish-ponds, and stagnating waters, are impure and malignant, exciting sometimes violent pains, inflammations, and tumors. The most experienced surgeons likewise prefer those with slender pointed heads, and greenish or yellowish streaks on their backs, with their bellies of a reddish yellow; for, when their heads are large, and from a blue they incline to a black colour all over their bodies, we look upon them to be the most malignant sort. But one observation more seems absolutely necessary, never to apply leeches lately caught in rivers, or foul waters; but let them be first put into a glass full of clean water, and often shifted, that they may purge themselves of their filth and venom. After keeping them some months in this manner, they may be used safely.

Before the leech is applied, it should be taken out of the water, and put into an empty cup, or glass, that, being thirsty, it may the more speedily insinuate itself into the skin, and draw off a greater quantity of blood. And, as for the part, it may be put to the temples, or behind the ears, if there is any disorder in the head or eyes, from a redundance of blood, and especially if the patient is delirious in a fever. They may be sometimes conveniently applied to the veins of the rectum, in the blind and painful piles; nor will this application be of less service, in hæmorrhages of the nose, and in spitting or vomiting blood; for their efficacy in promoting a revulsion, especially when an obstruction of the hæmorrhoids occasions this profusion, is very extraordinary. But, before the leech is used, the part should be rubbed, till it is hot and red; then the tail is to be taken hold of with a dry cloth, or it must be laid half over the edge of a glass, and then directed to the proper place, where, when it is once fixed, it sucks very greedily. If several are necessary, apply each successively in the same manner. When they will not adhere, as it sometimes happens, it is proper to moisten the skin with warm water, or the blood of a pigeon, or chicken; if that will not entice them, others must be substituted in their stead. The application of leeches to the caruncle in the greater canthus of the eye, after phlebotomy, has been found very serviceable, in all inflammatory disorders of that organ. Cream and sugar, rubbed upon the part, will invite leeches to bite, when other things fail.

As soon as the leeches are distended with blood, they generally fall off spontaneously; but, if a larger quantity of blood is requisite, new ones must be applied, or the tails of those already fixed must be cut off; for then, the blood running through them, they will be induced to draw more. If, after a sufficient evacuation, they do not spontaneously separate themselves from the skin, upon sprinkling a little salt or ashes, they immediately drop off; and this method is best; because pulling them away often causes an inflammation or tumor. The leech which is whole, may be put again into the clean water, and kept for future use; but that which is cut, certainly dies. The wound may be washed with warm water, and dressed with a vulnerary plaister, though it usually heals without.

When leeches fall off, the hæmorrhage generally continues for some time, as twelve hours, and frequently longer. Upon this occasion, as the blood cannot be received in vessels, bu is absorbed by linen, it makes a great appearance, and seems much more than it really is: this alarms the patient and puts the attendants into an unnecessary consternation, upon a supposition, that the hæmorrhage will be so profuse, as to occasion faintings and death, neither of which is likely to ensue; for the bleeding may, at any time, be stopped by compressure, or the application of styptics; as brandy, with a little powdered colcothar. But it is more frequently necessary to bathe the part wounded, with warm water, in order to encourage a discharge of blood, when it does not flow in quantities sufficient to answer the end proposed.

HISTRIX, *the porcupine*, an animal well known in many parts of the world, and so common in the mountainous parts of Italy, that it is brought to market at Rome, and sells but at a very low price, the flesh not being greatly esteemed.

It resembles the badger in shape, but in its nature more resembles the hare, and is properly of the leporine kind. It usually weighs between twenty and thirty pounds. Its body is often two feet long, and is all over covered with a very singular and remarkable kind of bristles. Its shoulders, legs, sides, and belly, are wholly black; and its back variegated with black and white. Its bristles more resemble those of the hog than of any other animal; its neck is short and thick; its head also short, and its nose obtuse; its nostrils very large, opening transversly, and its upper lip split, as in the hare. All about and over its nostrils, it has a number of black hairs, by way of whiskers, as the rat and mouse have; and it has, in each jaw, two large and long fore teeth, like those of the hare. The eyes are small and blue, and the ears of a very singular shape, representing those of the human species; and about these there is a grey down, very different from the covering of the rest of the creature. It has the like down upon the lower jaw; and all along the head and neck, quite to the shoulders, it has a sort of crest of very long bristles, sometimes eight inches long; this looks like an erect mane, and the bristles it is composed of are some white, some black, and others variegated with both these colours. Its legs are short, and the fore feet have each five toes, the hinder ones only four, of which the outer one is the largest, as in the bear. The bristles of the whole body are very thick, flatted at the bottom, and pointed at the extremity, and standing each on a short pedicle. Its bristles are of very different kinds; some of them are very sharp, rigid, and short; others longer, flexible, and flatted at the end; those of the first sort are white at the bottom, and chesnut-coloured at the top; the longer ones are white at both ends, and variegated with black and white in the middle.

The tail is a little more than a hand's breadth long, and is beset with spines, in several annular ranges; and at the extremity, instead of spines, it has ten or twelve tubular bodies, of the thickness of the spines, but of not more than half their length, very thin and transparent, open at the end, and placed on short pedicles. *Ray's Syn. Quad.*

HIVING, the placing a swarm of bees in a hive, in order to have the profit of their labours. When the swarm of bees has left an old hive, and is placed in form of a cluster hanging down from the branches of some shrub or loose bush, the Hiving is extremely easy, and may be done in half an hour after the time of their being still, and calm in the cluster; or it may be let alone till an hour or two before sun-set, provided that the sun do not shine too vehemently upon the place where they are, for that would disquiet them, and force them to rise; and in that case they usually take a long flight before they settle again, and are very often lost; this however may at any time be prevented, by placing an artificial screen before them, composed either of a coarse cloth, or of a few branches of trees well covered with leaves.

Those authors who speak largely of the œconomy of bees, give the new queen a set of officers, whose business it is to settle the proper places of resort; and they pretend that these bees go out of the hive a day or two before the swarm issues out, in order to fix upon a proper place. This however appears but a romantic conjecture, and we usually find the bees busied in search of a place, while the whole swarm is in the air; nor is it much to their credit, that they chuse such places as they do, for they usually fix in such as they can by no means subsist in.

It is commonly the branch of some shrub or tree that they settle upon, and we always find that they mean this as their settled habitation; for, however soon they are hived, the rudiments and beginning of combs are found on it. It is true, they

they always leave these places, if left to themselves, in five or six days; but this is not till they find them so inconvenient that they cannot keep them, either from their being too much scorched by the sun, or exposed to winds and rain. The quantity of wax and honey left in these places, when they have quitted them, abundantly proves however that they meant them for fixed abodes.

When they are placed in a hive, they very soon find themselves much better lodged than in the place they had provided for themselves, and they usually stay in it, and begin to work the next morning.

It might appear a very difficult task to get so large a number of bees into a hive, but it is much less so than it appears to be. They will often take possession of the hive of their own accord, when it is hung over them; but the shortest way is to hold the hive under the branch where they are, and then sweep them down into it. This may be done with the branch of a tree with leaves on it, or with the hand armed with a strong glove, and the face covered. But there are country fellows who will go without any sort of defence, and with their naked hand sweep them carefully off the bough into the hive, which they hold in the other hand underneath.

It is not to be expected that the whole swarm will be thus swept peaceably into the hive; many will fly away, and many clusters will fall beside the hive to the ground. All this however creates no difficulty, for, the hive being turned bottom upwards, and set on the ground near the tree, with its edges a little raised above the surface, those bees which fell in clusters to the ground, will soon scrawl to their companions in the hive, and soon after those which flew off, will descend and follow their example. If it happen however that some bees will obstinately keep to the place where they at first fixed themselves, the branch is to be rubbed over with the juice of such plants as these creatures hate the smell of; such are elder, rue, and some others. And, if this does not succeed, there must be linen rags burnt under them, the smoke of which will soon drive them off, and make them join their companions, who find themselves more at ease in the hive.

As it is necessary to render the places disagreeable to the bees from which they are to be taken into the hive, so many people think it very proper to prepare the hive for their reception, by scenting it with such things as they love the smell of. To this purpose they rub the inside of it with baum and bean flowers, and daub a little honey in some parts of it. This however does not seem necessary, those hives having been found to succeed full as well, where it was not done, as those where it was.

If it be about noon that the swarm is taken into the hive, it must not be removed from the place before evening; and in the mean time it must be sheltered from the two violent heat of the sun, by the shade of the trees; or, if that be not sufficient, a sort of screen must be made for it, either of a coarse cloth properly supported, or of branches of trees with their leaves on. In this manner it must remain till sun-set, and then the hive must be gently lifted up, and carried to the place where it is to remain, and the next morning the bees will be seen as busy at their work in it, as the old swarm in their hive.

It sometimes happens that the swarm is not placed so favourably as in the instance before-mentioned; they often hang themselves in a long cluster from the young shoots, or small branches of high trees; and in this case many different expedients are to be used to hive them, according to the circumstances of their position. The common method is for one man to climb the tree with a long staff in his hand, and another to mount a ladder placed against the tree, and hold the hive under the swarm, while the other sweeps them into it with his staff; and, when the bough on which they hang is so far from the body of the tree, that this is impracticable by the ladder, the hive is to be fixed to the end of a long pole, and by that means suspended under the swarm while they are swept into it. When all this is impracticable, by reason of the great height of the branch on which the swarm hangs, a large cloth is to be spread on some of the lower branches, and the whole swarm swept down in a cluster upon it: this is then to be thrown carefully to the ground, and another person is to be ready there, to whelm the hive over the greater part of the cluster, and the rest will usually soon creep into it, and join them. If they are slow in doing this, they are to be driven in by burning linen rags about the places where they fly, the disagreeable smell of which will send them towards the hive, where finding their companions not incommoded with it, they will naturally remain.

Another method of getting a swarm from a branch of a high tree, is to cut off the branch with a saw, as gently and with as little disturbance to the bees as possible. In this case, when the branch is off, a man may carefully descend with it, and the bees will not quit their hold, but will be all carried where he pleases with it, and may by that means be very easily put into the hive.

Sometimes the bees which go out in a swarm, fix upon a hole in a wall, or a hollow trunk of a tree, for the assembling themselves in.

This is a much better choice for them than the branch of a tree, but it is much worse for the person who is to hive them, for they are very difficult to be got out of these places. The common way of the country people is to attack these swarms in the middle of a cold night, and they then enlarge the opening from without, and, placing the hive under it, scoop the bees out of their nest with a ladle, and put them into the hive.

It usually happens that there are more than one young female in the hive, at the time when the swarm goes out; and it is not uncommon for two of them to go out with the swarm. In this case the swarm constantly divides into two bodies, and, on whatever branch it fixes, there are seen two clusters of bees, one placed near the other. Each of these is a complete swarm and has its female, but one of them is often much more numerous than the other; and, as the bees always love to live in large communities, the bees of the smaller cluster become tired of their condition, and by degrees join the larger; so that this is seen to increase, and the other to decrease in size every moment, till at length there remains no more of the smaller swarm than a few faithful creatures, forming a sort of guard about the female. In this case it is in vain for them to think of forming a community by themselves; and they finally, with the female, join the other swarm; so that the new swarm has two females. *Reaumur's Hist. Inf.*

HOACHE, in natural history, a name given by the Chinese to a peculiar kind of earth, which they have found out lately, very useful in the manufacture of their China ware.

It is called Hoache from the word hoa, which signifies soft and glutinous, and is described to us as being an earth approaching to chalk, but harder, and feeling like soap to the touch. There is great reason to believe that this is either the same earth with our soap-rock of Cornwall, or something very like it. Ours has very much the appearance of French chalk, with which they take out spots of cloaths, and which marks white in the same manner as chalk.

The word chalk is so little determinate in its general sense, and the white substance we commonly call by that name is so little likely ever to be used in earthen-ware of any kind, that there is great reason to believe French chalk is the substance to which the Hoache is compared; and, if so, all the characters agree so well, that it is probably the very same thing with our steatites. We have often attempted to make a porcelane ware with this, and that with good prospect of success. But we are to learn, in regard to the Chinese way of using it, that it is only one of the ingredients of their fine ware, not the whole matter of which it is made.

The Chinese physicians had long used this earth as a medicine, giving it in disorders of the lungs; but it is only of late times that the workmen in porcelane attempted to use it instead of kaolin. It succeeds, however, so well, that the porcelane made of it sells dearer in the Indies than any other kind. The grain of this porcelane is remarkably fine and even, so that it is fitter for receiving the finest pencilling than any other, and it may be made surprizingly light. But there is this disadvantage, that the whole is more brittle than the ordinary China, and the just degree of baking it is very difficult to hit; without which it is never strong. The Chinese sometimes make the body of their vessels of the common China ware, and dip them when dry into a thick liquor like cream in which the Hoache is dissolved. This gives a new and beautiful coat to the vessel. They give the common varnishing over this, and it succeeds to a very great perfection. *Obser. sur les Coutumes de l'Asie.*

Supposing we could not, for want of the petunse, or something analogous to it, ever arrive at making the true porcelane in England, there is yet room to hope for great advantage in making the varnish or coating of other vessels with this steatites or soap-rock. The manner in which the Chinese use it is this: they first wash it clean with river water to separate a yellow sort of earth, which lies near it in the mine where they dig it, and is often brought up with it. When it is thus cleansed, they beat it to powder, and mix it in large quantities of water; they stir the mixture well, and then, letting the coarser part settle, they pour off the thick liquor, and let it stand till a substance like cream subsides, which they keep moist and use, as before-mentioned, to dip the vessels in; or else they dry it, and use it with the petunse instead of the kaolin in the common manufactures.

It is said that a very good porcelane ware may be made with this earth alone, without any other mixture; but the workmen themselves are unwilling to do this, and always chuse, if they do not work in the common way, to add at least two parts of the petunse to eight of the Hoache, and with this mixture they make a very good ware, working it in the same manner as they do the petunse and kaolin. *Id. Ib.*

The Hoache, though ever so proper to supply the place of the kaolin, could not be used in the common works, because it costs three times the price, it being much scarcer, and brought much farther.

There is another very elegant sort of China-ware, which depends entirely on the Hoache for its beauty. It is all white; but, though the surface is perfectly smooth and polished, there are seen flowers and other ornaments on it in a very delicate manner. The method of making this is as follows: they make

make the veſſels of the common matter of the porcelane ware; they then diſſolve, in a ſufficient quantity of clear water, as much of the refined Hoache as will give it the conſiſtence of a ſyrup. With this they pencil out the figures they intend on the ſurface of the veſſel, while yet not quite dry. This penetrates the ſurface, and the lines and ſtrokes all appear very determinate. They let this dry thoroughly, and then cover the whole veſſel with the common varniſh of the porcelane. When it has been baked, the whole appears white, but the figures are very diſtinctly ſeen, and appear extremely beautiful. They are of a brighter white than any of the reſt, and ſeem formed of a thick white vapour, running with a regularity juſt under the ſurface of the veſſel. They have a way of doing this with another ſort of earth, which they call chekao; but this requires more trouble, as it muſt be roaſted and powdered before it is fit for uſe. The white of this alſo is not ſo fine when done as the other. *Obſ. ſur les Cout. de l'Aſie.*

HO'BBY, in zoology, the Engliſh name of a hawk, of the long-winged kind, called, by many authors, by the name ſubbuteo, the name by which others expreſs the ringtail and hen-harrier. The Hobby has a prominent and crooked beak, covered at the baſe with a yellow ſkin; the beak is white near this membrane; elſewhere it is blue. Its tongue is a little bifid, and the iris of its eyes hazel-coloured. It has a reddiſh brown line, mixed with white over the eyes, and its head feathers are black and brown; its neck feathers are of a whitiſh brown; its back and wings are of a blackiſh grey; its chin, and the upper part of its throat, are of a yellowiſh white, with a black ſpot on each ſide; its belly is brown; its tail is long, and pointed and variegated with brown and white. The legs and feet are yellow. It builds with us in high trees, but does not ſtay the winter with us; it feeds principally upon larks.

HOE'ING, according to Tull, is the breaking or dividing the ſoil by tillage, while the corn, or other plants, are growing thereon. It differs from common tillage, which is always performed before the corn or plants are ſown or planted, or in the time of performing it; and it is much more beneficial to the crops than any other tillage. This ſort of tillage is performed various ways, and by means of different inſtruments. Land which, before the tillage, would have yielded little, tho' the more it is tilled before ſowing, the more plenty of corn it yields, yet, if tilled only before the ſowing, will always have ſome weeds, and they will partake of the advantage of the tillage as well as the corn. This is one reaſon for an after tillage, ſuch as that by Hoeing. But there is another conſideration that yet more requires it; this is, that as ſoon as the ploughman has done his buſineſs, by ploughing and Hoeing the land, after ſowing, the ſoil, of its own accord, begins to undo it all again by tending towards its original texture and ſpecific gravity again; the altering of which was the only buſineſs of all the former tillage. The breaking the particles of the earth, and making in it new pores, and new particles, or new ſuperficies, is the great buſineſs of the plough and harrow; but, as ſoon as their uſe is over, the earth begins to coaleſce again into its own form, the particles unite together, and the artificial pores in a great meaſure cloſe up. The ſeed is nouriſhed in a worſe ground than it was firſt put into, and the more the plant grows up, and requires a larger ſupply of food, the worſe the paſture becomes. While nouriſhment is thus denied the growing plants, they are at the ſame time choaked with weeds, which, being of a hardier nature than they, will grow with leſs ſupplies, and therefore thrive more vigorouſly, and rob them of a great part of the little food the land before allowed them. Farmers in all ages have been acquainted, in ſome degree, with the uſe of tillage and dung to crops of uſeful plants; but they have ſo ill managed the time of giving theſe aſſiſtances to nature, that there is no doubt but one third part of the nouriſhment raiſed by dung and tillage, if it were given to plants and corn at many proper ſeaſons, and proportioned to the different times of their exigencies, would be of more benefit to the crop, than the whole is, when applied all together at the time of ſowing.

Nature, by what ſhe does in the animal œconomy, ſeems to point out to us ſomething like the remedying this by Hoeing; for when the teeth, as the plough, have tilled that ſoil or maſs which is earth-altered; and when the ſaliva and the juices of the ſtomach have ſerved to divide and attenuate it, as the ſalts of dung and other manure do land; after all this, the bile and pancreatic juices are ordained to farther attenuate it, at the very time when it is ready to be exhauſted by the numerous mouths of the lacteals, ſituate in the inteſtines. This laſt operation of theſe juices ſeems analogous to the meliorating the ſoil by Hoeing, after the plants are grown, and are becoming fit for uſe.

Tranſplanting is nearly allied in its nature to Hoeing, but it is much inferior. The nature of this will not admit of its being a general thing; and, even if it would, Hoeing is better. For, by tranſplanting, the plants can only be kept up to a certain period, after which they will not bear it; but Hoeing may be uſed to them with advantage, to their utmoſt ſtanding, and make them vigorous all the while.

The roots of a plant are all neceſſarily broken off in tranſplanting, and it requires ſome time for it to ſtrike a whole ſet of new ones; and, if the earth about it is not kept thoroughly moiſtened all this time, the new formed roots will not be able to ſhoot, and the plant will ſtarve in the midſt of plenty. But, on the contrary, in Hoeing, the ſame advantage of a new paſture for the plant is obtained, by the breaking the particles of the earth, and at the ſame time no more of the roots are broken off than can eaſily be ſupplied, and, the reſt remaining in their places, the plant continues growing without that ſtop or decay, which muſt happen on tranſplanting, and which it recovers only by degrees. It is obſerved, that ſome plants are the worſe for tranſplanting: lucerne and ſaintfoin are never ſo good after tranſplanting, as when they are left in their native places, at the ſame diſtances; and finochia, removed, is never ſo good and tender as when it is not. This laſt plant receives ſuch a check from tranſplanting in its infancy, that it has afterwards a diſeaſe like the rickets, which cauſes knots and ſwellings in it, that ſpoil it as a delicacy. All the tap-rooted plants ſuffer by tranſplanting, for it is neceſſary in this to cut off the long-main root, which afterwards, however good the ſoil may be, never arrives at the length it otherwiſe would have had, and which was neceſſary for the ſucceſs of the plant.

One great benefit of Hoeing is, that it keeps plants moiſt in dry weather, the advantage of which to their growth is eaſily ſeen. This good office it performs on a double account. Firſt, as they are better nouriſhed by Hoeing, they require leſs moiſture, and conſequently carry off leſs; for thoſe plants which receive the greateſt increaſe, having moſt terreſtrial nouriſhment, carry off the leaſt water, in proportion to their augment, as is proved by Woodward's experiments. Thus barley or oats, being ſown on a piece of ground well divided by tillage and dung, will come up and grow well without rains, when the ſame grains ſown on another part of the ſame land, not thus dunged or tilled, will ſcarce come up at all without rains, or, if they do, will wait wholly for the rains for their growth and increaſe.

The hoe alſo, particularly the horſe-hoe, for the other does not go deep enough, procures moiſture for the roots from the dews which fall moſt in dry weather; and theſe dews ſeem to be the moſt enriching of all moiſture, as it contains in it a fine black earth, which will ſubſide from it in ſtanding, and which ſeems fine enough to be the proper pabulum, or food for plants.

A demonſtration that the tilled earth receives an advantage from theſe dews, which the untilled does not, is this: dig a hole in any piece of land, of ſuch a depth as the plough uſually goes to; fill this with powdered earth, and, after a day or two, examine the place, and the bottom part of this earth, and bottom of the hole, will be found moiſt, while all the reſt of the ground, at the ſame depth, is dry. Or, if a field be tilled in lands, and one land be made fine by frequent deep ploughings, while another is left rough by inſufficient tillage, and the whole field be then ploughed a-croſs in dry weather, which has continued long, every fine land will be turned up moiſt, and every rough land as dry as powder from top to bottom.

Although hard ground, when thoroughly ſoaked with rain, will continue wet longer than fine tilled land adjoining to it, yet, this water ſerves rather to chill than to nouriſh the plants ſtanding in it, and to keep out the other benefits of the atmoſphere; it leaves the ground much harder alſo than before, when it is finally exhaled out of it; and when, at length, the earth is then hardened, it can receive no benefit from any thing leſs than a deluge of rain, which ſeldom falls till the ſeaſon of vegetation is over.

As fine hoed ground is not ſo long ſoaked with rain, ſo the dews never ſuffer it to become perfectly dry. This appears from the flouriſhing ſtate of plants in hoed ground, while others near them, but in ground not hoed, are ſtarved for want of nouriſhment. The common opinion is againſt this, but obſervation proves it to be true againſt the common opinion. The vulgar are guided by this, however, and will not hoe their ground in dry weather for fear of letting in the drought, as they call it; whereas Hoeing this is the only method of keeping away the drought, and without either this, or watering, they muſt periſh in theſe ſeaſons. *Tull's Horſe-Hoeing Huſbandry.*

HO'LLOWNESS *of trees.* This is one of the moſt miſchievous diſtemperatures to which trees are ſubject. It is generally occaſioned by the lopping of them in an improper manner, and leaving the wet to fall in upon them, eſpecially on their heads. When this miſchief is found out in its beginning, the only way is to cut the trunk off to the quick, ſacrificing the whole hollow part; it is, in this caſe, to be cut off ſloping, that the wet may run off from it. All ſoft woods are liable to this miſchief, after the lopping, particularly the elm; and, when it takes hold of any tree, it grows upon it daily, till the whole ſubſtance of the tree is at length eaten away, and only a coat of bark is left. The beſt way of preventing it, in the elm, is never to cut off the head or top of the tree at all, but only to lop the ſide branches; theſe will yield a very large quantity, and the body of the tree will thrive the better for their being often cut off, and will be good timber at laſt. *Mortimer's Huſbandry.*

HO'LLY, in botany. See the article AQUIFOLIUM.

HOLLY-*hedges*, are a very beautiful ever-green and ſtrong fence, but liable to periſh in hard winters. It has been ſuppoſed, that the ſeverity of the cold, in theſe ſeaſons, was the occaſion of

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this; but a closer observation has shewn, that the mischief is owing to the field mice, which in very severe seasons, when they can get at nothing else, disbark the roots of these shrubs. The method of preserving these hedges, in such seasons, is found to be by clearing away the weeds which are a harbour to these little animals, and placing traps and boxes in proper places, with a paste made of butter and rats-bane, daubed over their insides, and holes made in their sides no bigger than what the mice or rats, if there be any there, can creep into; and thus the vermin are destroyed, and the mischiefs which might attend rats-bane being exposed, are prevented. *Moreton's Northampt.*

HO'LLYHOCK, or *holy-oak*, in botany.—We have many species of this plant cultivated in our gardens, for the beauty of their flowers. They are all propagated from seeds, which are to be sown in March, upon a bed of light rich earth. When the plants are come up pretty strong, they should be transplanted out into nursery beds at about eight inches distance from one another. They must be watered till they have taken root, and will then require no farther care for the summer, but being kept clear of weeds. At the latter end of the September following, they should be transplanted into the places where they are to remain, and set in rows of two feet distance, and at a foot from each other in the rows where they may flower: and, when it is observed which roots produce the finest flowers, those should, the Michaelmas after, be transplanted into garden beds, where they will live four or five years; after which, they grow weak, and should be replaced by new ones. When the stalks of the plants begin to decay, they should be cut down close to the ground, otherwise they are apt to rot and destroy the roots.

HOLT-*waters*. These have been found by experience to be of admirable efficacy in all scorbutic and scrophulous cases: an account of some very remarkable cures performed by them, in these cases, was printed several years ago, and, though known to be fact in the place, was disbelieved by almost every body besides.

Mr. Lewis, the late minister of the place, confirms their efficacy from his own observation, and observes, that they are of an attenuating, astringent, and drying nature. The first of these properties they possess in common with all waters, which dilute, attenuate, and fit the juices for passing the proper vessels; their astringency they owe to the alum and iron which they contain, and their drying, absorbing, and healing qualities are probably owing to a quantity of sulphur, and a fine light ochre, which they are impregnated with. *Philos. Transf.* N°. 408.

HO'NEY-*suckle*, *caprifolium*, in botany, the name of a genus of plants, the characters of which are these: the flowers are generally placed many on the same stalk, and disposed in a circular form. The single flowers are composed of one leaf each, of a tubulated form, and divided at the end into two lips, the upper of which is divided into many segments, the lower whole, and of the shape of a tongue. The cup finally becomes a soft fruit or berry, containing a flatted and round-shaped seed.

The Virginian scarlet Honey-suckle, called the trumpet Honey-suckle, is a very beautiful flowering kind, and in great esteem. It is propagated by laying down the tender branches in spring, observing, in dry weather, to refresh them with water; and, the spring following, they will be ready to transplant, when they are to be cut off from the old plants, and carefully removed without disturbing their roots. The best time to remove them is in March, just before they shoot out; but, if the season should prove dry, they must be watered, and have a little mulch laid at their roots, to prevent the earth about them from drying too fast. They should be planted in a strong soil, and exposed to the south-east sun; but they must have a wall or pale behind them to support the branches, otherwise they will trail upon the ground. It is a native of Virginia, but will thrive very well with us, bearing all the cold of our winters, but does not succeed well near London, where the smoke commonly destroys it. *Miller's Gard. Dict.*

The propagation of all the several sorts of Honey-suckles is by laying down their branches in the spring, which, if they are supplied with water, will by the Michaelmas following have taken root so well, as to be fit to remove. They should at this time be transplanted into nursery beds for a year or two, the better to train them up, either for headed plants, or for creepers, to plant against trees, walls, &c.

They may also be propagated by planting cuttings in September, or in spring; but they sometimes fail this way, and always require much care and trouble. Their sweetness, and long continuance in flower, make them of great value in small quarters. Among flowering shrubs they are also very beautiful, when planted against the stems of old trees, where, if they are not too much shaded, they will flourish exceedingly.

The proper season for cutting them, to keep them in a regular form, is about Michaelmas, soon after they have done flowering. This is to be done with a knife, observing always to cut behind a leaf bud; for, how much soever the shoot is left longer, it will always die down to that part. They are most of them very hardy. *Miller's Gard. Dict.*

HOOF (*Dict.*)—Brittle Hoof, a name of an infirmity to which horses are subject. It comes sometimes naturally, and sometimes artificially. When it comes naturally, it is generally hereditary, the sire or dam having had the same complaint. When it comes on accidentally, it is sometimes owing to a distemper falling down into the feet; sometimes to the creature's being much foundered.

The Hoof, in this distemper, is so friable and rotten, as it were, that it cracks and flakes off on every slight occasion. The cure is to be attempted in this manner: take wax, turpentine, suet, and hog's lard, of each four ounces; sallad oil a quarter of a pint by measure, and of dog's grease half a pound; let the whole be melted together, and strained through a piece of canvas into a gally-pot. The Hoof is to be thoroughly anointed with this every day, morning and evening, especially at the root; and, if there are any large cracks, they must be filled up at every dressing with a mixture of equal parts of cow dung and hog's lard.

HORI'ZON (*Dict.*)— One great inconvenience that mariners have to struggle with at sea, is the frequent want of an Horizon: for, though the atmosphere may, at the height of ten or twelve degrees and upwards, be clear enough to give a view of the sun and other objects, yet, all below that height is often so hazy, as to hinder a distinct sight of the Horizon; and, consequently, an observation made at such a time cannot have the correctness wished for: but this defect is quite removed by a kind of horizontal speculum invented by Mr. Serson, who was lost with the Victory man of war, wherein he was sent to make trial of his machine.

The principle whereon this ingenious author founded this instrument, was derived from the consideration of a top, while spinning; for he observed that the top had a very considerable degree of steadiness in, and force to acquire an upright motion, whether the body which supported it was in motion or at rest, in an horizontal or an inclined situation: he therefore judged, that, if a circular machine, whose upper surface was a flat polished speculum, was to have a swift circular motion communicated to it, that speculum, by acquiring an horizontal situation, would shew all objects which it reflected, as much below the Horizon, as they really are above it, in the same manner as in a common looking-glass; consequently, if the image of the sun, as seen reflected from the speculum, was made to coincide with the sun's image, seen in a Hadley's quadrant, the angle given by the quadrant would in all cases be the double of the real altitude. Mr. Serson also found, that, to confine the speculum to one place, while it was spinning, it was necessary to let the point run in a hollow cup; for the horizontality of the speculum would not be altered, whatever position might be given to the cup, provided it touched the top only at the point it spun on.

This curious and useful instrument, as it is now improved by Mr. John Smeaton, F. R. S. consists in a well polished metal speculum of about three inches and a half in diameter, inclosed within a circular rim of brass; so fitted, that the center of gravity of the whole shall fall near the point whereon it spins; that is, the end of a steel axis running through the center of the speculum, above which it finishes in a square, for the convenience of fitting a roller to it, when it is to be set a going by means of a piece of tape wound round the roller. The cup in which it spins, is made of polished agate, flint, or other hard substance, and is placed on a small pillar, which is fixed to the bottom of a box, whose pyramidal cover is composed of glass panes; whereby an observation can be made on the speculum as well covered as uncovered, and thereby it will be prevented from tarnishing by the moist air or spray of the sea.

When the top is to be used in a meridian observation, it is convenient to know about what time it is proper to set it up; this may be had near enough by taking the sun's bearing from the meridian with an azimuth compass, allowing for the variation; and, if it has about five degrees to run before it culminates, it is time to spin the top, which will generally run twelve or fifteen minutes fit for observation. But, if it is likely to go down, or spin too weak, before the observation can be finished, the tape should in the mean time be got ready wound about the roller, that the top may be set up again without loss of time; and, if the box be held steady upon something nearly level, when the tape is drawn away, the speculum will be fit for observation commonly in less than two minutes.

As soon as the top is set up, put on the glass roof, if necessary; let an assistant hold the box as steady and level as he can, and in such a position as the observer may look directly through the glass roof: then let the observer place himself as near the box as he can conveniently, and look down on the sun's image in the horizontal speculum, and bring the sun's image seen in the quadrant to agree with it, so that their centers coincide; and the quadrant will give the double altitude, without any allowance for the height of the ship, or the sun's semidiameter. And although there may appear in the horizontal image a kind of trembling, yet, when the centers of the solar images are brought to coincide, the observation may be taken as truly as if there was no such trembling.

When the sun is about forty-five degrees high, the observer must look through that sight of the quadrant which is used for a back observation: but he must look down on the horizontal image, or that in the top, as it was the back Horizon; and then, making the solar images to agree, the quadrant, according as it is numbered, will give the double altitude, or double zenith distance.

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As this latter observation is sometimes found at first more difficult to make than the former, the observer would do well to exercise himself therein in good weather, when he has an opportunity of comparing his observations with those taken from the Horizon properly corrected.

These speculum tops are as useful by night as by day; for, as the images of the smallest stars may be seen in the speculum, consequently, any object that can be seen reflected from the glasses of the quadrant, may be observed by the top; and these are all the stars of the first magnitude, the planets Venus, Mars, Jupiter, Saturn, and the Moon: so that, by having the declinations of these bodies in an ephemeris, they may be used in observations as well as the sun.

As the great distresses to which ships are sometimes drove in several parts of the world, for want of an Horizon to observe by, are by this most ingenious contrivance quite removed; it is to be hoped, that, when the use of this instrument is more generally known, few ships will be without one, although the expence should amount to five guineas.

HORIZO'NTAL *Shelters*, have, by some persons, been greatly recommended to preserve fruit trees from blights; but, with how little reason, or upon what slight experiments, every one, who has ever made use of them, will easily judge; especially those which are contrived by placing tiles in the wall at certain distances; nothing being more obvious, than that vegetables, when prevented from receiving the advantage of dews, rains, &c. those kindly benefits of heaven, grow weak, languid, and at last intirely decay: and since, from vast numbers of experiments, which have been lately made, we find that trees imbibe great quantities of nourishment through the pores of their leaves and branches, whereby they are rendered vigorous and healthy, even in such seasons, and upon such soils, where one would think it impossible they should receive much nourishment from the earth; to deprive them of this advantage is no less than destroying them; though, perhaps, if the trees are vigorous, it may not be effected suddenly; but there will be very visible signs of decay on them daily, and a few years will put a period to their lives, as I have more than once observed, where such walls were built.

The only sort of these shelters which I have observed for fruit trees, was made with two leaves of slit deal, joined over each other, and painted; this being fixed on the top of the wall with pullies, to draw up and down at pleasure, formed a sort of pent-house; which being let down in great rains, or cold nights, during the time that the trees were in flower, or the fruit was setting, proved serviceable; but these shelters were removed away soon after the fruit was set; so that the trees might enjoy all the advantages of rain, dew, &c. in the summer; which is absolutely necessary, if we would have healthy trees, or good fruit. *Miller's Gard. Dict.*

HORMI'NUM, *clary*, in botany, a genus of plants whose characters are:

It hath a labiated flower, consisting of one leaf, whose upper lip is short and crested; but the under one is divided into three parts: the middle division is hollowed like a spoon; out of the flower-cup arises the pointal, fixed like a nail to the hinder-part of the flower, and attended with four embryo's, which afterwards turn to so many roundish seeds, inclosed in the cup of the flower.

HORN.— The Horns of many animals, particularly of the deer kind, are cast every year, and new ones grow up in their places. With us the deer drop them in March, and the new Horns are full grown by the July following. Vossius very justly ranks this among the most wonderful phænomena of nature; he says, that we have nothing analogous to the growth of such hard and solid bodies of so great a bulk, in so short a time.

Many idle opinions have been formed of the cause of the falling of these parts of the animal; and worms in the head, and many other things, have been supposed instrumental to it, which have no share in it. The true reason seems, that these are a sort of vegetables growing on the animal, as our nails and hair have by many been said also to be; and there appears a great analogy between them and the sprouting of the leaves and branches in trees and plants. Trees commonly cast their ripe fruit in summer, and drop their leaves in autumn, because the sap, or nourishing juice, flows into them no longer; and in the same manner, at certain stated periods, the blood and juices cease to flow into these parts of the animal, and they drop off. The cavernous part, at the root of the Horns, probably grows hard, and the pores through which the vessels pass, grow up at this time; and then, as no juices can be carried through them to the Horn, it is not at all wonderful that it decays, and falls off, for want of nourishment.

It is probable that this stoppage of the pores, and denying of the passage of any juices, happen in the Horns, as soon as they are arrived at their full growth in July; but they are so firmly fixed to the head, that it takes a long time for them to loosen and fall, whereas in the leaves of plants the pedicles are so tender, that they wither and fall immediately on the juices ceasing to flow into them. This analogy between the operations of nature, in the casting the Horns of deer, and the falling off of the ripe fruits and leaves from vegetables, will gather great strength from observation of the orange and other trees. If the stalk, from which a ripe orange has fallen, be compared with that part of the forehead of a deer from which a horn is just fallen, there will be seen such a similarity between the one and the other, that it will appear very obvious, that nature has operated by the same laws in both. *Philosophical Transactions.* N°. 227.

HORN-*fish*, an English name for the fish which we also call the gar-fish. It is by some accounted a species of the acus or tobacco-pipe fish; but the only reason for this opinion seems to have been, that it is as long and slender as that fish.

HORN-*owl*, in zoology, the name of a sort of owl distinguished by two clusters of feathers standing up over its ears, and resembling Horns. There are two kinds of this bird, a larger and a smaller; the first distinguished by the name of the bubo, the great Horn-owl, or eagle-owl; and the other called the otus, or noctua aurita. *Ray's Ornithol.*

HOR'NET, *crabro*, in zoology; this insect is very bold and venomous, and wholly resembles the wasp, only it is twice as large, and the head is of a longer and slenderer shape, and the eyes are formed somewhat like a half-moon. They build under ground, and in winter hide themselves in hollow-trees. They feed on flesh, and, when very hungry, will seize upon a small bird. Moffet relates, that they have been seen singly to pursue and kill a sparrow, and afterwards feed on its flesh.

HORNET-*fly*, in natural history, a very large two-winged fly, which has the shape and colours of the Hornet, and is, at first sight, scarce to be distinguished from it. The principal colour of the body of this fly is yellow; but it has two long and large black lines placed transversly on its wings, and has a black corslet, and a yellow head. *Reaumur, Hist. Ins.*

HORSE, in zoology, a noble animal, too well known to need a description.

Backing of HORSES. The first backing of a Horse is a thing of great consequence, as his value afterwards very much depends on it. After a colt has been exercised some time morning and evening, and becomes somewhat obedient, he is to be taken to some ploughed lands, the lighter the better; he must be made to trot over these in the hand, by that means to tire him and abate his wantonness. When this is done, care must be taken that all the tackling be good and firm, and every thing in its due and proper place; then a person is to hold his head, and another to mount him; but this must not be done suddenly, or at a jerk, but very gradually and slowly, by several half risings and heavings. If he bears this patiently, the person is to seat himself firmly on his back; but, if he be troublesome, and not tamed enough, the person is to forbear the attempt to mount, and he is to be trotted hard in the hand over the same ploughed lands again, till he is willing to receive the rider quietly on his back. When this is done, the person who is on his back must cherish him, and the man who has his head must lead him a few paces forward; then he is to be cherished again. The feet are to be fitted well in the stirrups, and the toes turned out; afterwards the rider is to shrink and move himself in the saddle, and the person who holds his head, is to withdraw his hand a little farther from the mouth. As the rider moves his toes forward, the holder must move him forward with the rein, till he is made to apprehend the rider's motion of body and foot, which must always go together, and with spirit, and will go forward without the other's assistance, and stay upon the restraint of the rider's hands.

When this is accomplished, let him be cherished, and have grass and bread to eat; and then let the rider mount and alight several times, cherishing him between each time; and thus he is to be managed till he will go on, or stand still, at pleasure. This being done, the long rein may be laid aside, and the band about the neck, which are always used on this occasion, and nothing will be necessary but the trenches and caveson, with the martingal. A groom must lead the way before; or another Horse going only straight forwards, and making him stand still, when desired. In this manner, by sometimes following, and sometimes going before another Horse on the trot, the creature will by degrees be brought to know that it is his business to be quiet and governable.

Breeding of HORSES. In order to have a good and beautiful race of Horses, it is necessary to chuse for a stallion a fine barb, free from hereditary infirmities, such as weak eyes, bad feet, spavins, pursiness, or the like: disorders that arise from accidents are of no consequence, nor is the Horse to be at all the less valued for them as a stallion. Three months before this Horse is to cover a mare, he should be fed with sound oats, pease, or beans, or with coarse bread, and a little hay, but a good quantity of wheat straw; he should be led out twice a day to water all this time, and after every watering walked about an hour, but not over-heated. If he be not prepared and put in heart in this manner, the colts will be weakly, and the horse himself will be spoiled, growing pursy and broken-winded.

If he is put to too many mares, he will not last long; his mane and tail will begin to fall off through weakness, and it will be difficult to get up his flesh again by the next year. The number of mares should be proportioned to his strength, and twelve, fifteen, or at the most twenty, are as many as a Horse will well serve for in a season. Mares go with foal eleven months, and as many days over as they are years old. This being certainly known, it is easy to contrive so that all the foals may be brought forth at a time, when there is plenty of grass. About the end

of

of May the mares are to be put into an inclofure capable of feeding them, as long as the ftallion is to be with them, or that they are in feafon. In this inclofure all the mares are to be put together, as well thofe which are barren as others. The ftallion's hind-fhoes are to be taken off, but the fore-fhoes fhould be left on to preferve his feet; then lead him forth, and let him cover a mare twice in hand, to render him more tame and gentle. After this take off the bridle, and turn him loofe among the reft, where he will become familiar with them, and not one of them will be horfed but when they are in feafon. There fhould be a little lodge built up in fome part of the inclofure, and peafe, beans, oats, bread, and other good food, put into the manger in it, that the Horfe may retire into it in the fcorching heats, and eat what he likes beft. He muft be thus entertained during the whole time he is with the mares, which is to be about fix or feven weeks.

Mares that are very fat and grofs do not hold well, but thofe which are moderately fat conceive with the greateft fuccefs and eafe. To bring a mare in feafon, it is a common thing to give her a quart of hempfeed, or twice that quantity, night and morning, for eight days before fhe is brought to the Horfe. If fhe refufe it alone, it may be mixed with beans or oats, and will go down; and, if the ftallion eat of it alfo, it will make him the better.

The ftallion fhould not cover before he is fix years old, nor after he is fifteen. A mare fhould never be covered before fhe is three years old; they fhould be always found and healthful, and of a good breed; fuch as thefe will bring forth better and finer foals than any others. The colts produced from thefe are not to be ufed for ftallions, for they will degenerate, and the race will foon become exactly our own country breed. If a barb is not to be had, a Spanifh Horfe is to be chofen.

For the method of fattening Horfes; fee FATTENING.

HORSE-*mackarel*, in ichthyology, a name given by us to a peculiar fpecies of mackarel, called alfo in Cornwall a fcad. It is the trachurus of authors in general. Bellonius calls it the lacertus, and the old Greek writers, as Ariftotle and the reft, the faurus. Artedi diftinguifhes it by the name of the fcomber, or mackarel, with the lateral lines aculeated, and with thirty rays in the pinna ani.

HORSE-*mill*, a machine for grinding corn, &c. turned by a Horfe.

A defcription of a HORSE-*mill.—Plate* XXIV. *fig.* 1. exhibits the draught of a Horfe-mill compofed of the great wheel A which is fuppofed to contain 100 cogs which catch in the trundle-head B of 20 wallowers, the axis of which correfponds to the trundle-head D, which has fix wallowers. According to this difpofition, a horfe harneffed at the bar H making one turn the mill-ftone will make forty; but, to avoid needlefs pieces of machinery, the mill reprefented, *fig.* 2, is much more fimple, and confequently preferrable.

In order to fhew the beft manner of building a mill, we muft be determined by reafon and experience concerning the proportion of its feveral parts.

The firft point is to make the machine as fimple as poffible; yet it feems neceffary to make a wheel and trundle-head, to give the mill-ftone fufficient velocity to turn round its axis 40 times in a minute. The refiftance to be overcome muft therefore be in proportion to the main ftrength of a Horfe, which is equal to a lever of 180 pounds weight, when it acts in a horizontal direction, and the Horfe goes about 2000 fathoms an hour.

I allow eight feet for the radius of the wheel, and make 112 cogs in the periphery, which catching in a trundle-head of feven wallowers, the mill-ftone will make fixteen turns for one of the wheel; and as the fame proportion ought to be between the number of cogs and that of the wallowers, as of the radius of the wheel to that of the trundle-head, the radius of the trundle-head ought to be fix inches.

As to the arm of the lever, at which the Horfe is to be harneffed, if it be too long, the Horfe, having a large circumference to defcribe, will make fewer turns in a minute, and the mill-Houfe muft be larger: wherefore I fhould chufe to fix it at twelve feet, which is moft convenient, in which cafe, the Horfe at every turn will defcribe a circumference of twelve fathoms four-fevenths; and as he can perform 2000 of thefe in an hour, he will perform 160 turns in the fame time, which, being multiplied by fixteen, is equal to 2560, the number of turns which the mill-ftone makes in an hour at the rate of 42 per minute.

HORSE-*worm*, in natural hiftory, a fpecies of fly-worm produced of eggs depofited, by a two-winged fly of the fhape and fize of the humble-bee, in the inteftines of Horfes.

It is indeed a very ftrange place this little creature chufes for the depofiting its eggs; but as noble a creature as the Horfe feems, and as much as we may fuppofe him created for our ufe, we are to confider, that the fame great hand made both him and this little fly, and that he feems indeed more created for the fly than for us; he is ufeful to us, but to the fly he is abfolutely neceffary, fince without him fhe could not propagate her fpecies.

The worms of the human bowels have not been longer known to the world than thofe of the Horfe; and the farriers in all ages, who have undertaken the care of thefe valuable animals, have had their remedies for the long worms bred in their inteftines, and alfo for the fhort ones. The fhort ones are the creatures mentioned in this article. But, though the world has fo long been acquainted with their exiftence, it never knew their origin till Mr. Vallifnieri difcovered of late, that they were produced from one of the humble-bee flies. *Reaumur's Hift. Inf.*

HOSE *in* HOSE, a term ufed in gardening, to fignify one long hufk within another, as in the polyanthus.

HOSE-*hufk*, is a long round hufk, as in pinks, gillyflowers, &c.

HOSPITAL (*Dict.*)—Camp Hofpitals are either general or regimental.

The general Hofpitals are of two kinds, viz. the flying Hofpital, attending the camp at fome convenient diftance, and the ftationary Hofpital, which is fixed to one place. In the choice of both, it will be better to have them in towns than villages, as the former will afford larger wards, befides more of other conveniencies: thefe wards fhould be as airy as poffible.

As to the difpofition of Hofpitals, in regard to preferving the purity of the air, the beft rule is to admit but few patients into each ward. It will alfo be found a good expedient, when the cielings are low, to remove fome part of them, and to open the garret ftory. The doors and windows may likewife be opened, and ventilators ufed to purify the air of every ward. In winter Hofpitals, the wards are to be warmed with chimneys, and never by ftoves; for, though the latter may warm a large ward better, and at a lefs expence, yet, by fcarce making any draught of air, they will be apt to increafe its putrid quality; whereas a fire, kept up in a chimney, acts like a conftant ventilator.

The general Hofpital fhould receive only fuch fick as the regimental ones cannot conveniently contain, together with thofe who cannot be moved with the army. Without this difperfion of the fick, the general Hofpital, in bad feafons, would have a greater number, than could be well attended; and what is equally, if not more pernicious, it would be too much crouded, by which means the contagion would fpread, and the mortality be rendered more general.

Regimental Hofpitals are of the greateft importance, and therefore fhould be fupplied with blankets and medicines from the public ftores, with an allowance alfo for nurfes and other neceffaries. Nor are they to be maintained in the field only, but alfo in winter-quarters, as there will always be a great many more fick, than can be taken care of in the general Hofpital.

Barns, ftables, granaries, and other out-houfes, but, above all, churches, make the beft Hofpitals, from the beginning of June to October: for, as the greateft danger arifes from foul air, which cannot be compenfated by diet or medicine, we may lay it down as a rule, that, the more airy and large the Hofpitals are, the lefs danger there is of the ficknefs fpreading. *Pringle's Obfervations on the Difeafes of the Army.*

HOSPITAL *fever*, a name given to the malignant catarrhal fever, as being frequent in Hofpitals.

Dr. Pringle has given us an elaborate account of the rife, fymptoms, and cure of this terrible difeafe in his Obfervations on the Difeafes of the Army. It may be owing to a great many concurring caufes, but the principal are foul and putrid air, occafioned by filth and impurity of any kind. Hence it is no wonder that it prevails in marfhy countries after hot feafons, and in populous cities; efpecially if low, and ill-aired, unprovided with common-fhores, or where the ftreets are narrow and foul, the houfes dirty, water fcarce, and where jails or Hofpitals are crouded, and not ventilated and kept clean; when in fickly times the burials are within the towns, and the bodies not laid deep; when flaughter-houfes are alfo within the walls; or when dead animals are left to rot in the channels, or on dunghils; when drains are not provided to carry off any large body of the ftagnating or corrupted water, in the neighbourhood; when flefh-meats make the greateft part of the diet, without a proper mixture of bread, greens, wine, or other fermented liquors; from the ufe of old and mufty grain, or what has been damaged by a wet feafon; or, laftly, when the fibres are relaxed by immoderate warm bathing.

When the difeafe comes on flowly, the fymptoms are fmall interchanges of heats and cold, trembling of the hands, interrupted fleep, &c. But, when it advances faft, the above fymptoms are all in a higher degree; and befides thefe, the patient is afflicted with great laffitude, a naufea, pains in the back, a conftant pain and confufion in the head, a dejection of fpirits, and an uncommon tremor of the hands. If the fick lie warm, and have no preceding flux, the body is generally coftive; but, when they lie cold, as they often do in field-Hofpitals, the pores of the fkin being fhut, a diarrhœa is a common fymptom: in the worft cafes, a flux appears in the laft ftage; when the ftools are involuntary, colliquative, ichorous, or bloody, and of a cadaverous fmell; which are the effects of a mortification of the bowels, and the figns of approaching death: fome are never delirious, but all are under a great ftupor or confufion. The petechiæ are the frequent, but not infeparable attendants of the fever; they are fometimes of a brighter or paler red, at other times of a livid colour, but are never raifed above the fkin. For the moft part, thefe fpots are fo little confpicuous, that, unlefs looked for attentively,

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tentively, they may eſcape notice. They are thickeſt on the breaſt and back, leſs on the legs and arms, and the Doctor never remembers to have ſeen any upon the face. This fever, though of the continued kind, has often exacerbations at night, with remiſſions and partial ſweats next day; and, after a long continuance, is apt to change into a hectic, a remitting, or intermitting form.

Prognoſtics in it. To have a little delirium, the ſtrength a little impaired, turbid urine in the decline of the diſeaſe, and at the ſame time a gentle ſweat or moiſture diffuſed over the body, are reckoned good ſigns; and it ſeems peculiar to malignant fevers, that deafneſs is rather a good ſign.

Method of cure. This varies according to the ſtate of the diſeaſe, which may be diſtinguiſhed into three periods; the firſt continuing as long as the perſon is able to go about; the ſecond beginning with his confinement; and the third when the pulſe ſinks, and a ſtupor comes on.

In the firſt, as well as in the other periods, the cure is principally to be aimed at by removing the patient out of the foul air. When this cannot be done, the ward or room ſhould be purified by making a ſucceſſion of air by means of fires, or letting it in by doors and windows, or diffuſing the ſteams of vinegar.

The next thing to be done, is to promote a diaphoreſis, which, in this period, ſhould only be attempted by mild ſudorifics, as the ſpiritus Mindereri.

When the fever is confirmed, contrayerva-powders, with nitre, camphor, the common ptiſan acidulated, and ſuch medicines as are good in inflammatory caſes, ought to be given. Coſtiveneſs is to be prevented by emollient clyſters. But opiates are dangerous, both in this and the third ſtage, in which the pulſe ſinks, and ſtupor is greater, a delirium impends, and petechiæ often appear. When this is obſerved to be the caſe, the nitre and diaphoretic medicines are to make room for a decoction of ſnake-root, to which a ſmall quantity of ſtrong water may be added. It may alſo be given in ſubſtance from two to four ſcruples a day, with ſenſible good effects. Towards the decline of the fever, an equal quantity of Peruvian bark may be joined with the root. Wine is alſo an excellent cordial at this period, and may be given either made into whey, or added to the panado, which was the only food allowed to the ſick. It may be taken from a half pint to a quart a day, according to the ſtrength of the patient. Perhaps there is no rule of more importance, than to give ſtrict charge to the attendants of the ſick, never to let the patient, when low, remain above two or three hours without taking ſomething cordial and nouriſhing. But, however neceſſary wine, volatiles, and other cordials are in this low ſtate of the fever, it ought to be remembered, that they muſt never be given with an intention to force a ſweat, but only as antiſeptics, and to ſupport the vis vitæ. If there be danger of a phrenites coming on, it will be proper to call in the aſſiſtance of epiſpaſtics. Sinapiſms too may be uſed when the pulſe is greatly ſunk. If a diarrhœa comes on in the decline of the fever, it is to be moderated by adding a few drops of the tinctura Thebaica, to the full quantity of the alexipharmic decoction; or by giving a ſpoonful or two of an aſtringent mixture. In proportion, however, to the putrid nature of the ſtools, aſtringents are to be uſed with the more caution. When the fever is over, there are few but complain of a vertigo; and want of reſt, a continuation of the deafneſs, and other nervous ſymptoms, are frequently the conſequence of great lowneſs; in which caſe the pillulæ Matthæi are to be given at night, with analeptics and medicines of the ſtrengthening kind. *Vid. Pringle's Obſerv. on Diſ. of the Army.*

HOTTO'NIA, *water-violet*, in botany, a genus of plants, whoſe characters are:

It hath a roſe-ſhaped flower, conſiſting of one leaf, which is divided into five parts, almoſt to the bottom; in the center of the flower ariſes the pointal, which afterwards becomes a cylindrical fruit, in which are contained ſeveral ſpherical ſeeds. This plant is very common in deep ſtanding waters and ditches, in ſeveral parts of England. The leaves of this plant appear on the ſurface of the water the beginning of April; and, in May, the flowers appear on pretty long naked ſtalks, growing in a ſpike. Theſe flowers are of a fine roſe colour; which, together with their fine cut leaves, make a beautiful appearance on the water. *Miller's Dictionary.*

HOU'GHING, in gardening, is neceſſary and beneficial to plants, for two things: 1. For deſtroying of weeds. 2. Becauſe it diſpoſes the ground the better to imbibe the night dews, keeps it in a conſtant freſhneſs, and adds a vigour to the trees, whoſe fruit, by that means, becomes better-conditioned than otherwiſe it would be. See HOEING.

HOWLE, *in ſhip-building*.— When the foot-hooks of a ſhip are ſcarfed into the ground timbers, and bolted, and then the plank laid on them up to the orlop, the carpenters ſay, they begin to make the ſhip Howle.

HU'MBLE-*Bee*, in the hiſtory of inſects. See the article BOMBYLIUS.

HUMBLE-*Bee flies*, in natural hiſtory, the name of a claſs of flies of different ſizes, but all agreeing in the great reſemblance they bear to the Humble-bees, of the ſmaller or middle-ſized ſpecies. Theſe might, at firſt ſight, very naturally paſs for real Humble-bees; but a cloſer examination will ſhew them not to be ſuch, as they have not the trunk of the Humble-bee, and have only two wings. The ſpecies of the Humble-bee fly are many of them of abſolutely different genera one from another, ſome of them having trunks, and others having a diſtinguiſhable mouth.

If the figure of theſe flies, in their winged ſtate, attracts our curioſity and attention, their prior ſtate, that of the fly worm of moſt of them, ought ſurely much more to do ſo. The place nature has aſſigned the worms of theſe flies for their habitation, is indeed a moſt ſtrange one; there is no other place for them to live in under this form, to begin their deſtined growth, and be fitted for their transformation, but in the inteſtines of horſes, or under the thick and firm ſkin of oxen. In the latter caſe, the worm hatched from the egg of its parent fly, depoſited there, makes a tumor in the place, which alone furniſhes it with food and habitation. and in the middle of which it has a place to breathe. *Reaumur's Hiſt. Inſ.*

Luxated HU'MERUS.— The Humerus, from the length and laxity of its ligaments, the largeneſs of its motion, and the ſhallowneſs of its cavity in the ſcapula, into which it is articulated, is rendered, of all the bones, the moſt ſubject and eaſy to be luxated. The head of this bone may often be diſlocated, under the arm-pit; ſometimes forward, and ſometimes backward, and even below the ſcapula; but ſeldom perpendicularly downwards, and never directly upwards, unleſs the acromion and corocoide proceſſes of the ſcapula ſhould chance to be fractured at the ſame time; beſide, as long as the ſtrong deltoide and bicipital muſcles of the Humerus remain entire, they greatly reſiſt and keep down the Humerus from being luxated upwards. As ſoon as a luxation is diſcovered in the Humerus, the ſafeſt way to attempt the reduction of it, is to place the patient on the floor, or on a low ſtool; two ſtrong aſſiſtants are then to be placed on each ſide of him, one to keep firmly hold of his body, that it may not give way to the extenſion, while the other lays hold of the luxated arm with both his hands, a little above the cubitus, gradually and ſtrongly extending it. But, before that extenſion be made, the ſurgeon himſelf ſhould have a large and ſtrong napkin, of a ſufficient length, tied at the ends, and hung about his neck, ſo that the knot may hang behind, but the other part of the napkin over his breaſt. The patient's arm muſt then be put through this napkin, up to the ſhoulder, and the ſurgeon muſt lay hold of the head of the Humerus with both his hands. This done, the aſſiſtant, who has hold of the arm, is to extend it ſufficiently, and the ſurgeon is to elevate the head of the Humerus, by means of the napkin through which the arm is put, directing it with his hands, till it ſlips into its former cavity in the ſcapula.

This ſeems the moſt ſafe, ready, and commodious of all methods, for reducing luxations of the Humerus; but it is to be acknowledged, that the extenſion cannot, by this means, be made ſufficiently ſtrong, in ſome caſes, particularly when the patient is very robuſt, or when the caſe has been delayed a conſiderable time without aſſiſtance. When one or two aſſiſtants therefore are not ſufficient to make a proper extenſion, it is eaſy to employ more, by means of napkins tied about the limb, and a proper number of aſſiſtants to hold the patient's body ſteady againſt that force. And, when all this is not ſufficient, the ſurgeon is forced to have recourſe to machines with ropes and pullies; which, though the patient is uſually terrified a little at them, yet make an eaſier, and a more equal and regular extenſion, than can be done by the hands of ever ſo many aſſiſtants. *Heiſter's Surgery.*

HU'MMING-*bird*, *guainumbi*, in ornithology, a large genus of birds, many ſpecies of it having been deſcribed by authors, and many, which they have not deſcribed, having been ſent into Europe by the curious. It is the ſmalleſt of all birds, but of the moſt beautiful and lively colours of all others. It flies very ſwiftly, and in flying makes a noiſe exactly like the Humming of a bee, and ſome of the ſpecies are not much larger than the humble-bee. It can ſuſtain itſelf a long time on the wing, and in that poſture thruſts his little beak into flowers, the juices of which it ſucks and feeds on. As it has no other food but this, there is no keeping it alive, but all die that are taken; and they are preſerved and ſent over as curioſities to us. Many have reported ſtrange ſtories of their ſleeping all the winter months, and reviving at the approach of ſpring; but Marcgrave ſaw them in great plenty, in the woods, in all ſeaſons. The Indians make pictures with the feathers of theſe birds, which are ſo brightly coloured, as to vie with the fineſt paint, and ſo thin as to be as cloſe as colours on canvas. *Ray's Ornithol.*

Plate XXVIII. *fig.* 4. repreſents one of the ſpecies of this beautiful bird, which Mr. Edwards calls,

The long-tailed black-cap HUMMING-*bird*.—This bird is engraved of its natural bigneſs; it hath a very long tail, of a looſe, ſoft texture, eaſily ruffled, and flowing with the leaſt breath of air; what is remarkable in the tail is, that theſe two fine feathers are the outermoſt but one on each ſide, having a leſſer ſtiff feather under them, as well as above, the better to ſupport them, which is ſingular. So far as my obſervation reaches, all birds, whoſe tail-feathers differ in length, have either the two middlemoſt or the two outermoſt the longeſt, as in the

ſwallow

ſwallow and magpye; the bill is thicker at the baſis than in moſt of this kind, pretty long, ending in a point, a little bowed downward, of a yellow colour, with a black point; the crown of the head, and beginning of the neck behind, is of a black colour, with ſomething of a bluiſh gloſs; the throat, breaſt, and belly, are covered with green feathers, inclining to blue, of a firm ſubſtance, lying cloſe and regular, like the ſcales of fiſhes, and of ſo fine a ſurface, that they reflect the light, as doth burniſhed gold; the feathers on the back are of a looſer make, of a yellower green, not having the bright luſtre of the breaſt; the wings are of a browniſh purple, having, in ſome lights, a brighter bluiſh-purple caſt; the ridge of the wing from the ſhoulder, a good way down, is white; the tail is black or duſky, the feathers increaſing in length from the middlemoſt to the outermoſt, ſave one, which is about five times longer than any of the reſt; the legs, feet, and claws, are black. *Edward's Natural Hiſt. of Birds.*

HU'NDRED. *Docimaſtic Hundred, or centner*, in metallurgy and aſſaying, is a weight diviſible, firſt into an Hundred, and thence into a great number of other ſmaller parts; but, though the word is the ſame, both with the aſſayers and metallurgiſts, yet it is to be underſtood as expreſſing a very different quantity in their different acceptation of it. The weights of the metallurgiſts are eaſily underſtood, as being of the common proportion; but thoſe of the aſſayers are a thouſand times ſmaller than theſe, as the portions of metals or ores examined by the aſſayers are uſually very ſmall.

The metallurgiſts, who extract metals out of their ores, uſe a weight divided into an Hundred equal parts, each part a pound; the whole they call a centner or Hundred weight; the pound is divided into thirty-two parts, or half ounces: and the half ounces into two quarters of ounces, and theſe, each, into two drachms.

Theſe diviſions and denominations of the metallurgiſts are eaſily underſtood; but the ſame words, though they are equally uſed by aſſayers, with them, expreſs very different quantities; for, as the centner of the metallurgiſts contains an Hundred pounds, the centner of the aſſayers is really no more than one drachm, to which the other parts are proportioned.

As the aſſayers weights are divided into ſuch an extreme degree of minuteneſs, and are ſo very different from all the common weights, the aſſayers uſually make them themſelves in the following manner, out of ſmall ſilver, or fine ſolder plates, of ſuch a ſize, that the mark of their weight, according to the diviſion of the drachm, which is the docimaſtic, or aſſaying centner, may be put upon them. They firſt take for a baſis one weight, being about two thirds of a common drachm: this they mark 64 lb. Then, having at hand ſome granulated lead, waſhed clean, well dried, and ſifted very fine, they put as much of it in one of the ſmall diſhes of a fine balance, as will equipoiſe the 64 lb. as it is called, juſt mentioned: then, dividing the granulated lead into very nice halves, in the two ſcales, after taking out the firſt ſilver weight, they obtain a perfect equilibrium between the two ſcales; they then pour the granulated lead out of one diſh of the ſcales, and inſtead of it put in another ſilver weight, which they make exactly equiponderant with the lead in the other ſcale, and mark it 32 lb. If this ſecond weight, when firſt put into the ſcale, exceed by much the weight of the lead, they take a little from it by a very fine file; but, when it comes very near, they uſe only a whetſtone to wear off an extremely ſmall portion at a time. When it is brought to be perfectly even and equal to the lead, they change the ſcales to ſee that no error has been committed, and then go on in the ſame manner till they have made all the diviſions, and all the ſmall weights. Then to have an entire centner, or Hundred weight, they add to the 64 lb. as they call it a 32 lb. and a 4 lb. and, weighing againſt them one ſmall weight, they make it equal to them, and mark it 100 lb. This is the docimaſtical or aſſaying centner, and is really one drachm. *Cramer, Art of Aſſay.*

HU'RA, *the ſand box-tree*, in botany, a genus of plants, whoſe characters are:

It hath male and female flowers on the ſame plant: the male flowers conſiſt of one leaf, which is funnel-ſhaped, having a long incurved tube; but is ſpread open at the brim, where it is ſlightly cut into twelve parts: in the bottom of the tube are placed ſeveral ſhort ſtamina, which are collected together. The female flowers have the ſame figure with the male, but have no ſtamina; the center of the flower being occupied by the ſhort round compreſſed pointal, which afterwards becomes a round fruit compreſſed at both ends, having twelve deep furrows, and as many different cells, each containing one round compreſſed ſeed: the fruit, when ripe, burſts open with great elaſticity, and caſts the ſeeds abroad.

It is propagated by ſeeds, which ſhould be ſown early in the ſpring, in pots filled with light rich earth, and plunged into an hot bed of tanner's bark. If the ſeeds are freſh, the plants will appear in about five weeks after the plants are ſown; when they ſhould be carefully cleared from weeds, and frequently refreſhed with water. As the plants will advance very faſt, when due care is taken of them, they ſhould have a large ſhare of freſh air admitted to them in warm weather, otherwiſe they will draw up too weak. When the plants are about four inches high, they ſhould be tranſplanted each into a ſeparate ſmall pot filled with light rich earth, and plunged again into the hot-bed of tanner's bark; being careful to ſhade them from the heat of the ſun, until they have taken new root; after which time they muſt have free air admitted to them, by raiſing of the glaſſes in proportion to the warmth of the ſeaſon; and they ſhould be frequently watered. When the plants have filled theſe ſmall pots with their roots, they muſt be ſhaken out of them, and their roots trimmed, and then placed in larger pots, which ſhould be filled with the like rich earth, and plunged again into the hot-bed; where they ſhould remain till Michaelmas, provided the plants have room, without touching of the glaſſes; at which time they muſt be removed into the bark ſtove, and plunged in the warmeſt part thereof: during the winter ſeaſon they muſt be often watered, but they muſt not have it in ſuch quantities then, as is given to them in ſummer; they muſt alſo be kept very warm, otherwiſe they will not live in this country. In ſummer they muſt have a large ſhare of freſh air, in warm weather; but they muſt not be removed into the open air; for they are too tender to live abroad in the warmeſt part of the year in this country.

HU'SBANDRY. The new method of Huſbandry, called by Tull the horſe-hoeing Huſbandry, has many evident advantages over the other, or old way; but the difference between them, in regard to the former, is beſt explained by a fair compariſon. In order to do this juſtly, there are four things to be carefully conſidered: 1. The expence of a crop. 2. The goodneſs of the crop. 3. The certainty of it. And, 4. The condition in which the land is left after the crop.

The profit or loſs, ariſing from land, is not to be computed only from the value of the crop it produces, but from its value after all expences of ſeed, tillage, &c. are deducted. Thus, when an acre of land produces a crop worth four pounds, and the expences of it amount to five pounds, the loſs of the farmer is one pound upon it; whereas, when as much land produces a crop only of the value of thirty ſhillings, and the expences are only ten ſhillings, the owner receives one pound advantage. The common expence of an acre of ſowed wheat, in the uſual way, is four pounds ten ſhillings; and the common expence of an acre of wheat, in the horſe-hoeing Huſbandry, is only ten ſhillings, including all the expences that can attend it. Thus this method of Huſbandry is but a ninth part of the charge of the common way; and as no ſheep are required, as there are in the other way, the leſs ſtock will do to begin with. The goodneſs of a crop conſiſts in the quality of it as well as in the quantity, and, wheat being the moſt uſeful of all grain, a crop of this is more valuable than a crop of any other corn. Add to this, that a crop of hoed wheat has always larger ears, and a fuller body, than a crop when ſown in the common way. More wheat may alſo be obtained this way than any other, becauſe the ſame lands will thus produce crops every year; and even the land which has been exhauſted by the common Huſbandry, will produce wheat in plenty this way, without fallowing or dunging, both which would otherwiſe be neceſſary. So that, in many places, this Huſbandry can raiſe ten acres of wheat for one that the old way could produce, becauſe, where land is poor, they ſow but a tenth part of it in wheat.

The largeſt produce of an acre of wheat land, ſo far as has yet been experienced, ſeems to be ten quarters, or eighty buſhels to an acre. This is leſs indeed than the produce of an acre in the common way, according to Houghton's computation: but, to compare the different profits to the farmer, we proceed thus: the rent and expences of a drilled acre being one pound, and that of a ſowed acre in the common way being five pounds; one quarter of corn produced by the drilled bears an equal proportion to one pound in profit, as five quarters produced in the common way do to five pounds. As, ſuppoſe it to be of wheat at two ſhillings and ſix pence a buſhel, there is neither gain nor loſs in the one nor the other acre, though the drilled produce only one quarter, and the other five.

But if the drilled acre yields two quarters, and the ſown acre yields only four quarters at the ſame price, the drilled acre brings the farmer one pound profit, while the other has one pound loſs. Likewiſe ſuppoſe the drilling farmer to have his five pounds laid out in five acres of wheat, and the other to have his five pounds laid out in one dunged acre, then, let the price be what it will for the wheat, if the five acres have an equal crop to the one acre, the gain and loſs muſt be equal. But, if the price of wheat be at two ſhillings and ſix-pence, the farmer in the common way, if he have five quarters on his acre, he muſt ſell it all to pay his rent; whereas, if he who drills the land have five quarters on each acre, the produce of one acre will pay for all five. Or ſuppoſe a drilled acre to produce no more than one-third of the ſown acre, which is rating it very low indeed, the expence of the ſown acre being five times as much as that of the drilled one, it is much more profitable to the owner to have the drilled acres; becauſe a third part of five pounds is one pound thirteen ſhillings and four-pence, and, a fifth of the rent and expence, which is all his charge, being only one pound, ſuch a drilled acre

acre brings the owner thirteen shillings and four-pence profit more than the sown acre, though that brings three times as great a crop.

The certainty of a crop is greater this way than in the old way of sowing; for most of the accidents, attending wheat crops, are owing to their being late sown, which is necessary to the farmer in the old way; but in the horse-hoeing method the farmer may plough two furrows whereon the next crop is to stand, immediately after the first crop is off. In this manner of Husbandry the land may be plowed dry and drilled wet, without any inconvenience; and the seed is never planted under the furrow, but placed just at the depth which is most proper, that is, at about two inches, in which case it is easy to preserve it, and there is no danger of burying it. Thus the seed has all the advantages of early sowing, and none of the disadvantages that may attend it in the other way; and the crop is much more certain than by any other means that can be used.

The condition in which the land is left after the crop, is no less in favour of the horse-hoeing Husbandry, than all the other articles. The number of plants is the great principle of the exhausting of land. In the common Husbandry, the number is vastly greater than in the drilling way, and three plants in four often come to nothing, after having exhausted the ground as much as profitable plants; and the weeds which live to the time of harvest in the common way, exhaust the land no less than so many plants of corn, often much more. The horse-hoeing method destroys all the weeds in the far greater part of the land, and leaves that part unexhausted and perfectly fresh for another crop. The wheat plants being also but a third part of the number at the utmost of those in the sowing way, the land is so much the less exhausted by them; and it is very evident from the whole, that it must be, as experience proves that it is, left in a much better condition after this than after the common Husbandry.

The farmers who are against this method, object that it makes the plants too strong, and that they are more liable to the blacks, or blights of insects, for that season; but, as this allows that the hoeing can, without the use of dung, give too much nourishment, it is very plain that it can give enough; and it is the farmer's fault, if he do not proportion his pains so as to have the advantages of the nourishment without the disadvantages. It is also objected, that, as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But, if this should happen, the sowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over nourished: or, if this is not chosen, the land, when thus made too rich, may soon be sufficiently impoverished by sowing corn upon it in the common old way. See HOEING.

HYA'CINTHUS, *hyacinth, or jacinth*, in botany, a genus of plants, whose characters are:

It hath a bulbous root: the leaves are long and narrow: the stalk is upright and naked, the flowers growing on the upper part in a panicle: the flowers consist each in one leaf, are naked, tubulose, and cut into six divisions at the brim, which are reflexed: the ovary becomes a roundish fruit with three angles, which is divided into three cells that are filled with roundish seeds.

All the different sorts of hyacinths are propagated by seeds or offsets from the old bulbs: the former method has been but little practised in England till very lately; but in Holland and Flanders it hath been followed for many years, whereby they have obtained a very great variety of the most beautiful flowers of this kind; and it is owing to the industry of the florists in those countries, that the lovers and delighters in gardening are so agreeably entertained, not only with the curious variety of this, but of most other bulbous-rooted flowers; few other florists thinking it worth their trouble to wait four or five years for the flower of a plant, which when produced, perhaps there might not be one in forty that may deserve to be preserved: but they did not consider, that it was only the loss of the three or four first years after sowing; for, if they continued sowing every year after they began, there would be a succession of flowers annually, which would constantly produce some sorts that might be different from what they had before seen; and new flowers being always the most valuable to skilful florists, provided they have good properties to recommend them, it would always be a sufficient recompence for their trouble and loss of time.

The method of raising these flowers from seed is as follows: having provided yourself with some good seed (which should be saved from either semi-double, or such single flowers as are large, and have good properties) you must have a parcel of square shallow boxes or pots, which must be filled with fresh light sandy soil, laying the surface very level: then sow your seeds thereon, as equally as possible, covering it about half an inch thick with the same light earth: the time for this work is about the beginning of August. These boxes or pots should be placed where they may enjoy the morning sun only until the middle or latter end of September; at which time they should be moved into a warmer situation; and, towards the end of October, they should be placed under a common hot-bed frame; where they may remain during the winter and spring months, that they may be protected from hard frosts; though they should be exposed to the open air, when the weather is mild, by taking off the glasses. In February the young plants will begin to appear above ground; at which time they must be carefully screened from frosts, otherwise they will prove very injurious to them: but you must never cover them at that season but in the night, or in very bad weather; for when the plants are come up, if they are close covered, they will draw up very tall and slender, and thereby prevent the growth of their roots. In the middle of March, if the weather proves good, you may remove the boxes out of the frame, placing them in a warm situation; observing, if the season be dry, to refresh them now and then with a little water, as also to keep them very clear from weeds; which would soon overspread the tender plants, and destroy them, if permitted to remain. *Miller's Gard. Dict.*

HYGRO'METER (*Dict.*)—*Plate* I. *fig.* 9, in the Dictionary, represents a double Hygrometer. It is made of a string either of hemp or cat's-gut, and shews the increasing moisture of the air by its twisting and shortening, and the dryness by untwisting and lengthening.

Thus, let A B C be the lower part of a twisted line or cord, hanging from the height of the room against one side thereof on the wall or wainscot; let there be described a large circle, graduated into an 100 equal parts, such as K L M N; in the center of which is a pin, with a small pulley I B, carrying an index O P. If now a cord be put round the pulley, and a small weight or ball D be suspended at the lower end to keep it straight, then, as the cord gathers moisture from the air, it will twist and become shorter; the consequence of which will be, that in contracting it will turn the pulley I B, and this by its index will point to the numbers on the graduated circle, which will shew the degree of moisture or dryness by the contraction or relaxation of the cord.

Again: if the ball D hang over the center E of another graduated circle C G H placed horizontally, carrying an index E upon its divisions, it will shew the same thing by the twisting and untwisting of the cord B C, as in the circle above.

I.

I.

JA'CEA, *knapweed, or matfellon*, in botany, a genus of plants whose characters are:

The leaves and stalks are destitute of spines, and the leaves have their margins equal, not serrated. *Boerhaave, Index alter.*

Tabernæmontanus recommends the decoction of it for ruptures: there are some that give it in powder in pottage. By the chymical analysis it yields hardly any thing but a substance loaded with acrid salt. *Martyn's Tournefort.*

It is too frequent in pasture grounds, and flowers in July and August. The herb, which is used, is effectual against tumors of the tonsils, and in hernias and wounds. *Dale from Schroder.*

I'CACO, *American plum*, in botany, a genus of plants whose characters are:

It hath a rose-shaped flower consisting of several petals, which are placed in a circular order, from whose flower cup arises the pointal, which afterwards becomes an oval, soft, fleshy fruit, inclosing a rough stone of the same form, in which is contained a round kernel.

JACOBÆ'A, *ragwort*, in botany, a genus of plants whose characters are:

It hath a radiated flower, the tube of which is almost of a cylindrical figure, and the seeds are fastened to down; to which may be added, the leaves are deeply laciniated or jagged.

JA'LAP (*Dict.*)—The characters of this genus are:

It hath a long thick fleshy succulent root: the leaves, which resemble those of nightshade, grow by pairs opposite on the branches: the stalks and branches are very full of knots: the flower consists of one leaf, and is shaped like a funnel: in the center of the flower is placed the ovary, inwrapped in one of the flower cups, which becomes an oblong five-cornered umbilicated fruit, consisting of a mealy nut. See *Plate* XXVIII. *fig.* 2. where *a* is the flower, *b*, the Jalap root of the shops.

These plants are always propagated by seeds, which should be sown upon a moderate hot-bed in March; and, when they come up, they should be transplanted into another hot-bed, at six inches distance from each other; and, when they have taken root, the glasses must be raised every day, that the plants may have a great deal of air, otherwise they are very subject to be drawn up tall and weak; nor can they be recovered to a sufficient strength again in a month's time, if once they are thus drawn. When the plants are grown to be a foot high, they should be put into pots filled with rich light earth, which should be plunged into a very moderate hot-bed, to facilitate their taking root: and, in removing them, you must be very careful to preserve as much earth to their roots as you can; for their roots have but few fibres to retain it in a ball, as many other plants will do; and it sometimes happens, when the root is left bare, it seldom takes fresh hold of the ground, at least not in a considerable time; so that the plants will make but a poor figure that season. When they are transplanted into the pots, and have taken root again, they should be hardened to endure the open air, for they are not very tender; but, on the contrary, they will not thrive well, if too much drawn or forced in the hot-bed. In the middle of May the pots may be removed into the places where they are designed to be continued for that season; observing to support the branches with a strong stake, and to water them as often as they require it. You may also in May plant some of them into the middle of the large borders of the pleasure-garden, doing it carefully; and observe to shade and water them until they have taken root; after which, they will require no farther care but to support them from being broken down by the winds, which they are very subject to be, especially when their heads are large.

The plants, thus raised, will grow to the height of three or four feet, and spread their branches very wide (especially if the roots have room in the pots;) and their flowers will begin to appear in June, and they will continue constantly flowering until the frost prevents them; which, together with the great diversity of colours in the flowers upon the same plant, renders them valuable to every curious person. The flowers of these plants never expand in the day time, while the sun is hot; but in the evening, when the sun declines, they begin to open, and continue expanded till the sun shines warm upon them the next day; so that, when it happens to be cloudy weather, as also late in autumn, when the weather is cool, the flowers will remain open most part of the day.

As the flowers are produced successively almost every day, so the seeds are in a short time after ripe, and do soon fall to the ground; so that, when your seeds begin to ripen, you must carefully look for them upon the ground twice a week: otherwise, if they lie too long upon the ground, and there should fall some rain, they will sprout, and be good for nothing. In sowing these seeds, you should be careful to take them from such plants as produced the greatest variety of flowers; for, if you save them from such as produce only plain-coloured flowers, the seeds will always produce the same sort; and those with yellow and red variegated flowers will constantly produce the same; these never varying from the red and yellow to the purple and white, though they will sometimes degenerate into plain yellow or red flowers, as will they into plain purple or white; but they will constantly retain one or both of their original colours.

JA'NSENISM, the tenets and opinions of Cornelius Jansenius (D. D. of the university of Lovain and Ypres, born at Leerdam, 1585) with relation to grace and free-will, as follows: 1. Some precepts of God are impossible to just men, though willing and endeavouring according to their present power; grace being wanting, whereby it might be possible for them to keep God's commands. 2. In the state of the fallen nature there is no resistance made to inferior grace. 3. To merit or demerit in the state of lapsed nature, there is not required in a man liberty from necessity, but liberty from coaction is sufficient. 4. The Semipelagians did admit the necessity of inferior preventing grace to every act, even to the beginning of faith; and in this they were heretics, because they would have that grace to be such as the will of man might resist or obey. 5. It is a Semipelagianism, to say that Christ died or shed his blood for all men. These propositions, though much defended in France and Flanders, were condemned by pope Innocent the Tenth in the calends of June, 1633; as likewise by Alexander the Seventh, and Clement the Ninth. Jansenism consists in maintaining this doctrine two ways, 1. By asserting that these propositions are sound and orthodox. 2. In affirming that they are evil and heretical, in the sense wherein the church had condemned them, but that this sense is not the true. *P. Simon. Sup. and Leo. de Mod.*

JAPA'NNING (*Dict.*)—The varnish, made and used in China and Japan, is composed of turpentine and a curious sort of oil they have. This they mix and boil up to a proper consistence, and this never causes any swelling in the hand or face of the people who use it. The swellings in these parts which often happen to those who work the lackered ware, and sometimes to those who only pass by the shops of these people, is from the lack and not the varnish. This lack is the sap or juice of a tree, which runs slowly out on cutting the lower part of the trunk of the tree, and is received in pots set on purpose under the incisions. This juice, as it flows from the tree, is of the colour and consistence of cream, and, as it comes in contact with the external air, its surface becomes black. As they only use it when black, their method of preparing it is to set it out in the open air, in large flat bowls, in which it looks all surface; but, that the whole may be of the same uniform colour, they continually stir it for twenty-four hours together, with a smooth piece of iron: by this means the whole becomes thicker than it was before, and of a fine deep black. When it is in this state, they powder some burnt boughs of trees, and mix them thoroughly with it, and then, spreading it thin over any board which they intend to japan, it is soon dried in the sun, and is then absolutely harder than the board it is laid on. When this is thoroughly dry, they polish it over with a smooth stone and water, till it is as smooth as glass; and then, wiping it very dry, they lay on the varnish made of oil and turpentine, and boiled to a proper consistence for this kind of work.

If the work is to be of any other colour than black, that colour is to be mixed with the varnish, and then the whole spread on very thinly and evenly; for in this laying it on depends the principal art of varnishing. When there are to be figures in gold or silver, these must be traced out with a pencil in the varnish over the rest of the work, and, when the varnish is almost dry, the leaf gold or leaf silver is to be laid on, and polished afterwards with any smooth substance.

JA'SHER, a book mentioned in ſcripture, and ſaid by ſome to be loſt. But ſome of the moſt celebrated Hebrew doctors ſay they have found it; telling us, that it is the book of Geneſis, wherein are contained the acts of Abraham, Iſaac, Jacob, and the other patriarchs, who were, by way of excellence, called jaſherim the juſt. But, that man muſt be eaſily ſatisfied, who can acquieſce with this interpretation. Dr. Lightfoot thinks the book of Jaſher is the ſame with the book of the Wars of God; but there is little foundation for it. This book, according to Grotius, was a triumphal poem; but Joſephus ſeems to bid faireſt for the truth, who ſays, that by this book are to be underſtood certain records kept in ſome place on purpoſe, and afterwards in the temple, giving an account of what happened among the Hebrews from year to year, and particularly the prodigy of the ſun's ſtanding ſtill, and directions and laws about the uſe of the bow, that is, the ſetting up of archery, and maintaining military exerciſes. If it be enquired why the title given to theſe Hebrew annals was the book of Jaſher, that is, the upright, this may be given as a reaſon, becauſe it was by all perſons reckoned as a very juſt and authentic account of all thoſe events and occurrences which it recorded; it was compoſed with great uprightneſs and truth, thence it was commonly known by the name of Jaſher's book, or chronicle. It was not the work of any inſpired perſon, but was of the nature of common civil annals; and, conſequently, we cannot infer from hence, that any book properly belonging to holy ſcripture, that is, that was written by inſpiration of the Holy Ghoſt, is at this day miſſing. *Lewis's Antiq.*

JASMI'NUM, *the jaſmine, or jeſſamine tree*, in botany, a genus of plants, whoſe characters are:

The leaves are in many ſpecies pinnated; the cup of the flower conſiſts of one leaf, but is divided at the top into five ſegments: the flower conſiſts of one leaf, is funnel-ſhaped, and divided into five ſegments: the flowers are ſucceeded by berries, which ſplit in the middle, each ſide, for the moſt part, containing a ſeparate ſeed.

The common white jaſmine is eaſily propagated by laying down the tender branches in the ſpring, which, by the ſucceeding ſpring, will be rooted ſtrong enough to be tranſplanted. They may alſo be raiſed by cuttings, which ſhould be planted in autumn in a moiſt border, where they may have the morning ſun: but they muſt be ſcreened from the violence of the ſun in the heat of the day, and frequently watered in dry weather. The cuttings, thus managed, will many of them live, and have roots fit to be removed in the following ſpring: but this method is ſeldom practiſed, the layers always making the beſt plants.

When theſe plants are removed, they ſhould be planted where they are deſigned to be continued, which ſhould be either againſt ſome wall, pale, or other fence, where the flexible branches may be ſupported; for, although it is ſometimes planted as a ſtandard, and formed into an head, yet it will be very difficult to keep it in any handſome order; or, if you do, you muſt cut off all the flowering branches; for the flowers are always produced at the extremity of the ſame year's ſhoots, which, if ſhortened before the flowers are blown, will intirely deprive the trees of flowers. Theſe plants ſhould be permitted to grow rude in the ſummer, for the reaſon before given: nor ſhould you prune and nail them until the middle or latter end of March, when the froſty weather is paſt; for, if it ſhould prove ſharp froſty weather after their rude branches are pruned off, and the ſtrong ones expoſed thereto, they are very often deſtroyed; and, this plant being very backward in ſhooting, there will be no danger of hurting them by late pruning.

The two ſtriped ſorts ſhould be planted in a warm ſituation, eſpecially the white ſtriped; for they are much more tender than the plain, and are very ſubject to be deſtroyed by great froſts, if they are expoſed thereto: therefore it will be proper to preſerve a plant of each kind in pots, which may be removed into the green-houſe in winter, leſt, by expoſing them to the cold, they ſhould all be deſtroyed, and the variety loſt.

The common yellow jaſmine was formerly in greater plenty in England than at preſent, and was planted againſt arbors, &c. to cover them, though it is not near ſo proper for that purpoſe as the white ſort, it being of much ſlower growth, nor will it ever extend its branches ſo far as that; but, however, it may have a place among the flowering ſhrubs of low growth, where it may be with more eaſe reduced to a ſtandard than the other. This plant flowers in May and June; but they have very little ſcent, which has occaſioned its being leſs regarded. It may be propagated by ſuckers, which it generally produces in great numbers; or by layers, as was directed for the common ſort; and are full as hardy. This ſort ſeldom riſes above five or ſix feet high.

The dwarf yellow jaſmine is ſomewhat tenderer than the former; yet will it endure the cold of our ordinary winters, if it be planted in a warm ſituation. The flowers of this kind are generally larger than thoſe of the common ſort, and better-ſcented; but are ſeldom produced ſo early in the ſeaſon. It may be propagated by laying down the tender branches, as was directed for the common white ſort; or by budding or inarching it upon the common yellow jaſmine; the latter of which is preferable, as making the plants hardier than thoſe which are obtained from layers; they ſhould be planted againſt a warm wall, and in very ſevere winters will require to be ſheltered with mats, or ſome other covering, otherwiſe they are ſubject to be deſtroyed. *Miller's Gard. Dict.*

The flowers only are uſed, and that but ſeldom in our ſhops; though Schroder commends them, as good to warm and relax the womb, to heal any ſcirrhi therein, and to facilitate the birth; as well as to be uſeful for a cough, difficulty of breathing, pleuriſy, and pains of the ſtomach, inteſtines, and womb. The oil, made by infuſions of the flowers, is made uſe of in perfumes.

The oil prepared of the flowers diſcuſſes crude humours, and is ſerviceable to thoſe who are ſubject to colds and catarrhs, and uſeful in the winter ſeaſon: in perſons of an hot temperature, it excites the head-ach; and, if long ſmelled to, endangers an hæmorrhage from the noſe. It is principally ſerviceable in contractions and hardneſſes of the limbs; for it heats, mollifies, and relaxes the joints, tendons, and nerves. It cures diſorders of the uterus, not only when applied to the hypogaſtrium and the pudenda, but alſo drank, or adminiſtered in a clyſter. It is no leſs effectual in the cholic proceeding from cold and viſcid humours. The flowers are principally uſed in diapaſms, and perfumes for gloves and linen. *Raii Hiſt. Plant.*

IBE'RIS, *ſciatica-creſs*, in botany, a genus of plants whoſe characters are:

The empalement of the flower conſiſts of four leaves, which are vertically oval: the flower has four leaves, which are unequal, two of them being longer, and ſpread broader, than the other; in the center of the flower is ſituated the pointal, attended by ſix ſtamina, two of which are ſhorter than the other: the pointal afterwards changes to a roundiſh compreſſed pod, having two cells, each containing one oval ſeed.

Theſe plants were commonly ſown to make edgings to large borders in the flower gardens, and are as proper for that purpoſe as any of the low annual plants: but they make a much better appearance when they are ſown in patches, intermixed with the dwarf lychnis, Venus's looking-glaſs, and other low annuals. If the ſeeds of theſe are ſown in the autumn, the plants will grow much ſtronger, and flower earlier in the year, than thoſe which are ſown in the ſpring; but, by ſowing them at different ſeaſons, they will flower at ſo many different times; by which means there will be a ſucceſſion of them in flower until the froſt puts a ſtop to them.

All the culture theſe require, is, to ſow their ſeeds in the places where they are to remain; for they do not bear removing well, unleſs it is done while the plants are young, and taken up with balls of earth to their roots: afterwards, if they are kept clear from weeds, they will thrive and flower very well. All theſe low annual flowers are very proper ornaments for the borders, or vacant ſpaces, between flowering ſhrubs; where, by the different ſorts being blended together, they will add much to the beauty.

ICE-*houſe*, a building deſigned to preſerve Ice, for the uſe of families in the ſummer ſeaſon. Theſe are more generally uſed in warm countries, than with us; particularly in Italy, where the meaneſt perſon, who rents a houſe, is not without his vault or cellar for keeping of Ice.

Ice-houſes being much more uſed with us than formerly, it may not be amiſs to give ſome general directions for the choice of the ſituation, and ſtructure of them, as alſo for the management of the Ice.

The ſituation, then, ſhould be upon a dry ſpot of ground: becauſe, wherever there is moiſture, the Ice will melt; for which reaſon, too much care cannot be taken to make drains all round them. The place ſhould likewiſe be elevated, and as much expoſed to the ſun and air as poſſible.

As to the figure of the building itſelf, the proprietor may chuſe ſuch as pleaſes his own fancy; but a circular form is the beſt for the well where the Ice is to be preſerved, which ſhould be large in proportion to the quantity to be kept.—It is beſt to have as much as may ſerve two or three years, in caſe of a mild winter, when little or no Ice is to be got. At the bottom of the well, there ſhould be a ſpace of about two feet deep left to receive any moiſture which may drain from the Ice, and a ſmall drain under ground ſhould be laid from this to carry off the wet. Over this ſpace of two feet ſhould be placed a ſtrong grate of wood; and the ſides of the well ſhould be built of brick, at leaſt two bricks thick; for, the thicker it is, the leſs danger there will be of the well's being affected by any external cauſe.

When the well is brought up within three feet of the ſurface, there muſt be another outer arch or wall begun, which muſt be carried up to the height of the intended arch of the well; and, if there is another arch turned over from this wall, it will add to the goodneſs of the houſe. The roof muſt be high enough above the inner arch, to admit of a door-way to get out the Ice. If the building is to be covered with ſlates, or tiles, reeds ſhould be placed conſiderably thick under them, to keep out the ſun and external air; the thickneſs of ſix or eight inches, with a plaiſtering of hair and lime, will be ſufficient to prevent all danger.

The external wall need not be built circular, but of what figure the proprietor pleases. Sometimes, the Ice-house is so contrived as to have an handsome alcove seat in its front.

Two feet diameter is sufficient for the aperture of the mouth of the well; which should have a stone, so contrived, as to stop it up in the exactest manner; and all the vacant space, between this aperture and the outer door, should be filled up with barley straw; and this last is to be always shut, before the inner door is opened. The building, thus finished, should have time to dry, before the Ice is put into it.

If a layer of reeds be placed smooth over the grate at the bottom of the well, on which to lay the Ice, it will do better than straw, which is commonly used; and, as to the choice of the Ice, the thinner it is, the easier it may be broken to powder: for, the smaller it is broken, the better it will unite, when put in the well. In putting it in, care must be taken to ram it as close as possible; as also to allow a vacancy of about two inches all round next the side of the well, to give passage to any moisture occasioned by the melting of some of the Ice.

When the Ice is put into the well, if a little salt-petre be mixed with it at every ten inches, or foot thickness, it will cause the Ice to join more closely into a solid mass. *Miller's Gard. Dict.*

ICHNEU'MON, in zoology, the name of an animal, of which there have been a multitude of idle and fabulous things asserted. It is a creature of the weasel kind, with a longer and narrower body than a cat, and something approaching both in shape and colour to the badger. Its nose is black and sharp, like that of a ferret. It has no beard, or whiskers: its nose is prominent, and its ears short and round. Its colour is a yellowish grey, much like that of some of the monkey class. This is its appearance when in a good humour; but, when frighted or provoked, it raises its hairs upright, and shews them variegated at intervals with grey and yellow in distinct portions. Its legs are short, and its feet have all five toes. Its tail is very long, and thick at the insertion; its teeth, and its tongue, like those of the cat. And, what is very singular, is, that in both sexes it has a large aperture situated below the anus, which it dilates and contracts at pleasure. Hence came the old opinion, that both male and female conceived, and brought forth young, in this animal. It is naturally a very cleanly animal, and is very brisk and nimble, and of great courage. It will engage a large dog, and, if it have a quarrel with a cat, will destroy that creature by three bites on the throat. Its nose is so sharp and narrow, that it can very hardly lay hold of any thing large with its teeth, and scarce can bite a man's clenched fist. It is very expert in seizing its prey; it stands erect on its hinder-legs, to descry where it is; then, throwing itself flat on its belly, crawls very slowly towards it, and, when within reach, darts violently upon it. It feeds indifferently on all animals that it can get at. Its common food are the snail, the lizard, the chameleon, such serpents as it can manage, and frogs and mice; it is also very fond of birds, and of none so much as the hen and chicken. *Ray's Syn. Quad.*

ICHNEUMON-*fly*. These flies sometimes are at great pains to destroy and carry the caterpillars, in whose bodies they intend to lay their eggs, to places where it is proper those eggs should be hatched. There is one species whose worm produced from the egg can never succeed, unless it be both bred in the body of a caterpillar, and also have that habitation buried under ground. To this purpose the parent-fly, when the time of her laying her eggs is come, forms a hole in the ground, which she covers with a little clod of earth, that no dust may fall in to fill it up; when this is prepared, she goes out in search of a caterpillar, proper for her purpose. Dr. Lister assures us, that he has often seen one of these flies seize a caterpillar much larger than herself for this intent, and, though this has been at a considerable distance from her hole, she has with great labour dragged the creature to it; as soon as she arrives with this load, she takes off the little pellet of earth from the mouth of the hole, and, going down into it to see that all is right and ready for the reception of the new guest, she returns out of it and draws in the caterpillar, which she leaves there, after giving it such wounds as, though they will not cause immediate death, yet will disable the creature so far as to make an escape impracticable. When the creature is thus lodged, she deposits her eggs in its flesh. And, this great business being done, she stops up the orifice of the hole very firmly with several pellets of dirt, and with dust carefully rammed in between, and will even fly up into gummy and resinous trees to get a cement to hold all firmly together. When the whole is thus filled up, even to the surface of the rest of the ground, she draws a leaf or two to the place, and, laying them over the mouth, flies away. There is after this no more care taken, but the young worms are hatched from the eggs, and feed on the flesh of the caterpillar till they are fully grown. They then change into the nymph state, and come out of that in form of their parent flies, in which state they easily make their way out of the ground. Some of these Ichneumons make the bodies of other smaller flies the places of hatching their eggs. They may be often met with flying with one of these small flies in their legs, the head of it being held close to their bellies. If they be watched on this occasion, they will be found usually to carry these flies to certain holes in the ground resembling worm holes. The first that they carry serves as the nidus for their eggs; the rest are for food for their young while in the state of worms; these being too voracious to be long subsisted on the body of one fly, and therefore their parents carry them more every day. The old ones on this occasion crawl backwards into the hole, dragging in the flies after them. When their young worms have fed sufficiently, they are converted into nymphæ; the cases of which are made up of the wings, legs, and other hard parts of the flies they had been feeding on. *Philos. Transf.* N°. 76.

ICHTHYO'LOGY, the science which treats of fishes.

The general division of fishes is into three classes; the cetaceous, the cartilaginous, and the spinose. The cetaceous fishes are those whose tail is so placed that, when the fish is in its natural posture, it stands parallel to the horizon. The cartilaginous fishes are those whose fins serving for swimming are sustained by cartilages in the place of the bony rays which support them in the other, and which have also cartilages in the whole body, instead of bones. These are the characters of the two first classes; and all those fish which have their fins supported by bony rays, which have their tail placed perpendicularly, not horizontally, and which have bones, not cartilages, in their bodies, are called the spinose fishes.

These are the division of the fish in general among authors.

The cetaceous fishes are arranged together, by the later writers on natural history, under the name of plagiuri. These agree in many things with the land animals, and are distinguished from one another by the same characters which serve for the distinction of the quadrupeds, particularly by the teeth. The general structure of these fishes is alike in all; and their only differences are in the teeth, and the number of fins. From the teeth and fins alone, therefore, are to be properly taken the generical characters of the plagiuri.

The cartilaginous fishes differ from each other only in the form of their body, and in the number of the foramina of the bronchia. For the number of the fins, and figure and position of the teeth, which in the former class make the only characters of generical distinctions, in these are so variable, that they frequently differ in the different species of the same genus. The characters for the distinction of the cartilaginous fishes into genera can therefore only be taken from the shape and foramina. Thus all the rays have flat or depressed bodies, and five foramina at the bronchia. All the petromyzæ have, on the contrary, rounded bodies, and seven foramina at the bronchia. The chonepterus and mola have roundish bodies, and only one foramen or hole for the bronchia; and so of the rest. The several species of the rays, though all properly belonging to the same natural genus, yet differ greatly in their number of fins, and in the shape and disposition of their teeth.

The true characters of these two great classes of fishes, the cetaceous and cartilaginous, are thus easily found; but the characters of the spinose kinds are to be sought for deeper, and do not offer themselves so readily. The multitude of these, and the great likeness between several of the different genera, render it no easy task to distinguish them one from another. Though it be a general rule, that the generical characters of fishes are to be taken from their external parts; yet, in cases where these external parts differ in themselves, in number, figure, and proportion, it is necessary that the primary characters of the genus should be taken from those parts which are the least variable of all others, and which are the most peculiar to the fish under consideration, and the least common to other genera. The utmost care and skill of the ichthyologist is necessary to the distinguishing these characters; and on a strict enquiry he will find, that those parts which seem at first most proper to found distinctions on, are in reality least of all so. The figure of the fins and tail in fish might seem one of the most essential characters for a generical distinction, yet, a farther search into their nature will shew that they can be of no use at all in this sense. Almost all the species of the cyprini, a genus constituted on essential and invariable characters, and a truly natural one, have fins acute at the end, and have forked tails; yet, had these been made characters of the genus, they would have excluded fish that are properly of it. Thus the the tench and the carassius have both obtuse fins, and tails straight or plain, not forked at the end. There are, indeed, many natural genera of fishes, in which the fins and tails are alike in all, as the pearch, the mackarel, the conger. These allow the fins and tail as very good collateral circumstances of the distinction, but even these could not well be distinguished by such marks alone, as they are common to many other genera besides.

IDO'LATRY (*Dict.*)—Dr. Owen divides the whole of idolatrous worship into Sabaism and Hellenism. Dr. Prideaux imagines the planets, as mediators, to be the first objects of Idolatrous worship: though Hellenism consists principally in the worship of dead men and dæmons, yet the Grecians at first adored the sun, moon, and stars, as even Plato owns; for, perceiving all things to run in a continual course, they called them Θεοὶ, Gods, from θέειν, to run. The Greek and Roman idolatry took its rise from that of the Egyptians, Phœnicians, and Syrians. It is a certain maxim, that religion, as well as learning, and mankind itself, had its first original in the East. We shall therefore consider that country first. Tho' the Egyptians were reputed the wisest of the Gentiles, yet they appear, in their religious

religious worſhip of beaſts, to have acted contrary to common ſenſe. It is alledged, the worſhip of brutes was the vail, under which were concealed the myſteries of their religion, as their morals were hid under hieroglyphics. But it is abominable to adore ſheep, cats, bulls, dogs, cows, ſtorks, apes, birds of prey, wolves, and ſeveral ſorts of oxen, as the Egyptians did, under any pretence whatever; the very heathens ridiculed this kind of Idolatry; each province and diſtrict in Egypt entertained a peculiar devotion for ſome beaſt or other. What was ſignified by this monſtrous Egyptian Idolatry is not eaſy to conceive; many fables have been invented to palliate its enormities. This Idolatry had footing in Egypt, in the time of Moſes and the Patriarchs. Thus much for the Egyptian Idolatry. The Phœnicians were among the moſt antient nations and firſt Idolaters; but all the account we have of their theology is in a little fragment preſerved by Euſebius little to be depended on.

It appears that the ſun, moon, and hoſt of heaven were worſhipped by the Jews, when they turned to Idolatry, after the example of neighbouring heathens, without images, by an humble proſtration before them, or their emblems, light or fire: we muſt farther remark, though the Jews were guilty of ſeveral kinds of Idolatry, eſpecially before the Babyloniſh captivity, yet the heathens very unjuſtly charged them with ſeveral acts of Idolatry of which they were innocent.

However, the long abode of the Iſraelites in Egypt left in them a ſtrange propenſity to Idolatry, which neither the miracles of Moſes, nor the rigour of his laws againſt the worſhip of idols, nor the ſplendid marks of God's preſence in the Iſraelitiſh camp, were ſufficient to overcome; they had contracted ſuch an invincible proneneſs to Idolatry, that they not only perſiſted in the worſhip of the Egyptian deities, but adopted moreover every new one which came in their way, as they became acquainted with other nations. Moſes has recorded many inſtances of their Idolatry; but they were guilty of many more, which have been preſerved by other inſpired writers, who ſeverally upbraid them with ſetting up and carrying about the idols of Remphan, Malkom, and many others of the like nature.

Saul and David, with all their authority, were not able to root out Idolatry from among this people; they ſacrificed upon high places, they conſulted divines and magicians. Solomon himſelf, whom God had choſen to build his temple, erected altars to the falſe gods of the Phœnicians, Moabites, and Ammonites, &c. and there were few of the kings his ſucceſſors who did not in this reſpect ſhew alike weakneſs; thus Jeroboam, the ſon of Nebat, king of Iſrael, introduced the worſhip of the golden calves, which took ſo deep root in the kingdom of Iſrael, that it never was intirely extirpated.

Leaving the Eaſtern nations, it is now proper to remove to the Weſt, and conſider the Idolatry of the Greeks and Romans, and other Weſtern nations, before Chriſt. Nothing can be more monſtrous than the Idolatry of the Greeks and Romans, contained in their poets and claſſics in the hands of every child, where we meet with an incredible number of them.

The ancient Britons had abundance of magical rites, and adored a multiplicity of idols. The Germans had the ſame idols as the Britons. For, from the heathen Saxons, the Engliſh learned their Idolatry.

Sozomen, with Origen, and others affirm, that, when our Saviour was carried into Egypt, to avoid the perſecution of Herod, the idols of this country, which were very numerous, and worſhipped to the greateſt degree of ſtupidity and exceſs, were moſt of them ſhaken off their baſis; however, though Idolatry was not perfectly ſuppreſſed, but was ſtill kept on foot in the ſame meaſure even in Rome, this is certain, that it began to be laid aſide after our Saviour's birth; the emperor Theodoſius, jun. deſirous to put a final end to the great work of aboliſhing Idolatry, publiſhed very ſevere edicts, wherein he ordered all things belonging to Idolatry to be deſtroyed throughout the Roman empire. At preſent Idolatry flouriſhes moſt in China.

I'LEX, *the ever-green oak*, in botany, a genus of trees, whoſe characters are:

The leaves are, for the moſt part, indented or ſinuated (and in ſome the edges of the leaves are prickly) and are ever-green; it hath amentaceous flowers, which are produced at remote diſtances from the fruit, on the ſame tree: the fruit is an acorn, like the common oak.

Theſe trees are propagated by ſowing their ſeeds: the beſt ſeaſon for this work is in the beginning of March: but then, as the acorns are ripe in autumn, they ſhould be preſerved either in ſand, or dry earth, until the ſpring, otherwiſe they will loſe their growing faculty; which is commonly the caſe with thoſe brought annually from Genoa, ſcarce one ſeed in fifty of them ever riſing; however, ſince we have many large trees now in England, which produce good ſeeds, we need not ſend to Italy for them: but, were I to adviſe, I ſhould much rather have them from Portugal than Italy; for, the voyage being much ſhorter, they are generally brought from thence in very good condition; eſpecially, if they are brought over in the packet-boat to Plymouth.

The manner in which I would adviſe their being ſown is, for large quantities, in drills at about four feet diſtance; but, for a ſmall parcel, they muſt be ſown in rows on a bed much nearer.

The ground on which theſe ſeeds are ſown, ſhould be well dug, and cleanſed from the roots of all noxious weeds, &c. and leveled even, and the great clods broken; then draw the rills with an hoe in a ſtraight line (as is practiſed in the ſowing of kidney beans) about two inches deep, laying the acorns therein three or four inches aſunder; then draw the earth over them with a head of a rake, obſerving that none of them are left uncovered; which would intice the vermin to attack your acorns, eſpecially the mice, whereby your ſeminary will be greatly injured, if not wholly deſtroyed.

Theſe trees are by many greatly eſteemed for hedges to ſurround wilderneſs quarters; but they are ſubject to grow too large for that purpoſe, becauſe we ſhould never hide the tops of the trees in ſuch places from the ſight; for they are, if rightly diſpoſed in the quarters, vaſtly more agreeable to the eye, than the fineſt ſheared hedge in the world; but they may do well enough for a large fence, to obſtruct the ſight, or to defend a new plantation of tender trees; for which purpoſe the acorns ſhould be ſown in the place where the hedge is deſigned; and, when the plants are come up, they ſhould be thinned, where they are too cloſe; and, if the ground is kept clear from weeds, and, every ſpring, dug about the plants, they will ſoon form a good hedge: but you ſhould obſerve, not to let them grow too much in height before the lower part of the hedge is well ſtrengthened, which would occaſion its bending, and the branches would be ſubject to be diſperſed with ſtrong winds, or great ſnows, and thereby become very unſightly: but, if they are regularly trained up, they will make a good thick hedge from the ground to the height of thirty-feet, and that in leſs time than any other ever-green tree whatever.

The ſoil in which theſe trees thrive beſt, is a hazelly loam, not too ſtrong, nor over light, in which they will grow to a large ſize, and reſiſt the ſevereſt cold of our climate; and, retaining their leaves all the winter, afford an agreeable proſpect in that ſeaſon: but they ſhould by no means be planted near ſuch walks, or other parts of the garden, as are intended to be kept clean; for in the month of April, when they caſt their old leaves, they make a great litter, and are apt to blow about with the wind, and become very troubleſome; and in June, when their male flowers fall off, they occaſion no leſs trouble to clean them up daily in ſuch places; and, in the pleaſanteſt ſeaſon of the year, they are the moſt unſightly trees in a garden, the old leaves decaying at that ſeaſon, and falling off; and the male flowers, which are generally in great plenty, are then produced, which renders it not ſo valuable in places much frequented: but, for larger plantations, at a remote diſtance from the habitation, ſo as to be juſt within the view, they make a very handſome appearance, eſpecially in the winter ſeaſon.

The wood of this tree is accounted very good for many ſorts of tools and utenſils, as mallet-heads, mall-balls, chairs, wedges, beetles, pins, &c. as alſo for palliſadoes; and affords the moſt durable charcoal in the world, and is the common fuel in the ſouthern parts of France and Italy. *Miller's Gard. Dict.*

ILEX *coccigera*, or holm-oak, is of much lower ſtature than the former ſorts, and ſeldom grows to the height of a tree: this, though a native of the warmeſt parts of France, yet will endure the cold of our climate in the open air. It may be propagated in the ſame manner as the former, and deſerves a place amongſt other ſhrubs of low growth, for its curioſity, as being the plant on which the kermes are bred. See *plate* XXV. *fig.* 1. where *a* is fruit, *b* the cup, *c* the kermes, *d* the catkin ſeparate. See KERMES in the Dictionary.

I'LIAC *Paſſion* (*Dict.*) — With reſpect to the Iliac paſſion, we are carefully to remember, that it is highly unſafe to exhibit draſtic purgatives, in order to render the body ſoluble; becauſe they never fail to increaſe the pains, ſpaſms, and all the other ſymptoms; nor is it expedient to uſe clyſters, prepared of exceſſively hot and carminative ſubſtances: much leſs are carminative and ſtomachic eſſences, or medicated wines, to be exhibited internally; ſince, though theſe may prove beneficial in a flatulent cholic, ariſing from a cold cauſe, as the ancients uſed to ſpeak, they are yet by no means to be exhibited, when the diſeaſe is of the acute kind, and all the fluids are in a violent and preternatural motion.

But, when the ſtrength begins to fail, and deliquiums to ſeize the patient, mild analeptics may be ſafely and advantageouſly uſed; ſuch as thoſe, for inſtance, prepared of the waters of black cherries, Turkiſh baum, lilies of the valley, and cinnamon, without wine, or a ſpoonful of generous wine, may be now and then exhibited, with ſingular advantage.

If the patient is plethoric, veneſection is forthwith to be inſtituted, and even repeated, if the caſe requires it. Great regard is, alſo, to be had to the judicious obſervations of the learned Paſcoli, who in Tom. II. uſes the following words: 'When a fever, and the ſigns of an approaching inflammation of the viſcera, are preſent, a vein is to be forthwith opened, rather in the inferior than in the ſuperior parts: hence, we almoſt always obſerve, that leeches, eſpecially when applied to the inteſtinum rectum, have been of ſingular uſe in the cure of an Iliac paſſion; ſince the blood, diſcharged from the hæmorrhoidal vein, relieves the part affected, in the moſt immediate manner of all others'.

When the uſe of quickſilver is indicated as proper and neceſſary, it is previouſly to be depurated, waſhed, and paſſed through leather: when thus prepared, it is not adviſable to exhibit more than

than a pound, or half a pound; which is most commodiously taken in fat broth. Immediately after it is taken, it is expedient the patient should lie for some time on his right side, that it may the more quickly pass through the right orifice of the stomach: besides, if his strength permits, he is to walk, or use gestation, that it may the better reach the inferior parts. But, when the inflammation is already present, and the strength much impaired, we are to abstain from the use of this medicine, lest the by-standers, and such as are not capable of forming a right judgment, should be of opinion, that the patient is destroyed by this remedy, which has the bad fortune to be suspected almost by every one.

In this disorder, great hopes of safety and recovery are justly placed in clysters, provided they are only used at proper times, and in due quantities; for these, when the large intestines are constricted by violent spasms, by relaxing their fibres, and rendering them flaccid, greatly allay the inversion of the peristaltic motion. It is most expedient, if the strength of the patient permits it, to inject a clyster of warm water, mixed with Fernelius's syrup of marshmallows, every two hours, and that during the first day of the disorder, that, by this means, the fæces may be rendered more liquid.

As for topics, I cannot help approving of the caution of Cælius Aurelianus, who advises us to abstain from heavy cataplasms, which, by their weight and roughness, increase the disorder, and the pains with which it is accompanied; for, sometimes, the inflation and distension of the abdomen are so great, that the patient cannot bear it to be moderately touched with the hand.

When the anus, in consequence of the spasmodic strictures, is so braced up, that it cannot admit a clyster-pipe, much less the nose of a pair of bellows, it is then expedient to apply to it a moderately warm fomentation, and, with a small pipe, to attempt the injection of pure tepid oil, that the spasmodically constricted coats of the intestinum rectum, being, by this means, softened, may be, afterwards, capable of receiving a larger quantity of liquor.

When the disease is upon the decline, baths are highly commodious; and may be, also, used in the first days of the disorder, when their propriety is indicated by proper circumstances; for these contribute greatly to the termination of the disease, and the expulsion of the peccant matter, by relaxing the fibres: thus baths were by the methodists, with great success, recommended in the decline of diseases, as we learn from Cælius Aurelianus.

In order to mitigate the pains which are, almost, the only cause of so many violent symptoms, and of the inverted peristaltic motion of the intestines, we are not to be afraid of using opiates, provided they are exhibited in the beginning of the disease, when the strength is as yet intire, a plethora removed, and no signs of a spacelus to be discovered. With respect to the great efficacy of opiates in this disorder, the reader may consult the sentiments of Wedelius, found in the *Miscell. Nat. Curiof. Dec.* 1. *An.* 2. *Obf. Hoffman.*

I'MAN (*Dict.*) — The Mahometans are not perfectly agreed concerning the dignity, and some other circumstances of this office. Some hold the imanate to be settled by divine right, and to be fixed, like the Aaronical priesthood, on one family: others affirm it to be of divine institution, in a qualified sense: but that it is not so unalterably tied to genealogy and descent as to hinder its passing from one family to another; the second party maintaining farther, that the Iman ought not only to be innocent of enormous crimes, such as infidelity, but also to be unblemished in lesser imputations, with which, if his character is sullied, he may be lawfully deposed, and the dignity conferred upon another: but this is denied by those who pass for good Mahometans, who affirm, that, after an Iman has been owned in his character by the mussulmen, it is reckoned downright impiety to deny he is God's immediate vicegerent; and therefore he that refuses to obey him, is reckoned as a rebel, and he that is so hardy as only to contradict him, is reproached as a very ignorant mortal. The Schiites, or the disciples of Ali, though they are not agreed among themselves concerning the person to whom this dignity belongs, yet they all maintain this privilege belongs to the family of Ali, exclusive of all others, and that it ought to be governed by laws of succession and proximity of blood, Ali being sole and apparent heir to Mahomet. This principle of the Schiites makes them not own any person for the head of religion, who cannot prove his descent in a direct line from their first Iman. The Schiites proceed farther, and maintain that the principal point of their religion, upon which all the rest is superstructed, consists in absolute and entire submission to this Iman, and an implicit belief of what he delivers. The Imans belonging to particular mosques are of the nature of our parish priests: they officiate in their public liturgy, in which they pray for the prince, and make a sort of harangue to the people. One of the principal functions of the caliph was to execute the Iman's office every Friday in the chief mosque where he resided; and, when he did not officiate himself, he used to delegate some person of condition.

IMPERATO'RIA, *masterwort*, in botany, a genus of plants whose characters are:

The leaves are not very ramous, but divided into three segments, each of which is divided into three others. The seeds are flat, oval, slightly striated, and marginated.

The roots of masterwort are long, and full of knots or joints, about a finger thick, running obliquely into the ground, shooting out many fibres from the joints, of a strong aromatic smell, and a pretty hot taste; the lower leaves are hardly a span high, somewhat like angelica, but much less, and divided into three segments of roundish leaves, crenated about the edges; the stalks seldom grow above a foot high, with but few leaves on them, and have, on their tops, umbels of small, white, five-leaved flowers, each of which is succeeded by two round, whitish, somewhat flat seeds. It is cultivated with us in gardens, its native place being the Austrian and Stirian mountains, and other Alpine countries, flowering in July.

The roots, which are the only part used, are cordial, sudorific, and alexipharmic, of great use in putrid malignant fevers, and all contagious pestilential distempers; they resist poison, and the bites of venomous creatures. They help pains of the stomach, and the cholic; in all nervine affections, and disorders of the head, they are used with good success. *Miller's Bot. Off.*

The roots are oblong, about an inch thick, wrinkled, and geniculated, brown without, white within, of an aromatic acrid taste, and fragrant smell.

The Historia Plantarum, ascribed to Boerhaave, ascribes the following virtues to these roots: they are attenuating, he says, and aperitive; provoke saliva, if held in the mouth, and are, carthartic, if taken inwardly, whence the root Imperatoria is called the countryman's purge. Taken in a lesser quantity, it proves sudorific and diuretic. In the hysteric and convulsive cholic, and the tympanitis, it often works with such violence as to require correctors, such as levisticum, meum, or some other sweet and viscid root. In intermittent fevers, especially tertians and quartans, it is a specific remedy, as well as in comatous disorders. It has the same aromatic, hot, and igneous taste and smell in every part of it; and whether it be used in infusion or decoction, is inferior to no medicine for speed in giving relief under the effects of poisons of a volatile kind, working by gentle sweat, and, if exhibited in a larger quantity, by stool. It is recommended also in the dropsy, being taken to the weight of an ounce in honey, provided the viscera be found: it is, also, an antiscorbutic. It is highly recommended in cases where any one of the viscera requires to be speedily freed from viscid matter. Baglivi very much recommends it for diseases of the breast, for the pleurisy and peripneumony, in cases where the matter is connected, but the expulsive faculty deficient: for these purposes the root is infused in water, which is afterwards sweetened with honey, and proves an excellent promoter of expectoration, to the relief of the patient from the disease. It is one of the principal ingredients in the same antidotes as angelica: being heating and aperitive, it is effectual for discussing of tumors, where there is no inflammation, or in those of the scorbutic kind. If the root be divided in the middle, you discover a multitude of vesicles full of an oily and balsamic substance, indued with an igneous quality, which renders the root more heating than angelica, and as good a corrector of a fœtid breath. The root is to be taken up in the middle of winter, in its second year. The leaves bruised are good to discuss cold tumors. The distilled oils, as well as the spirits, are carminative and stomachic. The root is justly accounted one of the best antiscorbutics, and, boiled in water, affords an excellent remedy for the gravel in the kidnies, and a stoppage of urine.

I'NCENSE (*Dict.*) — Pure frankincense is what is gathered in autumn, and is much the finest, and of the whitest colour; the ingredients it was made of were pounded severally, and, being mingled, were with great care made ready for divine service, and a quantity of it burnt every day upon the altar of Incense that was placed before the ark. It was intirely set apart for divine worship, and not to be applied to any private use, nor to be touched by any but the priests, and that only when they ministered in the sanctuary before the mercy-seat: if any man presumed to make this composition with the same spices and the same weight, with a design to burn it as a perfume, he was cut off; and it is not impossible but this excision extended not only to the trangressor, but to his whole race, that none of them should remain to keep up his name. Incense was burned every morning when the lamps were dressed, and every evening when they were lighted; and therefore it was called a perpetual Incense, because it was never intermitted twice a day. One reason why it was thus continually burnt, was, because of the vast number of beasts that were slain there and cut to pieces, and washed and burned every day at the sanctuary, which would have made it smell like a shamble, and, consequently, rather have inspired the comers with disgust and aversion than awe and reverence, if this sweet odour had not perfumed it and the garments of the priest. The odour of this Incense, the rabbins say, might be smelt as far as Jericho, and by this means the reverence due to the house of God was preserved, which would have been contemptible, if any ill smell had been constantly about it. *Lewis's Heb. Antiq.*

INDU'LGENCE (*Dict.*)—Clement VI, in his decretal, generally received by the Romish church, declares, that our Saviour has left an infinite treasure of merits and superogatory satisfaction arising from his own sufferings, together with those of the Blessed Virgin and the rest of the saints; and that the pastors and

and guides of the church, and more especially the popes, who are the sovereign disposers of this treasure, have authority given them to apply it to the living by virtue of the keys, and to the dead by way of suffrage, to discharge them from their respective proportions of punishments, by taking as much merit out of this general treasure as they conceive the debt requires, offering it to God almighty. Indulgences themselves, and the abominable abuses committed on their account, are sufficiently exposed by St. Cyprian, Tertullian, and many others. Spanheim gives us this account of the origin of Indulgences, viz. that the primitive church being very rigid in exacting penance for offences, as, first, Πρόσκλαυσις, standing and mourning before the church door. Secondly, Ἀκρόασις, admitting them to hear the word, but not to prayers. Thirdly, Ὑπόπτωσις, or protestation, when they were admitted to the word and some prayers. Fourthly, Σύστασις, when they were admitted to all the prayers, but not to the sacraments; which various steps sometimes took up a penitent's whole life, upon which many were driven to despair, or apostatised to gentilism. Hereupon a temperament was found out to remit the hardness of this canonical penance, which was afterwards abused and degenerated into those now called Indulgences, though they were but of late rise in the church of Rome.

INFLA'MMATORY *Fevers.*--These may be distinguished into two stages; the first, whilst the pulse continues hard, in which it is proper to bleed; and the second, when, the Inflammatory symptoms still remaining, the pulse is too low for that evacuation. In this last state, blisters are the chief remedy, and which, except in a few singular cases, are not to be used sooner. If the blisters are large, it is better to apply them gradually, than many at a time. It is usual to begin with the back, and, if necessary, to apply them next to the legs or thighs, reserving the arms last, that the patient may be so much the longer conveniently moved. In great lowness, attended with a delirium, sinapisms, applied to the soles of the feet, have frequently more efficacy than blisters, in raising the pulse, and relieving the head.

If the body has been costive before the disease, it is proper to open it by a laxative, after bleeding; and, after recovery, some lenient physic is generally requisite, for preventing a too hasty repletion incident to convalescents, upon indulging their appetites. There is no caution more necessary to a young physician, than to abstain from all opiates throughout these fevers, however much the patient may complain of pain or watchfulness. Indeed, if the fever be accompanied with a diarrhœa, which is not critical, the looseness is to be gradually checked by diascordium, after giving rhubarb, and endeavouring to turn the humours to the skin by the use of diaphoretics (omitting the nitre) with the use of the white decoction for common drink. *Pringle's Observ. on the Dis. of the Army.*

INK (*Dict.*)—Writing ink is commonly made of copperas and galls; but other astringent plants may serve the same purpose, such as oak-bark, red-roses, log-wood, or sumach. Mr. Boyle seems to doubt whether all astringent vegetables will do the same. *Boyle's Works abr.* Vol. I.

Filings of iron put into several of the common vegetable juices turn them instantly as black as Ink; and hence it should seem that vitriol only acts in the making Ink as a substance containing iron; which always gives a black colour to an infusion of galls, or the like vegetable substances, and that the more deep, as it is more divided in its particles by acids. According to this rule, all those vitriols which have iron for their basis, and all solutions of iron in vitriolic, sulphureous, or aluminous acids, must make Ink with galls, or a like infusion; and the blue vitriol of Cyprus, and such others as have copper for their basis, must have no such effect on these infusions; and both these deductions are confirmed by experience.

In examining separately the two principles of which the atramentitious vitriols are composed, that is, their vitriolic acid, and their basis of the matter of iron, it appears, that the acid alone, being mixed with an infusion of galls, will never make Ink; whereas the basis alone, that is, filings of iron, will always do it in a little time. Hence it appears, that the acid has no share in the effect, and that the whole is owing to the ferrugineous matter in the vitriol reviving again into iron. The manner in which this revivification of iron is so suddenly performed, on the mixing vitriol and the infusion of galls, seems to be, that this infusion acts as an absorbent on the acid which had before reduced the iron to vitriol, and the ferrugineous particles, being thus freed from the acid by which they were transformed into vitriol, appear again in their native form, and have the same effect upon the infusion that simple or pure iron would have. *Mem. Acad. Par.*

INSCRI'PTION (*Dict.*)—The customary manner of preserving the memory of considerable actions, among the ancients, was monumental remains; at first, they went no farther than erecting pillars or stones, to continue the notice of some memorable event. Thus Jacob, having had a supernatural dream at Bethel, and being assured of God almighty's protection, took the stone which had been his pillow, and set it up for a pillar, and poured oil upon it, as a token of a promise for divine protection; and that, in case of a prosperous return, the stone might put him in mind of the holy place, where he might offer the first of his substance. These stones at first conveyed but little intelligence, excepting what could be guessed by the bulk and situation. It is true, something was hinted at, but nothing explained without the help of memory; for this purpose they cut the stones in figures, gods, men, and battles, with the instructive ornaments of bass relievo, where the history was farther described; they likewise cut letters with names, Inscriptions, laws, and arts. This custom of cutting stones was very ancient among the Phœnicians and Egyptians. The Inscriptions, reported by Herodotus and Diodorus Siculus, shew sufficiently that the first way of instructing people, and transmitting histories and sciences to posterity, was by Inscriptions; and this particularly appears by Plato's dialogue, intitled Hipparchus, wherein he says that the son of Pisistratus, called by the same name, engraved, on stone pillars, precepts useful to husbandmen. Pliny assures us that the first public monuments were made with plates of lead; and the treaties of confederacy between the Romans and the Jews were written upon plates of brass, that, says he, the Jews might have something to put them in mind of the peace and confederacy concluded with the Romans.

Porphyrius mentions Inscriptions kept by the inhabitants of Crete, wherein the ceremonies of the sacrifices of the Corybantes were described. Euhemerus, as Lactantius reports, had written an history of Jupiter and the other gods, collected out of the titles and Inscriptions, which were in the temples, and principally in the temple of Jupiter Triphilianus, where, on the Inscription of a golden column, it was declared, that that pillar was erected by the god himself. Pliny assures us, that the Babylonian astrologers made use of bricks to keep their observations, and hard and solid matters to preserve arts and sciences. This was for a long time practised; for Arimnestus, Pythagoras's son, as Porphyrius relates, dedicated in Juno's temple a plate, whereon were engraved the sciences that were improved by him: Arimnestus, says Malchus, being returned home, fixed in the temple of Juno a brass table, as an offering consecrated by him to posterity; this monument was two cubits diameter, and there were seven sciences writ upon it.

Pythagoras and Plato, according to the opinion of the learned, studied philosophy from the Inscriptions of Egypt, engraven on Mercury's pillars.

Livy tells us, that Hannibal dedicated an altar with a long discourse engraven in the Greek and Punic languages, wherein he described his fortunate atchievements.

INTE'GRANT *Parts*, in philosophy, the similar parts of a body, or parts the same and of the same nature with the whole; as filings of iron are the Integrant parts of iron, and have the same nature and properties with the bar they were filed off from. The chemists distinguish, in their resolutions of bodies, between the dividing or resolving them into Integrant parts like these, and what they call constituent parts, that is, dissimilar parts, or the principles of the bodies they work upon. Thus, when crude mercury is dissolved in aqua fortis, though held imperceptibly in the menstruum, yet, when that menstruum is diluted with water, and a copper-plate is suspended in it, the menstruum leaves the mercury to work upon the copper, and the mercury subsides unaltered and in its own natural form; the mercury, therefore, in this operation, was only divided into its Integrant parts, or small parcels of the same nature and properties of the whole; but, when artificial cinnabar is resolved or divided into crude mercury and sulphur, neither of these are of the same nature and properties with the cinnabar, and are not its Integrant but its constituent parts. This therefore is the dividing a body into its constituent parts or principles. *Shaw's Lectures.*

I'NTERVAL, in music (*Dict.*)—The learned Mr. Euler defines an Interval, the measure of the difference of an acute and grave sound.

Suppose three sounds a, b, c, of which c is the most acute, a the most grave, and b the intermediate sound. From the preceding definition, it appears that the Interval between the sounds a and c is the aggregate of the Intervals between a and b, and between b and c. Therefore, if the Interval between a and b be equal to that between b and c, which happens when $a : b :: c : d$, the Interval between a to c will be double the Interval a to b, or b to c. This being considered, it will appear that Intervals ought to be expressed by the measures of the ratio's, constituting the sounds forming those Intervals: but ratio's are measured by the logarithms of fractions, the numerators of which denote the acute sounds, and the denominators the grave. Hence the Interval between the sounds a and b will be expressed by the logarithm of the fraction $\frac{b}{a}$, which is usually denoted by $l\frac{b}{a}$, or, which comes to the same, $lb - la$. The Interval therefore of equal sounds, a to a, will be null, as $la - la = 0$. The Interval, called an octave or diapason, will be expressed by the logarithm of 2; and the Interval of the fifth, or diapente, will be $l\frac{3}{2} = l3 - l2$. From whence it appears, that these Intervals are incommensurable: so that no Interval, however small, can be an aliquot part, both in the octave and fifth. The like may be said of the Intervals $l\frac{5}{4}$ and $l\frac{6}{5}$, and others whose logarithms are dissimilar. But Intervals expounded by logarithms of numbers, which are powers of the same root,

may

may be compared.—Thus, the Interval of the sounds 27 : 8, will be to the Interval of the sounds 9 : 4, as 3 is to 2: for $l\,\frac{27}{8} = 3\,l\,\frac{3}{2}$, and $l\,\frac{9}{4} = 2\,l\,\frac{3}{2}$.

But, though the logarithms of numbers, which are not powers of the same root, be incommensurable, yet an approximating ratio of such may be found. Thus the measure of the octave is $l\,2 = 0.3010300$, and the measure of the fifth is $l\,3 - l\,2 = 0.1760913$. Hence the Interval of the octave will be to that of the fifth, nearly as 3010300 to 1760913; which ratio, being reduced to smaller terms, will give us these simpler expressions for the ratio of the octave and fifth, 2 : 1, 3 : 2, 5 : 3, 7 : 4, 12 : 7, 17 : 10, 29 : 17, 41 : 24, 53 : 31, which last is very near the truth. *Euler. Tentam. Nov. Theor. Mus.*

INTERVALS, in husbandry, a term used to express the spaces left between the several rows of plants sown or set in a garden or field. The method of horse-hoeing husbandry, so strongly recommended by Mr. Tull, is objected to by many, on account of the largeness of the intervals which are to be left between the rows of corn. These are required to be about five feet wide, and it is thought such wide spaces are so much lost earth, and that the crop is to be so much the less for it. But it is to be observed, that the rows of corn separated by these Intervals need not be single; they may be double, triple, or quadruple, at the pleasure of the farmer; and four rows, thus standing as one, will have the five feet Interval but one fourth of its bigness as to the whole quantity, and it will be but as fifteen such Intervals to plants in single rows. Corn that is sown irregularly in the common way, seems indeed to cover the ground better than that in rows; but this is a mere deceptio visus, for the stalks of corn are never so thick as when they come out of one plant, or as when they stand in rows; and a horse-hoed plant of corn will have twenty or thirty stalks in a piece of ground of the same quantity, where an unhoed plant will have only two or three stalks. If these stalks of the hoed plant were separated and planted over the Intervals, the whole land would be better covered than it is in the common way; and the truth is, that, though these hoed fields seem to contain a much less crop than the common sown fields, they yet, in reality do contain a much greater. It is only the different placing that makes the sown crop seem the larger, and even this is only while both crops are young. *Tull's Horse-hoeing Husbandry.*

INTESTINAL *Fever, febris intestinalis*, in medicine, a name given by Heister to a peculiar species of acute fever passed over in silence by the generality of authors, but by some called the mesenteric fever, and by our Sydenham the new fever, nova febris. This differs from other acute fevers, in that it is attended always with a diarrhœa, which however is salutary, and which it is very dangerous to stop; and in that it is not relieved by the attemperating or diaphoretic medicines useful in other fevers, much less by the hot sudorifics; all these things exasperate and make it worse, and the only things that give relief in it, are gentle cathartics, and vomits that operate without violence. This fever, therefore, evidently shews the error of those hasty reasoners, who declare, that all acute fevers are to be cured by diaphoretics.

This peculiar species of fever, though unknown to many of the late writers, and called by Sydenham a new distemper, was not unknown to the antients. Hippocrates has left many things concerning it, as have also the later Greeks and Celsus: and, among the moderns, Duret, Sennertus, Forestus, Riverius, Etmuller, Baglivi, Stahl, Hoffman, and Lancisci, have all met with it, though they have given but very short and imperfect descriptions of it in their writings.

The generality of those who have written of this fever have referred it to the malignant kinds, from its being usually attended with severe and uncommon symptoms from the beginning, or from such being brought on in the course of an irregular treatment: the common method of curing fevers by diaphoretic medicines bringing on in this anxieties and streightness of the precordia, with pains about the stomach, loss of appetite and deliriums, with efflorescences of various kinds, particularly petechial spots; and these symptoms are not unfrequently attended with death. But it is to be observed, that diseases are to be carefully distinguished in their own symptoms, those which the physician brings on being often very different from what nature would offer.

These fevers have their seat in the stomach and intestines; or, if they have it any where else, it appears at least that their origin, which is in a putrid colluvies, is always much more easily reduced and evacuated by these, than by any other passages. Many of the distempers, mentioned by authors under peculiar names, are properly to be referred, as to their causes, to this species of fever. The dysenteric fever is absolutely of this kind, and many of the petechial ones. The catarrhal fevers also are referable to this kind; and the continual quotidian and tertian, with the fevers described by the antients under the names of hemitritæus, assodes, elodes, epiala, and lipyria, with the tritophyæ nearly allied to the hemitritæi, and by some authors confounded together, the words being used as synonymous.

The method of cure. All hot medicines must be avoided, and the discharge of the peccant matter by the diarrhœa promoted by clysters and by purging medicines. Some advise aloes, and other medicines of that kind; others sena and manna; some the purging salts; but most prefer rhubarb, given in often repeated small doses. Large draughts of the lubricating decoctions, such as barley water and water gruel, are to be given, and emulsions of sweet almonds and of the cold seeds. Small quantities of oil of sweet almonds are also to be given at times, and juleps of the cooling waters and syrups moderately acidulated, and powders of nitre, cinnabar, and the common absorbents, as crabs-eyes and the like, are to be given to take off the pains and spasms, and to attemperate the acrid matter. Bleeding in this fever is not necessary, unless in plethoric habits; and in those cases it must be done on the access of the disease, for, if done after the third or fourth day, it is usually found to do more harm than good.

The diet in these fevers is not to be so very thin and weak, as in other acute fevers; but moderate nourishment is to be allowed, that the patient may hold his strength sufficiently to go through it; in the beginning of the disease however, the patient has usually an aversion for food, and then it is not to be forced upon him; but, when the stomach begins to require it, then it is to be given in a moderate quantity; and great care is to be taken that nothing astringent or difficult of digestion be allowed, but light and innocent meats, and with these a little good wine to promote digestion. Some also have given frequent vomits, by small doses of ipecacunaha, in these fevers, and that with very good success; and it is remarkable, that the purple fever mentioned by Stahl, and others, as particularly affecting lying-in women, and being very frequent in Saxony, for a long time, was by Dr. Wagner, and others, cured by this method: its origin being found to be a viscous matter, putrifying in the stomach and intestines; and therefore the distemper, being properly one of these intestinal fevers, was curable by the same methods with them, that is, by emptying the primæ viæ. *Heister's Compend. Med.*

INTESTINES (*Dict.*)—The intestinal canal, like all other parts of the body, may be seized with a true inflammation, the signs and effects of which are generally these following: a burning, fixed, and pungent pain in the stomach; an exacerbation of this pain, at the very time any thing is taken into the stomach; a painful vomiting immediately after eating or drinking, accompanied with a tormenting hiccup; a violent and perpetual uneasiness about the precordia, and an acute continual fever. The causes of this disorder are either general inflammations, the contiguity of the stomach to the other parts inflamed, or the taking acrid substances into the stomach.

An inflammation of the stomach generally soon proves mortal, unless expeditiously cured, in consequence to the injury done to the important function of this part, and the incredible number of nerves connected with it.

Like other inflammations, it terminates either in health, in suppuratory, scirrhous, cancerous, or gangrenous disorders, or in the sudden death of the patient, accelerated by convulsions.

As soon as the disorder is, from its signs before enumerated, known to be present, we are forthwith, and with the greatest care, to use liberal venefection, which is to be repeated as necessity requires; highly mild, nutritive, emollient, and antiphlogistic liquors, of a quality opposite to the causes of the disorder: as, also, clysters and fomentations of a like nature. But all acrid substances, and especially vomits, are carefully to be abstained from.

A mild and lenitive drink.—Take, of the recent leaves of wood sorrel, three ounces; of the leaves of mallows, an handful and an half; of entire oats, an ounce; boiled with a sufficient quantity of whey; to every twelve ounces of which add two yolks of eggs, and one ounce of the rob of currants.

A clyster.— Take of the recent leaves of endive, succory, fumitory, mallows, and marsh-mallows, each an handful: boil with whey, and, after expressing the decoction, use ten ounces of it for a clyster, twice or thrice a day.

If an inflammation of the stomach terminates in a suppuration, many seemingly misfortunes ensue; but especially a nausea, vomiting, and pain, which, when their cause is unknown, are rarely cured; but, when it is known, they are to be treated in the same manner with abscesses.

When an inflammation of the stomach produces a scirrhus, or a cancer, it then excites excessive vomitings, and intolerable pains, which are heightened and protracted by taking the least thing into the stomach, of a fixed nature, and are generated by all acrid medicines.

By mild and lenient medicines alone, this species of the disorder may be alleviated, but rarely cured. Medicinal waters are, however, in this case, the most efficacious means of relief.

From what has been said above, and under the article LIVER, the origin, nature, effect, knowledge, prognostic, cure, and palliative cure of inflammations, suppurations, gangrenes, scirrhuses, and cancers, of the spleen, pancreas, and omentum, may be deduced.

Inflammations of the INTESTINES.—Not only the stomach, but also the Intestines, especially small ones, are often subject to an acute inflammation in their membranes. This misfortune is is produced by the common cauſes of an inflammation, conveyed to the inteſtines, either, for inſtance, by the acrid matter of liquor drank, of aliments, ſpices and pickles, medicines, or poiſons, taken into the ſtomach, conveyed thence into the Inteſtines, and there retained in their valvulous folds.

This misfortune may, alſo, be produced by an acrid, putrid, fetid, purulent, ichorous, gangrenous, bilious, or atrabilious matter conveyed from the œſophagus, ſtomach, liver, ſpleen, pancreas, and omentum, to the Inteſtines, where it remains and corrodes them. And, laſtly, an inflammation of the Inteſtines may be produced by violent previous convulſions, which create flatulences, ſtop the motion of the fluids, and by that means produce an inflammation.

This diſorder contracts the Inteſtines, cloſes up their cavities, prevents the paſſage of what is conveyed to them, produces highly acute, burning, and fixed pains; excites violent convulſions, when the inflamed part is irritated by the things conveyed to it; renders the patient coſtive, excites a vomiting of the aliments, and of things conveyed to the affected part, ſooner or later, according as the inflammation is near the ſuperior or inferior parts of the Inteſtines; produces painful flatulences, acute gripes accompanied with rumblings, the iliac paſſion, that diſorder called volvulus, an abſceſs, a gangrene, a ſcirrhus, a cancer, a highly acute fever, exceſſive weakneſs, in conſequence of the intenſe pain, and ſudden death.

So long as the diſorder continues in its inflammatory ſtate, it is, by the ignorant and unſkilful, taken for a twiſting of the Inteſtines; and, being, through a dangerous miſtake, aſcribed to cold, flatulences, and wind, is, for that reaſon, treated with hot medicines, a practice which proves fatal to the patient.

But a genuine inflammation of the Inteſtines is known from its concomitant continual acute fever, intenſe thirſt, exceſſive heat, a hard pulſe, a burning pain, high-coloured urine, and the induction of a ſudden weakneſs.

When an inflammation ſeizes the flexure of the colon, the diſorder reſembles the cholic; but, if it ſeizes the extremity of the inteſtinum rectum, it is generally taken for the blind hæmorrhoids; in which caſe, its moſt happy termination is by a mild, bloody, and bilious dyſentery.

As ſoon as an inflammation of the Inteſtines is known to be preſent, from the ſigns before enumerated, we are, in its firſt ſtage, with the greateſt expedition, to attempt its cure; which is to be obtained, firſt, by liberal and repeated venſection, as in a pleuriſy; ſecondly, by the careful injection of laxative, diluting, and antiphlogiſtic clyſters, repeated three, four, or more times a day; thirdly, by the frequent drinking of liquors of a laxative, diluting, and antiphlogiſtic nature, with a prudent addition of opium, and ſuch things as are oppoſite to the particular known cauſe of the diſorder; fourthly, by fomentations prepared of ſubſtances of like qualities applied to the whole abdomen, and eſpecially fomentations conſiſting of young, vigorous, and ſound animals; fifthly, by carefully abſtaining from all kinds of drink, aliments, or medicines which are of an acrid, hot nature, or capable of increaſing the impetus of the fluids; as, alſo, by avoiding exerciſe, and the exorbitancies of the paſſions: and, ſixthly, by perſiſting in the uſe of theſe things, till the intire diſorder is removed, and does not return in three days.

If this diſeaſe is not cured by proper remedies, and continues to rage with violence longer than three days, the pain, heat, and diſtraction, are ſucceeded by a ſhivering through the whole body, without any apparent cauſe, and by an obtuſe pain, with a ſenſation of weight in the part affected; theſe are ſigns, that the abſceſs is forming in it: within fourteen days after, the abſceſs breaking, the pus will be diſcharged: if this pus is diſcharged into the cavities of the abdomen, it produces many diſorders ſimilar to thoſe ariſing from the diſcharge of pus from the liver, and mentioned under the article LIVER: but, if this pus is diſcharged into the cavities of the Inteſtines, it produces a purulent dyſentery, ſmall or great, ſhort or long, according to the nature of the ulcer formed. In this caſe, intire membranes of the Inteſtines are frequently diſcharged, and a conſumption is often brought on.

As ſoon as an inflammation of the Inteſtines is known to be preſent, all ſuch aliments are carefully to be abſtained from, as are capable of generating a large quantity of hard and thick fæces: the patient is only to be nouriſhed with broths boiled with gently detergent roots; balſamic detergent decoctions are to be copiouſly drank, and injected by way of clyſters; or medicinal waters are to be copiouſly drank, and their uſe perſiſted in till a perfect cure is brought about.

The following aliment ſhould be uſed in this diſorder:—Take, of the roots of viper's graſs, goat's beard, ſkirret, parſley, and ſuccory, each two ounces: boil in fleſh broth, and, with every thirty ounces of the broth, mix two yolks of eggs, and a ſufficient quantity of ſalt.

The following decoction will be alſo of great ſervice:

Take, of the roots of garden valerian, two ounces; of the leaves of lovage, two handfuls; of the flowers of St. John's wort, one handful, and of the flowers of agrimony, two ounces: boil with two pints of water; of which let the patient drink two ounces every hour. This decoction is alſo to be uſed as a clyſter.

INVOLU'CRUM, among botaniſts, expreſſes that ſort of cup which ſurrounds a number of flowers together, every one of which, has, beſide this general cup, its own particular perianthium. The Involucrum conſiſts of a multitude of little leaves diſpoſed in a radiated manner. See the article CALYX.

JOINT, in anatomy; ſee ARTICULATION, in the Dictionary.

Pains in the JOINTS.—Thoſe pains of the Joints, which are accompanied with inflammation and tumor, have an affinity with the gout. The proper method of curing them is by bleeding, bliſtering the parts affected, and, unleſs the fever runs high, by purging. If there be no fever, or but a ſlight one, a mixture of equal parts of gum guaiacum and cinnabar of antimony will produce a very good medicine, both to open the body and correct the acrimony of the tumors. It ſhould be given ſo as to procure two ſtools at leaſt every day.

Of all theſe pains, the moſt ſevere is that which the Greeks name *ἰσχιάς* (and we corruptly ſciatica) becauſe it ſeizeth the hips; and it is attended with the greater difficulty, becauſe it is moſt commonly the conſequence of chronical diſeaſes, by the morbid matter being thrown on this part. This diſeaſe, when grown inveterate, weakens the thigh and leg, and makes the patient lame; and ſometimes alſo the head of the thigh-bone ſlips out of the ſocket, and then the thigh ſoon waſtes away.

In this diſeaſe little is to be expected from cupping or bliſtering the part: for the acrid humour lies too deep fixed in the membrane ſurrounding the bone, to be drawn out by theſe means. More efficacious is the volatile epithem, or a plaiſter compoſed of Burgundy pitch, with about an eighth part of euphorbium, and a ſufficient quantity of Venice turpentine. But nothing gives ſo much relief, in an obſtinate caſe eſpecially, as a ſeton paſſed below the part affected, in order to give vent to the morbid humour. But, if this operation be thought too cruel and troubleſome for the neceſſity of it, it will be of uſe to make an iſſue with a cauſtic in the inſide of the thigh above the knee; which muſt be kept open till the diſorder is quite removed. Hippocrates adviſes to apply the actual cautery in three or four places upon the hip. And indeed no remedy would be more efficacious than this, if patients could be reconciled to it: for, how terrifying ſoever the ſight of red-hot iron may appear, the pain from the application of it would be much ſooner over, than that which is raiſed by the common cauſtics.

The fleſh-bruſh ought likewiſe to be uſed ſeveral times every day, in order to facilitate the digeſtion and diſſipation of the concreted humour; and more eſpecially on the very hips, if practicable. But fomenting the part affected with warm water is generally prejudicial: becauſe this brings on a relaxation of the fibres, whereby the pain is increaſed.

I now paſs to internal remedies, the chief of which are bleeding and purging. Of cathartics, the moſt efficacious are dulcified mercury ſix times ſublimed, and the electuary of ſcammony; either of which muſt be often repeated, according to the patient's ſtrength. And, in the intermediate days of purging, the proper medicines are ſuch as are diuretic and laxative at the ſame time. Of this claſs I give the preference to the volatile tincture of gum guaiacum, or the balſam of guaiacum. *Mead's Monita & Præcepta.*

JOINT *cartilage, or articulating cartilage.* An articulating cartilage is an elaſtic ſubſtance, uniformly compact, of a white colour and ſomewhat diaphanous, having a ſmooth poliſhed ſurface covered with a membrane, harder and more brittle than a ligament, but ſofter and more pliable than a bone. *Phil. Tranſ.* N°. 469.

IO PÆ'AN, among the ancients, an exclamation uſed on account of a victory, or ſome proſperous event. Hoffman thinks that Io Pæan is a contraction of the Hebrew Jao, from Jehovah, and פקד, reſpexit; and was the ſame with Jehovah penoch, i. e. Dominus reſpiciat in nos. Something like this exclamation ſtill remains among the Symerones, a people of the Weſt-Indies, who, on any joyful occaſion, frequently cry out Yo Peho. *Hoff. Lex. in voc.*

IO'TA, a letter in the Greek alphabet, which derives its name from the jod of the Hebrew, or rather of the joda of the Chaldeans. Our Saviour mentions it, by ſaying, there ſhould not be an Iota, or tittle in the law, but ſhould be accompliſhed: ſo that whatever was foretold by Moſes, and the prophets, ſhould be exactly fulfilled; meaning nothing ſhould be wanting, becauſe Iota was the ſmalleſt letter in the Greek alphabet, as jod is in the Hebrew: they both ſtand for 10, in numbering.

JOU'I. This is an alimentary and reſtorative liquor, prepared in Japan, and capable of being preſerved ten or a dozen years. It is fluid like broth, aqueous, black, of an agreeable ſmell, and good taſte, ſalt, and ſavoury. With reſpect to the manner of preparing it, no more is known, than that it is made of the gravy of beef, expreſſed when half roaſted: the Japoneſe keep the reſt a ſecret, and ſell it very dear. This liquor is very rare in Europe: ſome, however, is imported either on account of curioſity or luxury. It is thought to be a reſtorative after diſeaſes, and, on this account, is eſteemed greatly all over the Eaſt.

I'RIS (*Dict.*)—Mr. Sharp gives the following account of an operation

operation upon this membrane, which he calls cutting the Iris.

There are two cafes, fays he, where this operation may be of fome fervice; one, when the cataract is from its adhefion immoveable; and the other when the pupil of the eye is totally clofed up by a diforder of the mufcular fibres of the Iris, which, gradually contracting the orifice, at laft leaves the membrane quite imperforate. This laft diftemper has hitherto been deemed incurable. The adhefion of the cataract I have confidered as a fpecies of blindnefs not to be relieved: but Mr. Chefleden has invented a method of making an artificial pupil, by flitting the Iris, which may relieve in both the inftances here ftated.

In performing this operation, the patient muft be placed as for couching, and the eye kept open, and fixed by the fpeculum oculis, which is abfolutely neceffary here, for the very reafon I would difcard it in the other, fince the flaccidity of the membrane from the iffue of the aqueous humour would take away its proper refiftance to the knife, and make it, inftead of being cut through, tear from the ligamentum ciliare; then, introducing the knife in the fame part of the conjunctiva you wound in couching, infinuate it, with its blade held horizontally, and the back of it towards you, between the ligamentum ciliare and the circumference of the Iris, into the anterior chamber of the eye; and, after it is advanced into the farther fide of it, make your incifion quite through the membrane; and, if the operation fucceeds, it will, upon wounding, fly open, and appear a large orifice, though not fo wide as it becomes afterwards.

The place to be opened in the Iris will be according to the nature of the difeafe: if the membrane itfelf be only affected with a contraction, the middle part of it, which is the natural fituation of the pupil, muft be cut; but, if there be a cataract, the incifion muft be made above or below the cataract, though I think it more eligible to make it above.

The contracted Iris, from a paralytic diforder, is fo often complicated with an affection of the retina, that the fuccefs is very precarious in this cafe. This operation, by what I have feen, has anfwered beft in adhefions of the cryftalline humour; though, to fpeak truly, but very feldom even there. As I would not miflead any one in an operation not yet much known in the world, I do confefs, that either the danger of the Iris feparating from the ligamentum ciliare, or of the wound not inlarging fufficiently, do, upon the whole, make the event very doubtful. I once performed it with tolerable good fuccefs, but, a few months after, the very orifice I had made, contracted, and brought on blindnefs again.

I have not here once ufed the word uvea, but have made mention of the ligamentum ciliare; both which parts are little underftood, for want of proper explanation; but which muft be rightly conceived of, in order to underftand what has been faid.

The generality of anatomifts call that membrane, which I have fpoke of under the name of Iris, the uvea, and its anterior lamina, the Iris: others, again, call the membrane uvea; and the colour of it, Iris: but both one and the other diftinction confound learners exceedingly, and take their rife from a want of proper attention to the hiftory of anatomy. The antients, who have given moft of the names we now employ in the defcription of the eye, were verfed principally, if not altogether, in the diffection of brutes; among which, thofe of the graminivorous kind have a party-coloured choroides, one half of it being dark, and the other of a light fhining green: this laft, from its refemblance to an unripe grape, was called the uvea; but the fucceeding writers, among the moderns, applying themfelves to human diffections only, and not duly confidering the difference of the human choroides, which is nearly of an uniform colour, and of that above defcribed, have retained the appellation, though we have not the thing. Hence has arofe the great variety of mifapplications of this word, which ought no more to be fpoke of in the anatomy of the human eye, than the tunica nictitans, which is proper to certain beafts and birds.

The ligamentum ciliare is that circular line on the globe of the eye, where the fclerotis, choroides, retina, cornea, proceffus ciliares, and Iris, terminate and unite together, forming a whitifh ring fomewhat denfer than any other part of the coats; but, fince the inftitution of this term, the defcription of the part it implies has been very much neglected, and the term itfelf confounded with the proceffus ciliares: wherefore it was neceffary to define it, that the procefs of the operation of the Iris might be better underftood. *Sharp's Surgery.*

IRIS, in botany, a genus of plants, whofe characters, according to Tournefort, are thefe: the flower is liliaceous, confifting of one leaf, and being of a tubular fhape at the bottom: hence it is expanded and enlarged, and forms fix parts, three of which point upwards, and three downwards. The piftil arifes from the bottom of the flower, and is furnifhed with three petals, which are arched, and fo bent down upon the reflex leaves of the flower, that they refemble a fort of palate: the flower cup finally becomes an oblong fruit, which opens into three parts at the end, and is feen to be divided into three cells, which contain roundifh and fometimes flattifh feeds. To this it is to be added, that the root is flefhy, oblong, and of the creeping kind, and not covered with coats.

We have a great many fpecies of this plant preferved in gardens, and moft of them very beautiful: their roots are tuberous, and increafe very faft, and all the fpecies are eafily propagated by parting them. The beft feafon for doing which is in Auguft, when their flower leaves are decayed, and the whole plant begins to change colour; but this fhould always be done when the weather is moift, fo that, if the month of Auguft fhould prove very dry, it fhould be deferred till September, though it is beft to do it fooner, if it can be. They all love a fhady and moift place. If too much dung is ufed to the ground, it rots their roots; and, if they ftand expofed to the fun, their flowers are but of very fhort duration. They fhould be taken up once in two years, to prevent their extending their roots too far; for they are very apt to fpread, and to harbour all forts of vermin.

The curious may raife their feveral fpecies from their feeds, which if taken from the choiceft flowers, and cultivated with care, ufually afford a fine variety in the flowers of the plants thus produced: they fhould be fown, foon after they are ripe, on an eaft border; they will come up in fpring, and the year following will flower. *Miller's Gard. Dict.*

IRON (*Dict.*)— Iron may be produced from its ore in a clofe veffel, in the following manner: roaft, for a few minutes, in a teft, placed under a muffel in a pretty ftrong fire, two centners of iron ore grofly powdered, that the volatile particles may be in part diffipated, and the ore foftened, in cafe it be too hard. When it is grown cold, beat it to a very fine powder, and roaft it a fecond time in a ftronger fire till it emits no fmell; then take it out of the fire.

Compofe a flux of the parts of the common white flux, and one part of powdered glafs; and add of fandiver and coal-duft of each one half part. Add of this flux three times the quantity of the roafted ore, and mix the whole very well together; then take a good crucible well luted within, and put into it the ore mixed with flux; cover it with common falt, and fhut it clofe with a tile, and with the lute applied to the joints. Put the common wind furnace upon its bottom part, having a bed made of coal-duft; introduce into the furnace a fmall grate fupported on its Iron bars, and a ftone upon it whereon the crucible may ftand; furround the whole with hard coals, not very large, and light them at top. Make the fire very ftrong, and continue to add frefh fuel, that the veffel may never be naked at top. When the fire has thus been continued in its full ftrength for an hour, take out the veffel, and ftrike on the floor where it ftands, to collect all the particles of Iron into a body; and, when cold, break the veffel, and you will find the pure Iron. *Cramer's Art of Affaying.*

Several attempts have been made to run Iron ore with pit coal, but we meet with no account of the fuccefs of fuch attempts: however, Mr. Mafon informs us, that, at Colebrook-Dale in Shropfhire, Mr. Ford makes iron brittle or tough as he pleafes, from Iron ore and coal, both got in the fame dale; there being cannon, thus caft, fo foft as to bear turning like wrought Iron. *Phil. Tranf.* N°. 482.

For the method of cafting Iron; fee FORGE.

IRON *furnaces.*— Thefe furnaces, as they are employed in running the moft difficult of all metals, fo they are, of all others, contrived the largeft, and capable of carrying heat to the greateft degree. When they are to be ufed, they are firft filled up to the top with coals; and, the lower part being lighted, the top, and all other parts of the furnace where the air could have paffage, are clofed firmly up with Iron-plates laid one over another. The confequence of this is, that the fire is put out, and the whole is kept in this ftate ten or twelve days. At the end of this time the furnace is opened, and the coals are found all black, without a fingle fpark of fire in any part, yet extremely hot, and reduced to a tenth part of their quantity. When the furnace has been thus opened about a quarter of an hour, the matter begins to take fire of itfelf by the mere contact of the air. The firft appearance of this is very remarkable; there arifes a very bright flame from fome of the coals, which plays about their furface, and fpreads itfelf from one to another, without the appearance of the leaft fpark of fire in any part of any of the coals. The ore of the Iron is, for the firft day, put only in the middle of the furnace, and that but in fmall quantity; the next day more, and every day afterwards more and more is put on, and by degrees it is fpread over the whole furface of the furnace to the edges. This is the method of working the ore to the utmoft advantage, and with the moft difpatch. The whole procefs for one furnace of ore is finifhed in about eight days from the time of opening the top; all the ufe of the firft quantity of coal is only thoroughly to warm the fides and walls of the furnace; and it is, after this, to be kept carefully fupplied with fuel, and the ore only out toward the fides, as the extreme heat, moft fenfibly in the center, increafes. If too much be laid on of the ore at firft, there is always a lofs from the quantity of metal. The quantity of the coals, neceffary to any given quantity of the ore, differs in proportion to the advantageous or faulty ftructure of the furnace. In the very beft conftructed ones, the weight of the coals and of the ore need be no more than

than equal. The flame which makes its way out of the bottom of the furnace, is of different colours, according to the natures of the ore and of the coals; ſometimes red, ſometimes yellow, and ſometimes green. That which iſſues out from the top of the furnace is of a red colour, and aſcends in a ſort of ſpiral line, reſembling the ſound of diſtant falls of waters, as it mounts up. With all the care that can be taken to heat the ſides of the furnace, and to keep them hot, the middle is always greatly the hotteſt, and the ore ſooneſt runs into metal there. *Swedenberg. de Ferro & Igni.*

IRON *works.* See FORGE.

IRREDU'CIBLE *caſe*, in algebra, is uſed for that caſe of cubic equations where the root, according to Cardan's rules, appears under an impoſſible or imaginary form, and yet is real. Thus, in the equation, $x^3 - 90x - 100 = 0$, the root, according to Cardan's rule, will be $x = \sqrt[3]{50 + \sqrt{-24500}} + \sqrt[3]{50 - \sqrt{-24500}}$, which is an impoſſible expreſſion, and yet one root is equal to 10; and the other two roots of the equation are alſo real. Algebraiſts, for two centuries, have in vain endeavoured to reſolve this caſe, and bring it under a real form; and the queſtion is not leſs famous among them, than the ſquaring of the circle is among geometers.

It is to be obſerved, that, as in ſome other caſes of cubic equations, the value of the root, though rational, is found under an irrational or ſurd form; becauſe the root in this caſe is compounded of two equal ſurds with contrary ſigns, which deſtroy each other; as, if $x = 5 + \sqrt{5} + 5 - \sqrt{5}$, then $x = 10$; in like manner, in the Irreducible caſe, when the root is rational, there are two equal imaginary quantities, with contrary ſigns, joined to real quantities; ſo that the imaginary quantities deſtroy each other. Thus the expreſſion: $\sqrt[3]{50 + \sqrt{-24500}} = 5 + \sqrt{-5}$; and $\sqrt[3]{50 - \sqrt{-24500}} = 5 - \sqrt{-5}$. But $5 + \sqrt{-5} + 5 - \sqrt{-5} = 10 = x$, the root of the propoſed equation.

Dr. Wallis ſeems to have intended to ſhew, that there is no caſe of cubic equations Irreducible, or impracticable, as he calls it, notwithſtanding the common opinion to the contrary.

Thus, in the equation, $r^3 - 63r = 162$, where the value of the root, according to Cardan's rule, is, $r = \sqrt[3]{81 + \sqrt{-2700}} + \sqrt[3]{81 - \sqrt{-2700}}$, the doctor ſays, that the cubic root of $81 + \sqrt{-2700}$ may be extracted by another impoſſible binomial, viz. by $\frac{9}{2} + \frac{1}{2}\sqrt{-3}$; and in the ſame manner, that the cubic root of $81 - \sqrt{-2700}$ may be extracted, and is equal to $\frac{9}{2} - \frac{1}{2}\sqrt{-3}$; from whence he infers, that $\frac{9}{2} + \frac{1}{2}\sqrt{-3} + \frac{9}{2} - \frac{1}{2}\sqrt{-3} = 9$ is one of the roots of the equation propoſed. And this is true: but thoſe who will conſult his Algebra, p. 190, 191, will find that the rule he gives is nothing but a trial, both in determining that part of the root which is without a radical ſign, and that part which is within: and if the original equation had been ſuch as to have its roots irrational, his trial would never have ſucceeded. Beſides, it is certain, that the extracting the cube root of $81 + \sqrt{-2700}$ is of the ſame degree of difficulty, as the extracting the root of the original equation $r^3 - 63r = 162$; and that both require the triſection of an angle for a perfect ſolution. *See M. de Moivre in the Appendix to Saunderſon's Algebra.*

ISA'TIS, *woad*, in botany, a genus of plants, whoſe characters are:

The flower conſiſts of four leaves, which are diſpoſed in form of a croſs; out of whoſe flower-cup riſes the pointal, which afterward turns to a fruit in the ſhape of a tongue, flat at the edges, gaping two ways, having but one cell; in which is contained, for the moſt part, one oblong ſeed.

Woad is commonly ſown upon a lay, which they plow into high ridges, except the land be very dry; and they harrow the turf till they break it to pieces, and pick out all the graſs, weeds, and lumps of earth, and fling them into the furrows to rot.

The land for this ſeed ought to be finely plowed and harrowed, and all the clods and turfs broken, and the ſtones picked up, and carried off.

The beſt time for ſowing it is the latter end of July, ſoon after the ſeed is ripe; which will come up in Auguſt, and muſt be hoed out, as is practiſed for turneps, leaving the plants ten or twelve inches aſunder; by which means they will grow ſtrong, and produce much larger leaves; and beſides, that ſown at this ſeaſon doth ſeldom miſcarry; whereas that which is ſown in the ſpring will be very liable thereto; and if it doth not, the plant will not have half the ſtrength the firſt ſummer.

It ought to be kept conſtantly weeded; but if it come up good, it will need the leſs weeding: the ordinary price of weeding is eight ſhillings per acre.

Some recommend the ſowing of it about the beginning of February; for which they give this reaſon, that whereas it is apt to be ſpoiled by the fly and grub, it eſcapes the better being early ſown; and if they do kill any of it, they have the better opportunity of ſowing more.

They do this by making holes with a ſtick about ſeven or eight inches aſunder, and put five or ſix ſeeds into each hole. They ſeldom or never ſow it more than two years upon the ſame piece of land; becauſe, if it be long continued, it robs the ſoil: but if it be moderately uſed, it prepares land for corn; and where the ſoil is rank, it abates the too great fertility of it.

It is ripe, when the leaf is come to its full growth, and retains its perfect colour and lively greenneſs; which is ſometimes ſooner, and ſometimes later, as the year proves dry or moiſt.

As ſoon as it is fit to cut, it ſhould be done with all the ſpeed that poſſibly may be, that it may not fade, or grow pale; and when it is cut, it ought to be immediately carried to the mill. The manner of doing which, and the way of ordering it, is beſt learned from experienced workmen, and is not to be truſted to a verbal deſcription of it.

In plowing it up, and ſowing it again, they pick up all the old roots, as they harrow it, except what they deſign for ſeed, which they let ſtand to the next year: it many times produces fifty quarters upon an acre.

They always keep a good quantity of ſeed by them, to plant the ground that fails: the ſeed of two years will ſometimes grow; but as it is apt to fail, it is better to ſow that of the firſt. And if they ſow or plant it late, if the ground be dry and hard, they ſteep it in water the day before they ſow it, which cauſes it to come up the ſooner.

Good woad may yield five or ſix crops in a plentiful year; though it ordinarily yields but four, ſometimes but three; eſpecially if it be let ſtand to grow for ſeed: but what grows in winter they do not uſe, though it is very good and very cheap. The two firſt crops are the beſt, which are uſually mixed in the ſeaſoning. The latter crops are much the worſe; which, if mixed with either of the former crops, ſpoil the whole.

It many times ſells from ſix pounds to thirty pounds a ton, an acre commonly yielding about a ton. *Miller's Gard. Dict.*

ISCHNA'MBLUCIS *, in natural hiſtory, the name of a genus of foſſils of the claſs of the ſelenitæ, but one of thoſe which are of a columnar form, not of the common rhomboidal one.

* The word is derived from the Greek, ἰσχνὸς, thin, ἀμβλὺς, blunt or obtuſe, and κίων, a column; and expreſſes a body in form of a thin or flatted column, with obtuſe ends.

The characters of this genus are: that the bodies of it are of a flatted columnar form, and octohedral in figure, conſiſting of ſix long planes, and two abrupt or broken ends; the whole being of a flatted figure. The top and bottom planes are much broader than the reſt; the four other planes, called the ſides, are narrower than theſe, but are uſually of very near the ſame breadth with one another, as are alſo theſe tops and bottoms, ſo that the whole figure comes very near an hexaedral priſm. *Hill's Hiſt. of Foſſ.*

I'SIA, feaſts and ſacrifices antiently ſolemnized in honour of the goddeſs Iſis. The Iſia were full of abominable impurities; and for that reaſon, thoſe who were initiated were obliged to take an oath of ſecrecy. They held for nine days ſucceſſively, but were ſo abominable, that the ſenate aboliſhed them at Rome, under the conſulate of Piſo and Gabinius. Two hundred years after, they were re-eſtabliſhed by the emperor Commodus, who himſelf aſſiſted at them. *Dict. Trevoux.*

I'SLAND *Cryſtal*, a body famous among the writers on optics for its property of a double refraction; but very improperly called by that name, as it has none of the diſtinguiſhing characters of cryſtal, and is plainly a body of another claſs. Dr. Hill has reduced it to its proper claſs, and determined it to be of a genus of ſpars, which he has called, from their figure, parallelopipedia, and of which he has deſcribed ſeveral ſpecies, all of which, as well as ſome other bodies of a different genus, have the ſame properties. Bartholine, Huygens, and Sir Iſaac Newton, have deſcribed the body at large, but have accounted it either a cryſtal or a talc; errors which could not have happened, had the criterions of foſſils been at that time fixed; ſince Sir Iſaac Newton has recorded its property of making an ebullition with aqua-fortis, which alone muſt prove that it is neither talc nor cryſtal, both bodies being wholly unaffected by that menſtruum.

It is always found in form of an oblique parallellopiped, with ſix ſides, and is found of various ſizes, from a quarter of an inch to three inches or more in diameter. It is pellucid, and not much leſs bright than the pureſt cryſtal, and its planes are all tolerably ſmooth, though, when nicely viewed, they are found to be waved with crooked lines made by the edges of imperfect plates. What appears very ſingular in the ſtructure of this body is, that all the ſurfaces are placed in the ſame manner, and conſequently it will ſplit off into thin plates, either horizontally or perpendicularly; but this is found, on a microſcopic examination, to be owing to the regularity of figure, ſmoothneſs of ſurface, and nice joining of the ſeveral ſmall parallellopiped concretions, of which the whole is compoſed; and to the ſame cauſe is probably owing its remarkable property in refraction. *Hill's Hiſt. of Foſſ.*

ISOPERIME'TRICAL (*Dict.*)—Iſoperimetrical lines and figures have greatly engaged the attention of mathematicians, ſince the invention of fluxions. The analyſis of the general problem concerning figures, that all thoſe of the ſame perimeter

perimeter produce maxima and minima, was given by Mr. James Bernouilli, from computations that involve second and third fluxions. And several inquiries of this nature have been since prosecuted in like manner, but not always with equal success. Mr. Mac Laurin, to vindicate the doctrine of fluxions from the imputation of uncertainty, or obscurity, has illustrated this subject, which is commonly considered as one of the most abstruse parts of this doctrine, by giving the resolution and composition of these problems by first fluxions only; and in a manner that suggests a synthetic demonstration, serving to verify the solution.

ISO'RA, *the screw-tree*, in botany, a genus of trees, whose characters are:

It hath a spreading anomalous flower, consisting of one or many leaves, divided into several parts, and appearing like two lips: from the bottom of the flower arises the pointal, whose apex afterwards becomes a twisted fruit, consisting of many cells, which are intorted like a screw; in which are contained several almost kidney-shaped seeds.

The name Isora, which father Plumier has given to this genus, is the Indian name for the plant; but by the English inhabitants of America, it is called screw-tree, from the form of the fruit, which is twisted like a screw.

JU'GLANS, *the walnut*, in botany, a genus of trees, whose characters are:

It hath male flowers or catkins, which are produced at remote distances from the fruit on the same tree: the female flowers grow two or three together, close to the branches: these are divided into four acute segments: the pointal is situated in the bottom of the empalement, which turns to a large nut covered with a thick green coat: the nut is deeply furrowed, and divided in the middle, containing a kernel having four lobes, which is covered with a thin skin.

This genus of plants has been universally intitled nux juglans, till Dr. Linnæus altered it to this of Juglans, the other being a compound name.

All the sorts of walnuts which are propagated for timber, should be sown in the places where they are to remain; for these trees always incline downwards; which, being stopped or broken, prevent their aspiring upward; so that they afterwards divaricate into branches, and become low spreading trees: but such as are propagated for fruit, are greatly mended by transplanting; for hereby they are rendered more fruitful, and their fruit are generally larger and fairer; it being a common observation, that downright roots greatly encourage the luxuriant growth of timber in all sorts of trees; but such trees as have their roots spreading near the surface of the ground, are always the most fruitful.

The nuts should be preserved in their outer covers in dry sand until February; when they should be planted in lines, at the distance you intend them to remain; but in the rows they may be placed pretty close, for fear the nuts should miscarry; and the young trees, where they are too thick, may be removed, after they have grown three or four years, leaving the remainder at the distance where they are to stand.

In transplanting these trees, you should always observe never to prune either their roots or branches, both which are very injurious to them; nor should you be too busy in lopping or pruning the branches of these trees; for it often causes them to decay: but when there is a necessity of cutting any of their branches off, it should be done early in September, that the wound may heal over before the cold increases; and the branches should always be cut off quite close to the trunk, otherwise the stump which is left will decay, and rot the body of the tree.

The best season for transplanting these trees is as soon as the leaves begin to decay; at which time, if they are carefully taken up, and their branches preserved intire, there will be little danger of their succeeding, although they are eight or ten years old, as I have several times experienced.

This tree delights in a firm rich loamy soil, or such as is inclinable to chalk or marl; and will thrive very well in stony ground, and on chalky hills, as may be seen by those large plantations near Leatherhead, Godstone, and Carshalton in Surry, where are great numbers of these trees planted upon the downs; which annually produce large quantities of fruit, to the great advantage of their owners; one of which, I have been told, farms the fruit of his trees, to those who supply the markets, for thirty pounds per annum.

The distance these trees should be placed, ought not to be less than forty feet, especially if regard be had to their fruit; though, when they are really designed for timber, if they stand near, it promotes their upright growth. The black Virginian walnut is much more inclinable to grow upright than the common sort; and the wood, being generally of a more beautiful grain, renders it preferable to that, and better worth cultivating. I have seen some of this wood, which hath been beautifully veined with black and white; which, when polished, has appeared at a distance like veined marble. This wood is greatly esteemed by the cabinet-makers for inlaying, as also for bedsteads, stools, tables, and cabinets; and is one of the most durable woods for those purposes yet known, it being rarely infected with insects of any kind, which may proceed from its extraordinary bitterness: but it is not proper for buildings of strength, it being of a most brittle nature, and exceeding subject to break very short, though it commonly gives notice thereof, by its cracking some time before it breaks.

The general opinion, that the beating of this fruit improves the trees, I do not believe, since, in the doing of this, the younger branches are generally broken and destroyed: but as it would be exceeding troublesome to gather it by hand, so in beating it off, great care should be taken that it be not done with violence, for the reason before assigned. In order to preserve the fruit, it should remain upon the trees till it is thorough ripe; when it should be beaten down, and laid in heaps for two or three days; after which they should be spread abroad, when, in a little time, their husks will easily part from the shells: then you must dry them well in the sun, and lay them up in a dry place, where mice or other vermin cannot come to them: in which place they will remain good for four or five months: but there are some persons who put their walnuts into an oven, gently heated, where they let them remain four or five hours to dry; and then they put them up in oil jars, or any other close vessel, mixing them with dry sand; by which method they will keep good six months. The putting of them in the oven is, to dry the germ, and prevent their sprouting: but, if the oven is too hot, it will cause them to shrink; therefore, great care must be had to that. *Miller's Gard. Dict.*

Concrete JUICES, in minerology, a name given by many authors to such substances found in the bowels of the earth, as have once been in a state of fluidity, and are capable of being rendered fluid again by art, by means of heat, moisture, or other common agents.

Others apply the word concrete to all those substances which may be separated from fluids by chemical operations, whether they are afterwards soluble in them again or not; such are the principles of spar separated from water by a slow distillation, and remaining at the bottom of the vessel.

Mineral JUICES.— Many countries afford these, and give marks by them of treasures that might be turned to great account, were the proper manner of assaying them known; which is, by first properly reducing them to a dry substance, so as to come at the solid matter they contain. With a view to the discovery of metallic veins, the erection of salt works, vitriol works, allum works, borax works, and the like, the curious on this subject may find many excellent hints for further discoveries in the close of Agricola's work, De re metallica; and the view is farther carried on by Boyle, Becher, Stahl, and Homberg. The Royal Academy of Paris have also given some hints that may be of use, in their Memoirs; and some practical things are recorded in the Philosophical Transactions.

I'VORY (*Dict.*)—A green dye may be given to Ivory by steeping it in aqua-fortis tinged with copper or verdigrease.

And by converting the aqua-fortis into aqua-regia, by dissolving a fourth part of its weight of sal ammoniac in it, ivory may be stained of a fine purple colour. *Boyle's Works abr.*

JUSTI'CIARY *court*, in Scotland. The court of Justiciary, has supreme jurisdiction in all criminal causes. It came in place of that of justice eyre, or justice general, which was last in the person of the earl of Argyle, who transacted for it with king Charles the First, and was made justice general of all the islands; which raising great debates between him and some hereditary sheriffs there, the jurisdiction was taken away in 1672, and this court of Justiciary erected instead of it, consisting of a justice general, alterable at the king's pleasure; a justice clerk, and five other judges, who are likewise lords of the session.

This court commonly sits on Mondays, and has an ordinary clerk, who has his commission from the justice clerk. They have four ordinary macers and a doomster, appointed by the lords of the session.

JUSTS, a combat on horseback, man against man, armed with lances. Antiently justs and tournaments made a part of the entertainment at all solemn feasts and rejoicings. The Spaniards borrowed these exercises from the Moors, and call them the cane plays. This is the same with the ludus Trojanus, antiently practised by the youth. The Turks use it still, and call it lancing the gerid. The difference between justs and tournaments consists in this, that the latter is the genus, of which the former is the species. Tournaments were all kinds of military races and engagements, made out of gallantry and diversion. Justs were such particular combats, where parties were near each other, and engaged with lance and sword: the tournaments were frequently performed by a number of chevaliers, who fought in a body. The Justs was a single combat of one man against another; though the Justs were usually made in a tournament, after the general re-encounter of all the cavaliers, yet they were sometimes single and independent of any tournament. He who appeared for the first time at a Just, forfeited his helmet or casque, unless he had forfeited before at a tournament.—The word is derived from the Latin, *juxta*, near, because combatants fought near one another: some derive it from *justa*, which, in the corrupt age of the Latin tongue, was used for this exercise; this being supposed a more just and equal combat than the tournament.

IVY. See HEDERA.

K.

KA'BIN, or Kebin, a kind of marriage permitted in Turkey and Persia, by which a man may take a wife for a certain term of time; having entered his promise, before a cadi, of giving the woman such a sum of money at his leaving her; for Kabin, in the Turkish language, signifies a dowry: some historians tells us, that this half marriage is only allowed among the Persians that are of the sect of Hali, and that it is condemned by the Turks; but it is very common with some nations of the negroes. *Ricaut. Pietro Della Valle, Tome* III.

KA'MAN, in natural history, a name given by many authors to a stone found about the burning mountains, and at some times used to engrave seals on. It is described as a white stone variegated with several colours.

KA'OLIN, the name of one of the two substances, which are the ingredients of China-ware. The other, which is called petuntse, is easily vitrifiable, and this Kaolin is scarce at all so. Whence the fire composes, from a mixture of them both, a semivitrification, which is China ware.

Mr. Reaumur had an opportunity of examining this substance, not in its native state, but only in form of small bricks, made out of a paste of the powder of the native Kaolin and water. He found it of a white colour, and sprinkled all over with fine glittering particles; but these he did not judge to be fragments of a different substance mixed among the mass, as are the small flakes of talc in our clays and sands; but that the whole mass was composed of some stone reduced to powder and made into a paste with water, and that these larger spangles were only coarser particles of the powder; the examination of which he promised himself would discover what the stone was of which they were formed. And this was the more worthy a diligent enquiry, since the petuntse might easily be supplied by many of our own earths and sands; nothing being required of that but a substance easily running into a white glass. But the difficulty of vitrifying this other ingredient renders it a thing much more difficult to be supplied by one of the same nature among ourselves. The comparison of these with other mineral substances soon proved that they were of the nature of talc; or, in other words, that Kaolin was talc powdered, and made up into a paste with water. And, to be assured whether the whole mass was talc powdered, or any thing else with a mixture of talc, he separated the particles of the Kaolin by water, and found the small ones wholly the same with the larger, and that the larger, when reduced to powder alone, made with water a paste wholly the same with the Kaolin. It is well known, that the fragments of talc have a great resemblance to the pearly part of some shell fishes; and hence unquestionably has arisen the opinion of porcelain being made of sea-shells; ignorant persons having seen the talc or Kaolin, and taken it for shelly matter. Talc has not yet been successfully used in any of our European manufactures of porcelain; but it is easy to see, from many unanswerable reasons, that, since China porcelain is made of a mixture of a vitrifiable and an unvitrifiable matter, nothing is so likely to succeed with us, in the place of the last of these, as talc.

1. We know no substance in the fossil world so difficult to reduce to glass as talc, which, if put into the strongest of our fires, in a crucible, is not to be vitrified, nor even calcined. 2. We know no substance which keeps so much brightness after having passed the fire as talc, or is of so pure a white; whence we may also learn that it is not to the petuntse alone, that the China ware owes its whiteness, but that the Kaolin is instrumental to the giving it that colour. 3. Talc is transparent, nay, and in some degree keeps its transparence after the action of the most violent fire. If we are to make porcelain of a vitrifiable and an unvitrifiable matter mixed together, yet it is necessary that the unvitrifiable matter should retain its transparence, otherwise it would obscure the mass; and talc is therefore the only known substance qualified for this purpose. Persons who have been at the China works, say, that the porcelain is made of equal quantities of petuntse and Kaolin, and it is therefore a just and exact semi-vitrification. 4. Talc is well known to have a great flexibility and toughness, and, as it is found to preserve this even after it has passed the fire, it is very probable, that it is owing to this property of the Kaolin, that the China ware is so much less brittle than glass. *Mem. Acad. Par.*

KE'RMES *Mineral.* The Kermes mineral was a preparation of Glauber, which the king of France bought of Mr. de la Ligerie, and made public in 1720. That receipt was in the following form: take a pound of Hungarian antimony, broken into thin pieces, according to the direction of its spicula; four ounces of nitre, fixed by charcoal; and a pint of rain water: boil them two hours: then filtre the warm liquor, and, when it cools, the Kermes precipitates. The same antimony undergoes the same operations with the remaining liquor, to which three ounces of fixed nitre, and a pint of water, are added. In a third boiling, two ounces of nitre, and a pint of water, are to be added to the former lixivium. The Kermes thus obtained is about a drachm, which after being well edulcorated by washing it in water, and burning spirit of wine on it, is dried for use.

Mr. Geoffroy shews, by many experiments, that the Kermes is the reguline part of the antimony, joined to a sort of hepar sulphuris. He teaches us a much easier way of preparing this medicine, thus: mix intimately the fine powder of two parts of antimony, and one of any fixed alkaline salt; melt those materials in a crucible; then, having powdered them while hot, boil them two hours in a large quantity of water; after this, pass the hot liquor through paper, receiving it into a vessel, in which there is hot water; the Kermes separates, when it cools. The grosser parts, which do not pass through the paper, are to be boiled again, and filtrated again; and the operation is to be repeated a third time, by which six or seven drachms of Kermes may be got out of every ounce of antimony. He says, he has seen effects, like to those of mild Kermes from antimony, reduced to such a fine powder, that none of the shining spicula are to be seen; and that the magistery of antimony, made by pouring spirit of nitre, or aqua regia, on the powder of antimony, and then edulcorating the mass with water, has the same effects as Kermes. *Mem. de la Acad. des Sciences.*

Half a grain, or a grain, of this powder, given every three or four hours, produces no violent effects; but, by increasing the dose, it may be made to vomit, purge, and sweat. Some commend this medicine as the most universal resolvent and deobstruent; assuring us, that it almost infallibly cures pleurisies, peripneumonies, asthmas, catarrhs, anginæ, small-pox, and many other diseases. Others are as positive, that it heats and thickens the blood, thereby increasing obstructions, and is particularly hurtful in all inflammatory diseases.

This preparation was famous in France, and known by the name of poudre des Chartereux, because a Carthusian monk, who got it from Mr. de la Ligerie, first brought it into vogue. See *Hist. de l' Acad. des Sciences* 1720, and the Memoirs for the same year, where it is said that Glauber was looked upon as the first inventor of this remedy.

Its effect, like that of many other antimonial preparations, is very various, which is frequently owing, as Mr. Geoffroy observes, to the different manner and care of making it. He adds, that, the more the Kermes contains of a regulus easily revivified, the more it proves emetic. He also shews how to make a cinnabar with Kermes and mercury, and to disengage the vitriolic acid from the Kermes. *See Mem. de l' Acad. des Sciences* 1734.

KERN, in the English salt-works, a word used to signify the crystallizing, or shooting of salt in the brine, when sufficiently evaporated in the boiling pan. The word is also used by the seamen for the first forming of the bay salt, made by the sun's heat in the isle of May.

KETTLE-*Drums*, are formed of two large basons of copper or brass, rounded at the bottom, and covered over with vellum or goat skin, which is kept fast by a circle of iron, and several holes fastened to the body of the drum, and a like number of skrews to skrew up and down, with a key for that purpose. The two drums are kept fast together by two straps of leather, which go through two rings, and are fastened, the one before, the other behind the pommel of the Kettle-drummer's saddle. They have each a banner of silk or damask, richly embroidered with the sovereign's arms, or those of the colonel, and are fringed with silver or gold; and, to preserve

preserve

preserve them in bad weather, they have each a cover of leather. The drum-sticks are of crab-tree or other hard wood, of eight or nine inches long, with two knobs on the ends, which beat the drum-head, and cause the sound. The Kettle-drum with trumpets is the most martial sound of any; each regiment of horse has a pair.

KING *of sacrifices*, a Roman magistrate, who had the disposing of all that was necessary for the sacrifices they offered to their deities, and the solemnities of their festivals: he was set up, after the expulsion of their kings, because there were certain sacrifices, wherein it was customary for the king himself to officiate, that there might be somebody to represent the royal character: however, to preserve their liberty, he had the administration of nothing but what appertained to religion, and even in that the pontifex maximus was above him.

KIRK-*Sessions*, the name of a petty ecclesiastical judicatory in Scotland. Each parish, according to its extent, is divided into several particular districts, every one of which has its own elder and deacon to oversee. A consistory of the ministers, elders, and deacons, forms a Kirk-sessions. This meets once a week, the minister being moderator, but without a negative voice: it regulates matters relating to public worship, elections, catechising, visitations, &c. It judges in matters of less scandal; but greater, as adultery, are left to the presbytery; and, in all cases, appeal lies from it to the presbytery.

KITCHEN-*Garden*, a garden appropriated to herbs and plants used at the table.

The Kitchen-garden should always be situated on the side of the house, so as not to appear in sight, but must be placed near the stables, for the conveniency of dung; which ought always to be considered in the disposition of the buildings, and the laying out of the garden: for, if this garden be placed at a great distance from the stables, the labour will be very great in wheeling the dung; and such expences should ever be avoided, if possible.

As to the figure of the ground, that is of no great moment, since in the distribution of the quarters all irregularities may be hid; though, if you are at full liberty, an exact square, or an oblong, is preferable to any other figure.

The great thing to be considered is, to make choice of a good soil, not too wet, nor over-dry, but of a middling quality; nor should it be too strong or stubborn, but of a pliable nature, and easy to work: and, if the place where you intend to make the Kitchen-garden should not be level, but high in one part, and low in another, I would by no means advise the levelling it; for by this situation you will have an advantage which could not be obtained on a perfect level, which is, the having one part of dry ground for early crops, and the low part for late crops, whereby the Kitchen may be the better supplied throughout the season with the various sorts of herbs, roots, &c. And in very dry seasons, when in the upper part of the garden the crops will greatly suffer with drought, then the lower part will succeed, and so vice versa; but I would by no means direct the chusing a very low moist spot of ground for this purpose; for, although in such soils garden-herbs are commonly more vigorous and large in the summer season, yet they are seldom so well tasted or wholesome as those which grow upon a moderate soil: and especially, since in this garden your choice fruits should be planted, it would be wrong to have a very wet soil. This garden should be fully exposed to the sun, and by no means overshadowed with trees, buildings, &c. which are very injurious to your Kitchen-plants and fruit-trees; but, if it be defended from the North wind by a distant plantation, it will greatly preserve your early crops in the spring; as also from the strong South-west winds, which are very hurtful in autumn to fruit and garden-herbs.

The quantity of ground necessary for a Kitchen-garden must be proportioned to the largeness of the family, or the quantity of herbs desired: for a small family, one acre of ground may be sufficient; but, for a large family, there should not be less than three or four acres; because, when the ground is regularly laid out, and planted with espaliers of fruit-trees, as will hereafter be directed, this quantity will be found little enough, notwithstanding what some persons have said on this head.

This ground must be walled round; and, if it can be conveniently contrived, so as to plant both sides of the walls, which have good aspects, it will be a great addition to the quantity of wall-fruit: and those slips of ground, which are withoutside of the walls, will be very useful for planting of gooseberries, currants, strawberries, and some sorts of Kitchen-plants; so that they may be rendered equally useful with any of the quarters within the walls: but these slips should not be too narrow, lest the hedge or pale which incloses them should shade the borders where the fruit-trees stand: the least width of these slips should be twenty feet; but, if they are double that, it will be yet better, and the slips will be more useful; and the fruit-trees will have a larger scope of good ground, for their roots to run. These walls should be built about twelve feet high, which will be sufficient height for any sort of fruit.

If the soil where you intend to place your Kitchen-garden be very strong, then you should plow or dig it three or four times, before you plant any thing therein; and, if you throw it up in ridges, to receive the frost in winter, it will be of great service to meliorate and loosen its parts.

The manure which is most proper for such soils, is sea-coal ashes, and the cleansing of streets and ditches, which will render it light much sooner than any other dung or manure; and, the greater quantity of ashes, the better, especially if the ground be cold; and, where these ashes are not to be obtained in plenty, sea-sand is very proper, or rotten wood, or the parts of vegetables rotted are very good: all which will greatly loosen the soil, and cause it to be not only easier to work, but also more advantageous for the growth of plants.

But, on the contrary, if your soil be light and warm, you should manure it with rotten neats-dung, which is much preferable to any other, for hot soils; but, if you use horse-dung, it must be well rotted, otherwise it will burn up the crops, upon the first hot dry weather.

The soil of this garden should be at least two feet deep; but, if deeper, it will be still better, otherwise there will not be depth enough for many sorts of esculent roots, as carrots, parsneps, beets, &c. which run down pretty deep in the ground, and most other sorts of esculent plants delight in a deep soil: and many plants, whose roots appear short, yet if their fibres, by which they receive their nourishment, are traced, they will be found to extend to a considerable depth in the ground; so that, when these are stopped by meeting with gravel, chalk, clay, &c. the plants will soon shew it, by their colour and stinted growth.

You should also endeavour to have a supply of water in the different parts of the garden, which, if possible, should be contained in large basons or reservoirs, where it may be exposed to the open air and sun, that it may be softened thereby; for such water as is taken out of wells, &c. just as it is used, is by no means proper for any sort of plants.

In the distribution of this garden, after having built the walls, you should lay out banks or borders under them, which should be at least eight or ten feet broad, whereby the roots of the fruit-trees will have greater liberty than in such places where the borders are not above three or four feet wide; and upon these banks you may sow many sorts of early crops, if exposed to the south; and upon those exposed to the north you may have some late crops: but I would by no means advise the planting any sort of deep-rooting plants too near the fruit-trees; especially pease and beans; though, for the advantage of the walls, to preserve them in winter, and to bring them forward in the spring, the gardeners in general are too apt to make use of those borders, which are by the best aspected walls, to the great prejudice of their fruit-trees; but for these purposes it is much better to have some reed-hedges fixed in some of the warmest quarters, under which you should sow and plant early pease, beans, &c. where they will thrive as well as if planted under a wall; and hereby your fruit-trees will be entirely freed from such troublesome plants.

Then you should proceed to dividing the ground out into quarters, which must be proportioned to the largeness of the garden; but I would advise, never to make them too small, whereby your ground will be lost in walks; and, the quarters being inclosed by espaliers of fruit-trees, the plants therein will draw up slender, and never arrive to half the size as they would in a more open exposure.

The walks of this garden should be also proportioned to the size of the ground, which in a small garden should be six feet, but in a large one ten; and on each side of the walk should be allowed a border three or four feet wide between the espalier and the walk, whereby the distance between the espaliers will be greater, and the borders, being kept constantly worked and manured, will be of great advantage to the roots of the trees; and in these borders may be sown some small sallad, or any other herbs, which do not continue long, or root deep; so that the ground will not be lost.

The breadth of these middle walks, which I have here assigned them, may by many persons be thought too great; but my reason for this is to allow proper room between the espaliers, that they may not shade each other, or their roots interfere, and rob each other of their nourishment; but, where the walks are not required of this breadth, it is only inlarging of the borders on each side, and so reducing the walks to the breadth desired.

But the walks of these gardens should not be gravelled; for, as there will constantly be occasion to wheel manure, water, &c. upon them, they would soon be defaced, and rendered unsightly; nor should they be laid with turf, for, in green walks, when they are wheeled upon, or much trodden, the turf is soon destroyed; and those places, where they are much used, become very unsightly also: therefore the best walks for a Kitchen-garden are those which are laid with a binding sand; but, where the soil is strong, and apt to detain the wet, there should be some narrow under-ground drains made by the side of the walks, to convey off the wet; otherwise there will be no using the walks in bad weather: and, where the ground is wet, if some lime-rubbish, flints, chalk, or any such material as can be procured with the least expence, is laid at the bottom of these walks, and the coat of sand laid over it, the sand will be kept drier, and the walks will be found in all seasons: these sand-walks are by much the easiest kept of any; for,

for, when either weeds or moſs begin to grow, it is but ſcuffling them over with a Dutch hoe in dry weather, and raking them over a day or two after, and they will be as clean as when firſt laid.

The beſt figure for the quarters to be diſpoſed into is a ſquare, or an oblong, where the ground is adapted to ſuch a figure; otherwiſe they may be triangular, or of any other ſhape, which will be moſt advantageous to the ground.

When the garden is laid out in the ſhape intended, if the ſoil is ſtrong, and ſubject to detain the moiſture, or is naturally wet, there ſhould always be under-ground drains made, to convey off the wet from every quarter of the garden: for otherwiſe moſt ſort of Kitchen-plants will ſuffer greatly by moiſture in winter: and, if the roots of the fruit-trees get into the wet, they will never produce good fruit; ſo that there cannot be too much care taken to let off all ſuperfluous moiſture from the Kitchen-garden.

Theſe quarters ſhould be conſtantly kept clear from weeds; and, when any part of the ground is unoccupied, it ſhould always be trenched up into ridges, that it may ſweeten, and imbibe the nitrous particles of the air, which is of great advantage to all ſorts of land; and the ground will then be ready to lay down, whenever it is wanted.

The ground in theſe quarters ſhould not be ſown or planted with the ſame crop two years together: but the crops ſhould be annually changed, whereby they will prove much better than when they conſtantly grow upon the ſame ſpot. Indeed, the Kitchen-gardeners near London, where land is dear, are often obliged to put the ſame crop upon the ground for two or three years together; but then they dig and manure their land ſo well every year, as to render it almoſt new: though, notwithſtanding all this, it is conſtantly obſerved, that freſh land always produces the beſt crops.

In one of theſe quarters, which is ſituated neareſt to the ſtables, and beſt defended from the cold winds; or, if either of the ſlips without the garden-wall, which is well expoſed to the ſun, lies convenient, and is of a proper width; that ſhould be preferred, for a place to make hot-beds for early cucumbers, melons, &c. The reaſons for my giving the preference to one of theſe ſlips, are, firſt, there will be no dirt or litter carried over the walks of the Kitchen-garden in winter and ſpring, when the weather is generally wet; ſo that the walks will be rendered unſightly: ſecondly, the view of the hot-beds will be excluded from ſight: and, laſtly, the convenience of carrying the dung into theſe ſlips; for, by making of a gate in the hedge or pale, wide enough for a ſmall cart to enter, it may be done with much leſs trouble than that of barrowing it through the garden: and, where there can be a ſlip long enough to contain a ſufficient number of beds for two or three years, it will be of great uſe, becauſe by the ſhifting of the beds annually, they will ſucceed much better than when they are continued for a number of years on the ſame ſpot of ground. As it will be abſolutely neceſſary to fence this melon-ground with a reed-hedge, it may be ſo contrived as to move away in panels; and then that hedge which was on the upper ſide the firſt year, being carried down to a proper diſtance below that which was the lower hedge, and which may remain, there will be no occaſion to remove more than one of the croſs-hedges in a year; therefore, I am perſuaded, whoever will make trial of this method, will find it the moſt eligible. *Miller's Gard. Dict.*

KNEE.—The mucilaginous glands of the Knee, which lie near the edges of the patella, are very remarkable: they are diſpoſed in fringes, and ſupported by a great quantity of fatty matter, which in ſome meaſure makes one maſs with them. This common maſs is contained within the capſular ligament, and on the ſide of the joint is covered by a very fine membrane, which likewiſe lines the inner ſurface of the ligament. The glandulous ſubſtance is eaſily diſtinguiſhed from the fat by the reddiſh colour of the capillary veſſels, which ſurround the glands. The ſuperior portion of this maſs is, as it were, ſupported by a ſmall ligament, fixed in the anterior part of the great common notch of the condyles of the os femoris, and which from thence runs from the upper part of the patella. There are alſo other mucilaginous glands, both above and below the edges of the ſemilunar cartilages, and likewiſe in the ham: ſome of theſe ſerve for a joint, and the others for the crucial ligaments. Theſe laſt lie in folds, formed by the internal membrane of the capſular ligament, which give particular coverings to the crucial ligaments, and to the other bundles of ligamentary fibres near them. *Winſlow's Anatomy.*

Luxated KNEE. A luxation of the Knee is a receding of the tibia from under the femur. The leg is ſometimes thus luxated from the baſis of the thigh-bone, on the outſide, ſometimes on the inſide, and ſometimes backward, but very rarely or never forwards, unleſs it be forcibly driven with great violence that way; for the patella is bound againſt the articulation forwards, by the ſtrong tendons of the muſcles which extend the leg; nor is it indeed eaſy for the bones of the leg to be wholly diſplaced from that of the thigh, ſo as to make a perfect luxation of the Knee, by reaſon of the great ſtrength of the ligament, and the two deep ſinuſes, which receive the head of the thigh-bone, unleſs thoſe ſtrong ligaments ſhould happen to be broken aſunder at the ſame time. This is the reaſon alſo why people, who ſuffer a perfect luxation of the Knee, are generally tortured with violent and excruciating pains and convulſions; and, if they eſcape the miſchiefs uſually attending ſuch ſymptoms, they are generally troubled afterwards with a lameneſs and ſtiffneſs of the joint; but ſlight or imperfect luxations of this joint are uſually very ſpeedily and eaſily cured. The patient in this caſe is to be ſeated on a bed, bench, or table, and one aſſiſtant is to hold the thigh firmly above the Knee, and another ſtrongly to extend the leg, while the ſurgeon replaces the bones by his hands and Knee, in their natural places. If the hands and ſlings are not ſufficient, in this caſe, to make a proper extenſion, recourſe muſt be had to the pullies, generally uſed on ſuch occaſions; but, in children and young perſons, great care muſt be taken not to make the extenſion ſo violent, as to ſeparate the epiphyſes from the bones, to which they are, in ſuch ſubjects, not yet firmly united. After the luxation is properly reduced, the Knee is to be bound up with a proper bandage, and placed in a frame or caſe, ſo as to be kept at reſt for a proper time. *Heiſter's Surgery.*

L.

LA'BYRINTH, in gardening, a winding, mazy, and intricate turning to and fro, through a wilderness, or a wood.

The design of a Labyrinth is, to cause an intricate and difficult labour to find out the center; and the aim is, to make the walks so intricate, that a person may lose himself in them, and meet with as great a number of stops and disappointments as is possible, they being the most valuable that are most intricate.

As to the contrivance of them, it will not be possible to give directions in words; there are several plans and designs in books of gardening: they are rarely met with but in great and noble gardens, as Hampton-Court, &c.

There are two ways of making them; the first is with single hedges: this method has been practised in England. These, indeed, may be best, where there is but a small spot of ground to be allowed for the making them; but, where there is ground enough, the double are most eligible.

Double ones, or those that are made with double hedges of a considerable thickness of wood between hedge and hedge, are approved as much better than single ones; as is the manner of making them in France, and other places; of all which, that of Versailles is allowed by all to be the noblest of its kind in the world.

It is an error in Labyrinths in making them too narrow, for by that means the hedges must be kept close clipped: whereas, if the walks be made wider, according to the foreign practice, they will not stand in need of it.

The walks are made with gravel, usually set with hornbeams: the palisades ought to be ten, twelve, or fourteen feet high: the hornbeam should be kept cut, and the walks rolled. *Miller's Gard. Dict.*

LACE'RNA, the name of a garment worn by the ancients, being a kind of cloke made of wool, only used by the men. They wore it over the toga or tunica; it was at first very short, but, growing popular in the Roman army, was soon lengthened. The Lacerna was scarce known in Rome till the time of the civil wars and the triumvirate; then indeed it came into fashion; for, the soldiers being frequently in the city-gates, the sight became familiar to the citizens, and they fell into the use of it; so that it became a common dress of the knights and senators, but Valentinian and Theodosius prohibited the senators wearing it in the city. Some will have this garment the same with the chlamys.

LACTU'CA, *lettuce*, in botany, a genus of plants whose characters are:

It hath a fibrose root, which is, for the most part, annual: the leaves are smooth, and grow alternately upon the branches; the stalks are, for the most part, slender and stiff, and commonly terminate into a sort of umbel: the cup of the flower is oblong, slender, and scaly: the seeds are oblong, depressed, and generally terminate in a point.

It would be beside my purpose to mention in this place the several sorts of lettuce that are to be found in botanic writers, many of which are plants of no use, and are never cultivated but in botanic gardens for variety; and some of them are found wild in many parts of England. I shall therefore pass over those here, and only mention the several sorts which are cultivated in the kitchen-garden for use: 1. Common or garden lettuce. 2. Cabbage lettuce. 3. Cilicia lettuce. 4. Dutch brown lettuce. 5. Aleppo lettuce. 6. Imperial lettuce. 7. Green capuchin lettuce. 8. Versailles or upright white cos lettuce. 9. Black cos. 10. White cos. 11. Red capuchin lettuce. 12. Roman lettuce. 13. Prince lettuce. 14. Royal lettuce. 15. Egyptian cos lettuce.

The first of these sorts is commonly sown very early for cutting, to mix with other small sallad-herbs, and is only different from the second sort, in being a degeneracy therefrom; or, otherwise, the second is an improvement by frequent cultivation from the first: for, if the seeds are saved from such plants of the second sort as did not cabbage closely, the plants produced from that seed will all degenerate to the first sort; which is by the gardeners called lapped lettuce, to distinguish it from the other, which they call cabbage lettuce. The seeds of the first, which are commonly saved from any of the plants, without having any regard to their goodness, are generally sold at a very cheap rate, especially in dry seasons, when these plants always produce the greatest quantity of seeds; though sometimes this seed is sold in the seed shops, and by persons who make a trade of selling seeds, for the cabbage lettuce; which is often the occasion of people's being disappointed in their crop: so that this sort should never be cultivated, but to be cut up very young; for which purpose this is the only good sort, and may be sown any time of the year; observing only in hot weather to sow it on shady borders, and in the spring and autumn upon warm borders; but in winter it should be sown under glasses, otherwise it is subject to be destroyed by severe frosts.

The cabbage lettuce may also be sown at different times of the year, in order to have a continuation of it through the whole season. The first crop is generally sown in February; which should be upon an open warm spot of ground, and, when the plants are come up, they should be thinned out, to the distance of ten inches each way; which may be done by hoeing them out, as is practised for turneps, carrots, onions, &c. provided you have no occasion for the superfluous plants; otherwise they may be drawn up, and transplanted into another spot of good ground at the same distance; which if done before the plants are too large, they will succeed very well, though they will not be so large as those which were left upon the spot where they were sown; but they will come somewhat later, which will be of service, where people do not sow every month.

The Cilicia, imperial, royal, black, white, and upright cos lettuces may be sown at the following times: the first season for sowing these seeds is at the end of February, or the beginning of March, upon a warm light soil, and an open situation; i. e. not overshadowed with trees; and, when the plants are come up, they should be either hoed out, or transplanted into another spot of ground, as was directed for the cabbage lettuce, observing to leave these sorts fifteen or sixteen inches apart each way; which will be full near enough for these plants, especially if the soil be good; and you must carefully keep them clear from weeds, which is the only culture they will require, except the black cos lettuce, which should be tied up when they are full grown, to whiten their inner leaves, and render them crisp; otherwise they are seldom good for much, rarely cabbaging without this assistance.

You may also continue these sorts through the season, by sowing them in April, May, and June; observing to sow the late crops in a moist shady situation, otherwise they will run up to seed before they grow to any size; but in August, toward the latter end, you may sow of these sorts, to abide the winter; which plants should be transplanted either under glasses, or into a hot-bed, which should be arched over with hoops, in order to be covered in winter, otherwise in hard winters they are often destroyed; but you must constantly let these plants have as much open free air as possible, when the weather is mild; only covering them in hard rains, or frosty weather; for if they are kept closely covered in winter, they will be subject to a mouldiness which soon rots them.

The most valuable of all the sorts of lettuce in England are the Egyptian green cos, and the Versailles or white cos, the Cilicia, and black cos; though some people are very fond of the royal and imperial lettuces; but they seldom sell so well in the London markets as the others, nor are so generally esteemed. Indeed of late years, since the white cos has been commonly cultivated, it has obtained the preference of all the other sorts, until the Egyptian green cos was introduced; which is so much sweeter and tenderer than the white cos, that it is by all good judges esteemed the best sort of lettuce known. This sort will endure the cold of our ordinary winters full as well as the white cos; but at the season of its cabbaging, if there happens to be much wet, this sort, being very tender, is very subject to rot.

The brown Dutch and green capuchin lettuces are very hardy, and may be sown at the seasons as was directed for the common cabbage lettuce; and are very proper to plant under a wall or hedge to stand the winter; where many times these will abide, when most of the other sorts are destroyed; and, therefore, they will prove very acceptable, at a time when few other sorts are to be had; they will also endure more heat and drought than most other sorts of lettuce, which renders them very proper for late sowing; for it often happens, in very hot weather, that the other sorts of lettuce will run up to seed in a few days after they are cabbaged; whereas these will

will abide near three weeks in good order, eſpecially if care be taken to cut the forwardeſt firſt, leaving thoſe that are not ſo hard cabbaged to be laſt. In ſaving of theſe ſeeds, the ſame care ſhould be taken to preſerve only ſuch as are very large, and well cabbaged, otherwiſe the ſeeds will degenerate, and be good for little.

The red capuchin, Roman, and prince lettuces are pretty varieties, and cabbage very early; for which reaſon a few of them may be preſerved; as may ſome of the Aleppo, for the beauty of its ſpotted leaves; though very few people care for either of theſe ſorts at table, when the other more valuable ones are to be obtained; but, in a ſcarcity, theſe may ſupply the place pretty well; and theſe ſorts are very proper for ſoups. The ſeeds of theſe muſt alſo be ſaved from ſuch as cabbage beſt, otherwiſe they will degenerate, and be good for little. *Miller's Gard. Dict.*

LA'DLE-*boards*, thoſe boards diſpoſed on the circumference of the water-wheels of over-ſhot mills; forming hollows, or receptacles not unlike ladles, to receive the water that falls upon the wheel.

LA'MMAS-*day*, *quaſi lamb-maſs*, the firſt of Auguſt, ſo called from a fond conceit the Popiſh people had, that St. Peter was patron of the lambs, becauſe our Saviour ſaid to him, Feed my lambs; upon which account they thought the maſs of this day very beneficial to make their lambs thrive.

LAMP, λαμπὰς, a ſort of luminary, conſiſting of oil diſpoſed with a wick in a proper veſſel for burning.

The uſe of lighted Lamps in churches, and places of devotion, is very antient.— In the city of Fez is a moſque, wherein are nine hundred brazen Lamps burning every night. — In Turkey, all the illuminations are made with Lamps.— Polydore Virgil aſcribes the firſt invention of Lamps to the Egyptians; and Herodotus deſcribes a feaſt of Lamps held annually in Egypt.

Kircher ſhews the manner of preparing Lamps, which ſhall diffuſe a light ſo diſpoſed, as to make the faces of thoſe preſent appear black, blue, red, or of any other colour.

There has been a great diſpute among the learned, about the ſepulchral Lamps of the antients: ſome maintain, they had the ſecret of making Lamps that were inextinguiſhable, alledging ſeveral that had been found burning, at the opening of tombs, fifteen or ſixteen hundred years old. But others treat theſe relations as fables; and others think that the Lamps which before were extinguiſhed, took light afreſh upon the admiſſion of freſh air.

Dr. Plott, however, is of opinion, ſuch perpetual Lamps are things practicable, and has himſelf made ſome propoſals of this kind. The linum aſbeſtinum, he thinks, may do pretty well for the wick, and that naphta, or liquid bitumen, conſtantly ſpringing into ſome of the coal mines, will anſwer for the oil.

If the aſbeſtos will not make a perpetual wick, he thinks there is no matter in the world that will; and argues, that the tradition of ſuch Lamps muſt be fabulous, or that they made them without wicks.

Such a Lamp he thinks it poſſible to make of the bitumen ſpringing into the coal mines at Pitchford in Shropſhire; which, he ſays, like other liquid bitumens, will burn without a wick. Thoſe Lamps that kindle on the immiſſion of freſh air, the ſame author thinks, might be imitated by incloſing ſome of the liquid phoſphorus in the recipient of an air-pump; which, under thoſe circumſtances, will not ſhine at all; but on letting in the air into the recipient, there will poſſibly, ſays he, appear as good a perpetual Lamp, as ſome that have been found in the ſepulchres of the antients.

Cardan's LAMP, is a contrivance of the author of that name, which furniſhes itſelf with its own oil.

It conſiſts of a little column of braſs, tin, or the like, well cloſed every-where, excepting a ſmall aperture at bottom, in the middle of a little gullet or canal, where the wick is placed.

Here the oil cannot get out, but in proportion as it ſpends, and ſo opens the paſſage of that little aperture.

This kind of Lamp was in much uſe ſome years ago; but it has ſeveral inconveniencies; as that the air gets into it by ſtarts and gluts; and that, when the air in the cavity comes to be much rarefied by heat, it drives out too much oil, ſo as ſometimes to extinguiſh the Lamp.

Dr. Hook and Mr. Boyle have invented other Lamps, that have all the conveniencies of Cardan's, without the inconveniencies.

LA'MPADARY, an officer in the antient church of Conſtantinople. His buſineſs was to ſee the church well lighted, and he bore a taper before the emperor, the empreſs, and the patriarch, when they went to church or in proceſſion. There were alſo Lampadaries in the emperor's palaces; the word is from the Latin, *lampas*, a lamp.

LANCE, an offenſive weapon, borne by the antient cavaliers, in form of a half-pike; it conſiſts of three parts, the handle, the wings, and the dart. Pliny attributes the invention of Lances to the Etolians. Varro and Aulus Gellius ſay the word Lance is Spaniſh, whence others conclude the uſe of this weapon was borrowed by the people of Italy from the Spaniards.

LAND.— There are various methods of improving Lands, as, 1. By incloſing and dividing the ſame into ſeveral fields, for paſture or tillage, which is one of the moſt principal ways of improvement; firſt, by aſcertaining to every man his juſt property, and thereby preventing an infinity of treſpaſſes and injuries, that Lands in common are ſubject unto, beſide the diſadvantage of being obliged to keep the ſame ſeaſons with the other people who have Land in the ſame field; ſo that the ſowing, fallowing, and tilling the ground, muſt be equally performed by all the Land-holders; and, when there happens a ſlothful, negligent perſon, who has Land intermixed with others, it is one of the greateſt nuiſances imaginable. Secondly, it being of itſelf a very great improvement: for, where Land is properly incloſed, and the hedge-rows planted with timber trees, &c. it preſerves the Land warm, and defends and ſhelters it from the violent cold nipping winds, which in ſevere winters deſtroy much of the corn, pulſe, or whatever grows on the open field, or champain grounds. And, where it is laid down for paſture, it yields much more graſs than the open fields, and the graſs will begin to grow much ſooner in the ſpring. The hedges and trees alſo afford ſhelter for the cattle from the cold winds in winter; as alſo ſhade for them in the great heats of ſummer. And theſe hedges afford the diligent huſbandman plenty of fuel, as alſo plough-boot, cart-boot, &c. and, where they are carefully planted and preſerved, furniſh him with timber, and maſt for his ſwine: or, where the hedge-rows are planted with fruit-trees, there will be a ſupply of fruit for cyder, perry, &c. which, in moſt parts of England, are of no ſmall advantage to the huſbandman.

By this method of incloſing, there is alſo much more employment for the poor, and is therefore a good remedy againſt beggary; for in thoſe open countries, where there are great downs, commons, heaths, and waſtes, there is nothing but poverty and idleneſs to be ſeen amongſt the generality of their inhabitants. It is very obſervable of late years, how much advantage the incloſing of the Land in Worceſterſhire, and ſome other counties at a diſtance from London, has been to the inhabitants; for, before this method was introduced amongſt them, the Lands, for the moſt part, lay in commons, &c. Upon which the poorer ſort of people built themſelves cottages with mud walls, where they contented themſelves with a cow or two, and ſome ſwine: and thoſe of them who were more induſtrious than the reſt, travelled to the neighbourhood of London every ſpring, where they were employed in the gardens and fields for the ſummer ſeaſon; and in autumn they returned to their native countries, where they lived, in winter, upon what money they had ſaved in ſummer. But, ſince they have converted their waſtes and commons into incloſures, there are but few of the inhabitants of thoſe countries, who come to London for work, in compariſon to the numbers that formerly came; ſo that moſt of the labourers, who come to London for employment, are either Welch, or inhabitants of ſome diſtant counties, where this improvement hath not as yet been introduced.

The advantages of incloſing Land are now ſo generally known, that there is no occaſion for us to enumerate them here; ſince the improvements which have been made of late years, in ſeveral parts of England, and the increaſe of rent, that is every-where made by thoſe that incloſe, are ſufficient arguments to enforce the practice, and render it general; more eſpecially in the north, where it is much neglected; becauſe it would greatly ſhelter the Lands, and render them much warmer than they now are.

In incloſing of Land, there ſhould be regard had to the nature of the ſoil, and what it is intended for; becauſe corn Land ſhould not be divided into ſmall parcels; for, beſides the loſs of ground in hedges, &c. the corn ſeldom thrives ſo well in ſmall incloſures, as in more open fields; eſpecially where the trees are large in the hedge-rows. The graſs alſo in paſtures is not ſo ſweet near hedges, or under the drip of trees, as in open expoſures; ſo that where the incloſures are made too ſmall, or the Land is overplanted with trees, the herbage will not be near ſo good, nor in ſo great plenty, as in larger fields: therefore, before a perſon begins to incloſe, he ſhould well conſider how he may do it to the greateſt advantage: as, for inſtance, it is always neceſſary to have ſome ſmaller incloſures near the habitation, for the ſhelter of cattle, and the conveniency of ſhifting them from one field to another, as the ſeaſon of the year may require; and hereby the habitation, barns, ſtables, and outhouſes, will be better defended from ſtrong winds, which often do great damage to thoſe that are expoſed to their fury. Theſe ſmall incloſures may be of ſeveral dimenſions; ſome of them three, four, ſix, or eight acres in extent; but the larger diviſions for corn ſhould not contain leſs than twenty or thirty acres, or more, according to the ſize of the farm.

The uſual method of incloſing Land is, with a ditch and bank ſet with quick. But in marſh Land, where there is plenty of water, they content themſelves with only a ditch, by the ſides of which they uſually plant ſallows or poplars, which, being quick of growth, in a few years, afford ſhade to the cattle; and, when they are lopped, produce a conſiderable profit to their owners. In ſome counties the diviſion of their Lands is by dry walls made of flat ſtones, laid regularly one upon another,

ther, and laying the top courfe of ftones in clay, to keep them together, the weight of which fecures the under ones. But in fome parts of Suffex and Hampfhire they often lay the foundation of their banks with flat ftones, which is of a confiderable breadth at bottom; upon which they raife the bank of earth, and plant the hedge on the top, which in a few years make a ftrong durable fence, efpecially if they are planted with holly, as fome of thofe in Suffex are. See the article FENCES.

2. The draining of Land is alfo another great improvement to it: for though meadows and paftures, which are capable of being overflowed, produce a greater quantity of herbage than dry Land; yet, where the wet lies too long upon the ground, the grafs will be four, and extremely coarfe; and, where there is not care taken in time to drain this Land, it will produce little grafs, and foon be over-run with rufhes and flags, fo as to be of fmall value. The Land which is moft liable to this is cold ftiff clays, where the water cannot penetate, but is contained as in a difh; fo that the wet which it receives in winter, continues till the heat of the fun exhales the greateft part of it.

The beft method of draining thefe Lands is, to cut feveral drains acrofs the Land, in thofe places where the water is fubject to lodge; and from thefe crofs drains to make a convenient number of other drains, to carry off the water to either ponds or rivers in the lower parts of the Land. Thefe drains need not be made very large, unlefs the ground be very low, and fo fituated as not to be near any river to which the water may be conveyed: in which cafe, there fhould be large ditches dug at proper diftances, to contain the water; and the earth which comes out of the ditches fhould be equally fpread on the Land, to raife the furface. But, where the water can be conveniently carried off, the beft method is, to make under-ground drains, at proper diftances, which may empty themfelves into large ditches, which are defigned to carry off the water. Thefe fort of drains are the moft convenient; and, as they are hid from the fight, do not incommode the Land; nor is there any ground loft where thefe are made.

The ufual method of making thefe drains, is to dig trenches, and fill the bottoms with ftones, bricks, rubbifh, or bufhes, which are covered over with the earth, which was dug out of the trenches: but this is not the beft method, becaufe the water has not a free paffage through the drains; fo that, whenever there is a flood, thefe drains are often ftopped by the foil which the water frequently brings down with it. The beft method I have yet obferved to make thefe drains, is, to dig trenches to a proper depth for carrying off the water, which fhould be three feet wide at their tops, and floped down to about a foot wide at their bottom; then, having prepared a quantity of good brufh wood, the larger fticks fhould be cut out to pieces of about fixteen or eighteen inches in length, which fhould be laid acrofs the lower part of the drain, at about fourteen inches diftance from the bottom, driving them down at both ends, fo as that they may have firm hold of the ground on each fide; fo as to leave a foot of the lower part of the drain open, through which the water is to pafs; then cover thefe fticks with the fmaller brufh-wood, furz, broom, or any other kind of brufh, laying it lengthwife pretty clofe; on the top of thefe may be laid rufhes, flags, &c. and then the earth laid on to cover the whole. Thefe forts of drains will continue good for a great number of years, and are never liable to the inconveniencies of the other drains; for the water will find an eafy paffage through them; and, where there is plenty of brufh-wood, they are made at an eafy expence: but, in places where wood is fcarce, it would be chargeable to make them: however, in this cafe, it would be a great advantage to thefe Lands, to plant a fufficient number of cuttings of willow, or the black poplar, on fome of the moift places, which would furnifh brufh-wood for thefe purpofes in four or five years; and, as the expence of planting thefe cuttings is trifling, there cannot be a greater advantage to an eftate which wants draining, than to practife this method, which is in every perfon's power, fince there is little expence attending it.

In countries where there is plenty of ftone, that is the beft material for making thefe under-ground drains; for when thefe are properly made, they will never want repairing.

The beft time of the year for making thefe drains is about Michaelmas, before the heavy rains of autumn fall; becaufe, at this feafon, the Land is ufually dry; fo that the drains may be dug to a proper depth: for, when the ground is wet, it will be very difficult to dig to any depth; becaufe the water will drain in, wherever there is an opening in the ground.

When the drains are made, and the water carried off the Land, it will be proper to pare off the rufhes, flags, &c. which may be laid in heaps in proper places to rot, and will afford a good manure for the Land. The ground muft alfo be plowed, to deftroy the roots of noxious weeds; and if it be laid fallow for one feafon, and plowed two or three times, it will greatly mend the Land. The rufhes and flags, which were pared off the ground, when rotten, fhould be fpread over the furface, and the grafs feed fown thereon, which will greatly forward the grafs, fo that it may foon be brought to a good turf; which Land, thus mended, has been let at four times the rent it was let at before.

There are fome perfons, who, after they have pared off the flags, rufhes, &c. from their Land, lay them in fmall heaps, and burn them in dry weather, then fpread the afhes on the Land to improve it; which is a good method, where a perfon is in hafte to have grafs again: but, where the ground can be fallowed one year, it will loofen the foil, and more effectually deftroy the roots of all noxious weeds; and the rufhes, &c. when rotted, will afford a much larger quantity of manure for the Land, than when it was burnt; befides, this can only be practifed in the fummer feafon, when the weather is very dry; for, if there fhould fall much rain, the fires will go out, and it will be impracticable to burn it. But, where the method of burning is practifed, the heaps fhould not be too great, and it fhould burn very flowly: which will render the afhes a much better manure, than where the fire is too violent, or the heaps too large; for, in this cafe, the inner part will be over burnt, before the fire reaches the outfide of the heap.

As the draining of cold wet Lands is a great improvement to them, fo the floating or watering of dry loofe Lands is not a lefs advantage to them. This may be eafily effected where there are rivers, or refervoirs of water, which are fituated above the level of the ground defigned to be floated, by underground drains, made after the manner of thofe before directed for draining of Land, through which the water may be conveyed at proper feafons, and let out on the ground; in order to this, there muft be good fluices made at the heads of the drains, fo that the water may never get out, but at fuch times as is required; for, if this be not taken care of, the water, inftead of improving the Land, will greatly damage it.

But where the Land lies fo high, as that there is no water in the neighbourhood lying above its level, it will be more expenfive; becaufe, in fuch cafe, the water muft be raifed, by machines, from refervoirs or ftreams which lie below it. The moft common engine ufed for this purpofe is the PERSIAN WHEEL (which fee.) Yet, notwithftanding the expence of raifing the water, it has been found greatly advantageous, in many parts of England, to drown the Lands; for the profit has many times more than doubled the charge.

The time for drowning of Land is ufually from November to the end of April: but, though this is the general practice, yet I cannot approve of this, for many reafons: the firft is, that, by the wet lying continually on the ground in the winter, the roots of the finer forts of grafs are rotted and deftroyed; and, by letting on of the water, at the feafon when the feeds of docks, and other bad weeds, which commonly grow by river-fides, are falling, thefe feeds are carried upon the Land, where they remain and grow, and fill the ground with bad weeds; which is commonly the cafe with moft of the water meadows in England, the grafs in general being deftroyed; fo that rufhes, docks, and other trumpery, make up the burden of thefe Lands: but if thefe meadows were judicioufly managed, and never floated till March or April, the quantity of fweet good grafs would be thereby greatly increafed, and the beautiful verdure of the meadows preferved: but there is little hope of convincing thofe perfons by arguments, who are fo much wedded to their own prejudices, as to fhut their eyes and ears againft experiments or reafon.

Where the Land is very hot and dry, and it lieth convenient to be watered at a fmall expence, it fhould be repeated every week in dry hot weather, which will prove a great advantage to the Land. But, whenever this is done, there fhould no cattle be admitted, while it is wet; for they will poach, and fpoil the turf.

3. Another great improvement of Land is by burning of it; which, for four, heathy, and rufhy Land, be it either hot or cold, wet or dry, is a very great improvement: fo that fuch Lands will, in two or three years after burning, yield more, exclufive of the charges, than the inheritance was worth before. But this is not to be practifed on rich fertile Land; for, as the fire deftroys the acid juice, which occafions fterility in the poor Land, fo it will in like manner confume the good juices of the richer Land, and thereby impoverifh it; fo that it hath been with great reafon difufed in deep rich countries. See the article BURNING *of land*.

4. It is alfo a very great improvement, where Land is overgrown with broom, furz, &c. to ftub them up by the roots; and, when they are dry, lay them on heaps, and cover them with the parings of the earth, and burn them, and fpread the afhes over the ground. By this method vaft tracts of Land, which at prefent produce little or nothing to their owners, might be made good at a fmall expence, fo as to become good eftates to the proprietors.

LANTERNISTS, the name of the members of an academy of learned men fet up at Touloufe in France. The occafion of the name was as follows: fome counfellors of the parliament of this town, with other gentlemen of feveral diftinctions, projecting to form a fociety for clofe correfpondence and communicating their notions to each other, appointed a fet day to meet at each other's houfes; and here, to prevent interruption from foreign company, they chofe to meet in the evening, after the hours for common vifits were over; and, to to make their meeting more private, they took no flambeaux along with them, but lighted themſelves with ſmall lanthorns. Thus they carried on their converſation with a great deal of pleaſure and improvement, and kept it private for a conſiderable time; but, there being few things which time does not diſcover, their meeting broke out at laſt, and all people of ſenſe and regularity commended the deſign: and now, being no longer incog, they puſhed the project further; they increaſed the ſociety, and made a company in form. Upon the ſcore of their ſmall lanthorns, ſome pleaſant men called them the Lanterniſts; and they took their denomination in good part, as the learned academies in Italy had done before them. Thus theſe Lanterniſts, to preſerve the memory of their original, took a ſtar for their device, with this motto, Lucerna in nocte. Afterwards they ſettled a prize to be given every year to the man or woman who made the beſt rhiming copy of verſes in commendation of the king, to be publiſhed by the company: the prize is a very fine medal, with a ſtar and legend as abovementioned; and, on the reverſe, Apollo playing upon the harp, ſitting on the top of Parnaſſus, with this motto, Apollini Toloſano. *Mercure galant, Juin*, 1698.

LA'PATHUM, *the dock*, in botany, a genus of plants whoſe characters are:

The empalement of the flower is compoſed of three ſmall leaves, which are reflexed: the flower hath three leaves, which are larger than thoſe of the empalement, and are coloured: in the center of the flower is ſituated the three-cornered pointal, ſupporting three ſmall ſtyles, and is attended by ſix ſtamina: the pointal afterwards becomes a triangular ſeed, incloſed by the petals of the flower.

LA'PWING, in ornithology, the Engliſh name of the black-breaſted tringa with a hanging creſt. Were the Lapwing leſs common, it would be highly eſteemed for its beauty. It is very frequent in our fenny countries, and in the wet places of moſt other parts of Europe.

Authors have deſcribed it under the names of vanellus, capra, and capella.

LA'RIX, the *larch-tree*, in botany, a genus of trees, whoſe characters are:

The leaves, which are long and narrow, are produced out of little tubercles, in form of a painter's pencil: the cones are produced at remote diſtances from the male flowers on the ſame tree: the male flowers are very like ſmall cones at their firſt appearance, but afterwards ſtretched out in length.

Theſe trees are propagated by ſeeds, which ſhould be ſown in the beginning of March, upon a bed of light ſoil, expoſed only to the morning ſun: or otherwiſe it may be ſown in pots or boxes of light earth, and placed near an hedge, where they may have the morning ſun only. The ſeed ſhould be be covered about half an inch thick with fine light earth, and in very dry weather ſhould be gently refreſhed with water. In about ſix weeks, if your ſeeds were good, your plants will come up, at which time you ſhould carefully guard them againſt the rapacious birds, which would otherwiſe pull off the heads of the plants, as they thruſt themſelves out of the ground with their covers on them; and obſerve to refreſh them with water in dry weather, eſpecially if they are ſown in pots or boxes; as alſo to keep them clear from weeds, which, if ſuffered to grow among the young plants, will ſoon deſtroy them: nor ſhould they be too much expoſed to the ſun, or ſtrong winds; both which are very injurious to theſe plants, while they are young: but in October you ſhould (if they are in boxes or pots) remove them into a ſituation where they may be defended from ſharp winds, which are ſometimes hurtful to them, while young; but afterwards they will endure the ſevereſt weather of our climate.

Theſe trees are very proper for the ſides of barren hills, where few other ſorts will thrive ſo well; nor is this tree very delicate in its ſoil, but will grow much better on poor ſtrong ſtony land, than in rich ground: and, during the ſummer, they appear very beautiful; but in autumn they caſt their leaves, whereby ſome people have been deceived, by ſuppoſing them dead, and have deſtroyed them.

From the wounded bark of this tree exudes the pureſt Venice turpentine; and on the body and branches of it grows the agaric, which is a drug uſed in medicine: the wood is very durable, and (by ſome) reported to be very difficult to burn. But I do not know how this ſhould be, to a tree which abounds with turpentine; though it is ſaid alſo to be ſo ponderous as to ſink in water. It will poliſh exceeding well, and is by the architects abroad much coveted, both for houſes, and building of ſhips. Witſen, a Dutch writer upon naval architecture, mentions a ſhip to be long ſince found in the Numidian ſea, twelve fathoms under water, being chiefly built of this timber and cypreſs, both which woods were reduced to that hardneſs, as to reſiſt the ſharpeſt tools; nor was any part of it periſhed, though it had lain above a thouſand years ſubmerged. And it was upon tables of this wood that Raphael, and ſeveral of the greateſt artiſts, eterniſed their ſkill, before the uſe of canvas was introduced. *Miller's Gard. Dict.*

LASERPI'TIUM, *laſerwort*, in botany, a genus of plants, whoſe characters are:

It hath an umbellated flower, compoſed of five heart-ſhaped leaves, which are equal, and expand in form of a roſe, and reſt on the empalement, which afterwards turns to a fruit compoſed of two ſeeds, which are gibboſe on one ſide, with four large foliaceous wings, which extend the length of the fruit, and are ſhaped like a water-mill.

Theſe plants are extreme hardy; ſo will thrive in moiſt ſoils and ſituations. They are propagated by ſeed, which if ſown in the autumn, the plants will come up the following ſpring; but, when they are ſown in the ſpring, the ſeeds commonly remain in the ground a whole year. The plants ſhould be tranſplanted the following autumn, where they are deſigned to remain; for they ſend out long deep roots, which are frequently broken; when the old plants are removed, they ſhould be planted three feet aſunder; for the plants grow very large. They decay to the ground every autumn, and come up again the following ſpring; but the roots will continue many years, and require no other culture, but to clear them from weeds, and to dig between the roots every ſpring.

LATHE (*Dict.*)—The Lathe is compoſed of two wooden cheeks, or ſides, parallel to the horizon, having a groove or opening between; perpendicular to theſe, are two other pieces, called puppets, made to ſlide between the cheeks, and to be fixed down at any point at pleaſure.

Theſe have two points, between which the piece to be turned is ſuſtained; the piece is turned round, backwards and forwards, by means of a ſtring put round it, and faſtened above to the end of a pliable pole, and underneath to a treddle or board moved with the foot. There is alſo a reſt which bears up the tool, and keeps it ſteady.

As it is the uſe and application of this inſtrument that makes the greateſt part of the art of turning, we refer the particular deſcription thereof, as well as the manner of applying it in various works, to that head. See TURNING.

LATHY'RUS, *chichling vetch*, in botany, a genus of plants, whoſe characters are:

It hath a papilionaceous flower, out of whoſe empalement riſes the pointal, covered with a membranaceous ſheath, which afterwards becomes a pod, ſometimes round, ſometimes cylindrical, and at other times angular: to which may be added, it hath a compreſſed ſtalk, with a raiſed rib, and a leafy border; and has only one pair of leaves, growing on the nerves, which terminates in a tendril.

LATIFO'LIOUS *, in botany, an epithet applied to ſuch trees and plants as have broad leaves.

* The word is formed from the Latin, *latus*, broad, and *folium*, a leaf.

LAT'TIN, a name formerly given to the plates of iron covered with tin, and now uſually called tin, of which our mugs and ſuch other things are made.

The method of preparing theſe plates of tin, as they are called, is as follows: plates of iron are prepared of a proper thinneſs; theſe are cut into ſquares fitted to receive the tinning, but it is not every kind of iron that will ſerve for this purpoſe, but only ſuch as is moſt diſtenſible, eaſily beating out to any degree of thinneſs when hot, and malleable even when cold, without danger of flying to pieces. Of this the Germans have large quantities, which they always ſelect for this purpoſe. This ſort of iron is firſt formed into ſquare bars of an inch in diameter; theſe they beat out a little into flatneſs, and then cut into pieces, which they call ſemelles, or ſoles. They fold theſe together, and having made them into parcels, containing forty pieces each, they beat them all at once with a hammer, which weighs ſix or ſeven hundred weight. When they have done this, the principal part of the whole work is to prepare the leaves, now beat out to a proper thinneſs, ſo as that they ſhall readily receive the tin; for, if there be but the ſmalleſt particle of duſt on them, or only the ſlighteſt ruſt in any part, the tin will never fix there.

This ſmoothing of the plates may be brought about by filing them, but that would be too expenſive, wherefore they do it by ſteeping them in acid waters. Thus, preparing a great number at a time, they leave them in this liquor till the ſurface is a little preyed upon by it, and then they are ſcowered with ſand, which makes them very ſmooth and fine. By this means a woman cleans more plates in an hour, than the moſt expert workman can do in many days. Mr. Reaumur, to whom the world owes the diſcovery of this proceſs, mentions ſeveral waters, any one of which will ſucceed; but the Germans themſelves uſe nothing but common water, made eager with rye. This they make a great ſecret of, but the preparation is very eaſy. After they have ground the rye groſly, they leave it to ferment in common water for ſome time; and they are thus ſure of a ſharp and eager menſtruum, excellently fitted for their purpoſe. With this liquor they fill certain troughs, or tons, and into theſe they put ſeveral bundles of the plates of iron: and to make the liquor be more eager, and act the better on them, they keep it in ſtoves, where it has little air, and is kept warm with ſmall charcoal fires. The workmen go into theſe vaults once or twice a day, to turn the plates, that they may be the better wrought upon by the acid, and to take out thoſe which are moſt wrought upon, and put in others in their room. The more acid the liquor is, and the warmer the ſtove; the ſooner the plates are cleanſed: it requires, however, at leaſt two days to effect this, and oftener ſomething more.

This was the method which the German labourers, employed in the tin works in France, always made uſe of, in order to prepare the iron to receive the covering of tin ; but the authors, finding that this was a very laborious employ, and that the heat in the ſtoves was ſo great, that they could hardly bear it, propoſed ſome other methods in the place of this, which were attended with much leſs trouble, and as ſmall an expence, if not leſs ; and theſe, upon trial, were found to ſucceed equally well.

Having obſerved that the iron leaves, or plates, are covered with a ſmall layer of a ſort of ruſt, which they contract in the fire, and which the acid liquor took very little hold of ; he judged it might be better to expoſe the plates to ruſt, in order to the cleanſing them eaſily of it ; as ruſt is always accompanied with a ſort of fermentation, and the particles of ruſt, found on the ſurface of the iron, would be ſure to raiſe up every thing in their way. To this purpoſe he ſteeped the plates of iron in waters in which were ſeparately diſſolved alum, common ſalt, and ſal armoniac. Some other plates he did not ſteep in theſe liquors, but only juſt dipped them in, and then expoſed them to the air to ruſt. All theſe liquors, thus uſed, cauſed the iron to ruſt very freely, but the ſal armoniac beſt of all. After two days, during which every plate had been dipped into this menſtruum only twice or thrice, he ordered both theſe, and thoſe which had been left ſteeping during the ſame ſpace of time, to be ſcowered ; and on comparing them together, it was found, that thoſe which had been dipped, and expoſed to the air, became much cleaner than thoſe which had been all the time ſteeped. The ruſt covered all the ſurface in the latter, without raiſing the ſcale ; whereas, in the former, the ſurface was raiſed into bliſters of ruſt, which carried it wholly off with them. The diſſolvents, though very weak, are obſerved to produce the deſired effect, as well as ſtronger, which muſt be much dearer ; but, among the latter, he prefers vinegar in France, which ſucceeds very well, and, being plentiful there, is very cheap. This operates ſo quick on the iron, that the plate need only be once dipped into it, and immediately taken out again, and ſet in a moiſt place, where it will ruſt in eight and forty hours. If the dipping is repeated three or four times, the ruſting will be ſtill more expeditious, and, eſpecially, if a ſmall quantity of ſal armoniac be diſſolved in the vinegar about a pound to the puncheon. This will make a very efficacious menſtruum, the vinegar diſſolving iron very well, and the ſal armoniac ruſting it ſooner than any other ſalt. This, however, muſt be uſed very moderately, and the plate muſt be ſteeped in cold water afterwards, to take off any particle that might yet remain upon it, otherwiſe it would be ſubject to ruſt after it was tinned.

There are ſeveral other ways of making iron ruſt, as keeping it in a moiſt cellar, expoſing it to the dew, ſprinkling it with ſimple water, or, which is ſtill better, with water in which ſal armoniac has been diſſolved, ſeveral times a day ; and, in thoſe countries where the pyrites is common, the vitriolic waters, which partake of it, will do it very well. This water may be prepared at little or no expence, only by heaping up large quantities of the pyrites, and letting it moulder in the air, then putting it into common water, and making a lixivium of it.

The leaves of tin, when they are finiſhed, are always found to be more bright and gloſſy on one ſide than on the other, which is owing to the plates of iron having always ſeveral roughneſſes on one ſide, where it has been moſt expoſed to the hammer. Theſe roughneſſes are what are principally to be eaten down by the menſtruums ; for which reaſon Mr. Reaumur greatly prefers ſprinkling, or wetting them, to ſteeping ; becauſe, in ſteeping, as both ſides are equally expoſed to the force of the menſtruum, the ſmooth ſide muſt be conſequently eaten away too far, while the other is but eaten barely enough ; this occaſions a loſs of the iron, which the author propoſes to ſave by ſprinkling, or ſimply wetting, as the bad ſide only might be ſubjected to the action of the menſtruum.

There are two other cautions, very neceſſary to be obſerved in this part of the work. The firſt is in the management of the plates, before they come to be prepared ; which is, in the beating of them, to turn them continually about, ſo that all parts of every plate may be equally extended. And the other is, to plunge them into ſome ſoft clay, or fuller's earth, before they are heated, that they may not ſolder themſelves together.

Which ever method of ruſting the plates be uſed, it is always neceſſary to ſcower them with ſand, as ſoon as it is done ; and, when they are thus cleaned, they muſt be immediately plunged into water, to prevent their ruſting again ; and they are to be left in this water till the inſtant in which they are to be tinned, or, in the language of the workmen, blanched. The people employed in this part of the operation are called blanchers, and the others who, aſſiſt at the cleaning the plates, the ſealers.

The blancher makes as great a ſecret of his art, as the ſealer does of his ; and it was with great difficulty that Mr. Reaumur obtained it. The manner of doing it is this :

They flux the tin in a large iron crucible, which has the figure of an oblong pyramid with four faces, of which two oppoſite ones are leſs than the two others. The crucible is heated only from below, its upper part being luted with the furnace all round. The crucible is always deeper than the plates, which are to be tinned, are long ; they always put them in downwright, and the tin ought to ſwim over them. To this purpoſe artificers of different trades prepare plates of different ſhapes, but Mr. Reaumur thinks them all exceptionable. But the Germans uſe no ſort of preparation of the iron, to make it receive the tin, more than the keeping it always ſteeped in water till the time ; only, when the tin is melted in the crucible, they cover it with a layer of a ſort of ſuet which is uſually two inches thick, and the plate muſt paſs through this before it can come to the melted tin. The firſt uſe of this covering is to keep the tin from burning ; as, if any part ſhould take fire, the ſuet would moiſten it, and reduce it to its primitive ſtate again. The blanchers ſay, this ſuet is a compounded matter. It is indeed of a black colour, but Mr. Reaumur ſuppoſes that to be only an artifice to make it a ſecret, and that it is only coloured with ſoot, or the ſmoke of a chimney ; but he found it true ſo far, that the common unprepared ſuet was not ſufficient ; for after ſeveral attempts, there was always ſomething wanting, to render the ſucceſs of the operation certain. The whole ſecret of blanching, therefore, was found to lie in the preparation of this ſuet ; and this he at length diſcovered to conſiſt only in the firſt frying and burning it. This ſimple operation not only gives it the colour, but puts it into condition to give the iron a diſpoſition to be tinned, which it does ſurpriſingly.

The melted tin muſt alſo have a certain degree of heat, for, if it is not enough, it will not ſtick to the iron ; and, if it is too hot, it will cover it with too thin a coat, and the plates will have ſeveral colours, as red, blue, and purple ; and, upon the whole, will have a caſt of yellow. To prevent this, by knowing when the fire has a proper degree of heat, they might try with ſmall pieces of iron ; but, in general, uſe teaches them to know the degree, and they put in the iron when the tin is at a different ſtandard of heat, according as they would give it a thicker or a thinner coat. Sometimes, alſo, they give the plates a double layer, as they would have them very thickly covered. This they do by dipping them into the tin, when very hot, the firſt time, and, when leſs hot, the ſecond. The tin which is to give the ſecond coat, muſt be freſh covered with ſuet, and that with the common ſuet, not the prepared. *Philoſophical Tranſactions*, Nº. 406.

LAVEN'DULA, *lavender*, in botany, a genus of plants whoſe characters are :

It is one of the verticillate plants, whoſe flower conſiſts of one leaf, which is divided into two lips ; the upper lip, ſtanding upright, is roundiſh, and, for the moſt part, bifid : but the under lip is cut into three ſegments, which are almoſt equal : theſe flowers are diſpoſed in whorles, and are collected into a ſlender ſpike upon the top of the ſtalks.

Theſe are propagated by cuttings or ſlips ; the beſt ſeaſon for which is in March, when you ſhould plant them in a ſhady ſituation, or at leaſt ſhade them with matts until they have taken root ; after which they may be expoſed to the ſun, and, when they have obtained ſtrength, may be removed to the places where they are deſigned to remain. Theſe plants will abide the longeſt in a dry, gravelly, or ſtony ſoil, in which they will endure our ſevereſt winters ; though they will grow much faſter in ſummer, if they are planted upon a rich moiſt ſoil ; but then they are generally deſtroyed in winter ; nor are the plants half ſo ſtrong-ſcented, or fit for medicinal uſes, as thoſe which grow upon the moſt barren rocky ſoil.

LA'VERS, ſacred veſſels in the temple of Solomon at Jeruſalem ; they were a ſort of baſons which received the water that fell from another ſquare veſſel above them, from which they drew it by cocks ; each Laver contained ten barrels ; they were uſed in waſhing the victims, veſſels, &c. They were ten in number, placed five on each ſide the court, over-againſt the altar or place of ſlaughter.

LAVI'GNON, the name of a French ſhell fiſh common on the coaſt of Poitou. It is of the chama kind, having a very thin pair of ſhells for its covering, which are eaſily cruſhed to pieces between the fingers, and which never can ſhut cloſe, in the manner of the oyſter or muſcle, or other common bivalve ſhells. The fiſh, therefore, always buries itſelf in the mud by way of ſecurity. The ſhells are very ſmooth and poliſhed, eſpecially, on the inſide, and they are naturally white. This colour they always retain within, though their outer ſurface is often tinged black with the mud.

LAU'NDER, in minerology, a name given, in Cornwall, Devonſhire, and other places, to a long and ſhallow trough, which receives the powdered ore after it comes out of the box or coffer through the iron ſtrainer, at the foot of the ſtamping-mills ; the waſte or light part of the ore is waſhed away by a gentle ſtream of water, but the more ponderous part ſtays behind, which is ſent to the melting-houſes after it is dreſſed, at the frames, or waſhing-places, then dried, and made fit for the furnaces.

LAU'RA *, a place where monks anciently dwelt.

* The word is derived from the Greek λαύρα, a village.

Authors are divided about the difference between a Laura and a monaſtery. Some pretend that a Laura was a monaſtery, wherein lived at leaſt 1000 monks ; but this is no ways creditable. But the Lauræ were a kind of villages, whereof each ſeveral houſe was inhabited by one or two monks at the moſt. The term Laura was only underſtood of the religious places in Egypt and the Eaſt, where their houſes ſtood apart from each other,

other, and were not joined by any common cloister, the monks that inhabited them only meeting in public once a week.

LAURE'OLA, *the small spurge laurel*, in botany, is the same with the thymelæa, with laurel-shaped leaves.

Laureola is a very rough purge; it operates both upwards and downwards, and usually carries off a great quantity of matter, but it is apt to erode, and inflame the stomach and intestines. The leaves are somewhat milder than the bark of the stem; that of the root is strongest of all. Many have given it in drops with success; but it is so rough and dangerous a medicine, that, while there are others capable of answering all the purposes intended by it, it is unpardonable to bring it into use.

LAU'RO-*cerasus*, the laurel, in botany, the name of a genus of trees, the characters of which are these: the flower is of the rosaceous kind, being composed of several petals arranged in a circular form. The cup is hollowed, and funnel-fashioned, and from it there arises a pistil, which finally becomes a fruit, resembling a cherry, soft, and inclosing a stone with a roundish kernel.

This was discovered to be poison by the accident of two women dying suddenly at Dublin, after drinking some of the common distilled laurel water. Several experiments were then made on dogs, and communicated to the Royal Society by Dr. Madden, and afterwards confirmed by Dr. Mortimer, which plainly shewed the poisonous effect of laurel water. See *Philosophical Transactions*. N°. 418, 420.

LAU'RUS, *the bay-tree*, in botany, a genus of trees, whose characters are:

It hath a flower consisting of one leaf, which is shaped like a tunnel, and divided into four or five segments: the male flowers (which are produced on separate trees from the female) have eight stamina, which are branched into arms: the ovary of the female flowers becomes a berry, inclosing a single seed within an horny shell, which is covered with a skin.

These trees are very proper to plant upon the warm sides of dry hills, where they may be protected from the severe blasts of the north and east winds; in which situations I have seen some of these trees upwards of thirty feet in height, which is a plain indication of their large growth.

But I know it will be objected, that these trees are often destroyed in hard winters, and so are improper to make large plantations of in England. That they have been sometimes killed by severe winters, I cannot deny: but, if they are brought up thus hardy, as has been directed, and not sheared, I dare affirm, they will resist the severest cold of our climate, when grown to a moderate age, provided they are planted in a dry soil; in which, though their leaves should be intirely shrivelled by extreme cold, yet, if permitted to remain undisturbed, and not cut, they will shoot again the succeeding summer, as I have more than once experienced. And in the hard winter, anno 1728, when most of the bay-trees seemed to be destroyed which grew abroad, and many people were so inconsiderate as to dig them up, and throw them away, it was observable, that all those which were permitted to stand did shoot out again in the succeeding summer, and recovered their usual verdure. Which should caution every person, not to be over hasty in condemning trees to the fire, but to wait for the success of a whole season, before they are pulled up. *Miller's Gard. Dict.*

Canon LAW, a public regulation for the deciding ecclesiastical affairs. The canon Law is made up of these following parts: first, the holy scriptures; secondly, the constitutions of councils, properly called canons; thirdly, the decrees and decretal epistles of popes; and, fourthly, the opinions of the fathers: besides these constituent parts, the civil Law is likewise taken in, in some cases, i. e. extracted from the Theodosian or Justinian codes, and sometimes from the capitularies of the ancient kings of France. The time, in which the several collections were put together, which make up the canon Law, is divided into three divisions: the first comprehends the old Laws, by which the church was governed for above 1000 years, and which is contained in the ancient collections and ecclesiastical constitutions. The second division consists of that which the French call cours, canon; being composed of collections, which were made since the year 1150 to 1483; and the third division of time takes in all the additions made since the period above-mentioned, either by the constitutions of new councils, the decrees of later popes, or by other provisions which are owned to have the force of Law in ecclesiastical matters. To say something of the progress of this matter, upon each division of time; to begin with the first with respect to what was collected either in Greek or Latin: the first collection of the Greeks was published about the year 385; the author of the performance being Stephen bishop of Ephesus, or, as others will have it, Sabinus bishop of Heraclea. This work took in the canons of the two general councils of Nice and Constantinople, together with those made by the five provincial councils of Ancyra, Neo-Cæsarea, Gangra, Antioch, and Laodicea, held in Asia much about the same time. The second collection was made a little after the general council of Chalcedon, held in 458; and here most of the canons of the general council of Ephesus, and of that of Chalcedon, were added to the canons of the first collection; the greatest part of the learned are of opinion that this collection was drawn up by Stephen bishop of Ephesus. To this body were added, the canons of the council of Sardica, the apostles canons, and those of St. Basil. The third Greek collection was ordered to be drawn up by the council in Trullo, held at Constantinople in 692. This was afterwards augmented in the year 790; some canons of the second general council of Nice, as Morery calls it, being added to it. The fourth Greek collection was compiled by Photius, patriarch of Constantinople, about the year 880; besides these four Greek collections, in which the canons were ranged according to the order of the councils, or the epistles of the fathers made use of; besides these collections, I say, John of Antioch made another in the year 550, in which, the canons were disposed into heads according to the subject-matter under fifty titles or divisions; the same John of Antioch, being preferred to the patriarchate of Constantinople in 554, drew up the first nomo-canon, divided likewise into fifty titles or heads, in which he cites the civil Laws from Justinian's codes and novels, i. e. so much of them, as the canons are concerned in. Photius drew up another nomo-canon, where the resembling Laws and canons are placed together, for view and comparison, about the year 883. Arsenius, a monk of Athos, and, afterwards, patriarch of Constantinople, made a new nomo-canon in 1255, and Matheus Blastares, a monk of St. Basil's order, made another in 1335: so much for the Greeks. We shall say something of the Latin collections, of which the most considerable are four. The oldest was drawn up by the order of pope Leo, in 460. The second Latin collection was made by Donysius Exiguus, who was likewise the author of the paschal cycle, and the christian æra; this collection was published in 496, to which, in the year 500, Dionysius added a supplement consisting of popes decrees. The third Latin collection was made in Spain by Isidore, bishop of Seville, in the year 620. The fourth appeared in 790, under the name of Isidorus Peccator, or Mercator: besides these collections, in which the order of time in the councils or decretal epistles is generally observed, there have been several others drawn up, in which, the division is made, according to the diversity of the subject-matter; and of this kind are those drawn up by Ferrandus, deacon of the church of Carthage, in the year 527; by Martin archbishop of Braga in Portugal, 572; by Cresconius, an African bishop, in 670; and by Regino Abbot of Prûm, in the diocese of Treves, in the year 900; this last added the civil Laws to the canons and opinions of the fathers where they had any relation to them; so that, in reality, this collection may pass for a nomo-canon. About the year 1020, Burchardus, bishop of Wormes, made a new collection of canons, vulgarly called the decretum of Burchard (instead of a book or collection of decreta) some likewise call this work Brocardica, by mistake for Burchardica. In the year 1100, Ivo Carnutensis, or bishop of Chartres, drew up two bodies of canon Law, one of which was commonly called the decretum, and the other panormia, or rather pannomia, that is to say, a collection of all the Laws. And likewise, among the collections of canon Law, may be added the orders and constitutions of bishops, and pœnitentials, or books in which penance and discipline are stated; as likewise Gregory, a Spanish priest, his Polycarp, which compiler lived some little time after Ivo Carnutensis; (and thus much for the first division of time, with reference to the common law. The second period of the canon law takes in that commonly called the Cursus Canonicus. This consists of three parts, the first of which contains Gratian's Decretum; the second takes in the great Decretals collected by order of pope Gregory IX, in 1230; the third comprehends the four lesser collections of Decretals, i. e. the Sextus, the Clementines, the Extravagants of John XXII, and the common Extravagants. The Decretum of Gratian is a collection of ecclesiastical constitutions, and of those ancient regulations which passed for Law in the church, till the middle of the XIIth century. This Gratian was a Benedictine, who employed twenty-four years in this work, which he published in the year 1150; the performance is divided into three parts, the first of which contains 101 distinctions, in which ecclesiastical persons are his principal subject; the second part contains 36 causes, in which, the matter and form of trial and sentence are handled; and the third consists of five distinctions, concerning consecration of holy things. (This Decretum of Gratian was received and corrected by pope Gregory XIII, and a new edition published in 1580.) After the Decretum of Gratian, there was a collection of the decretal epistles drawn up, which were written by popes living after Gratian's time. Bernard Circa, afterwards bishop of Fayenza, compiled a new body of canon Law in 1188; and Johannes Valensis drew up another about twelve years after. Peter of Beneventum finished a third collection which was approved by pope Innocent the IIId, in 1210. After the IVth council of Lateran, held in the year 1215, under the same pope Innocent the IIId, there appeared a fourth collection, the author of which is not known. Tancred, archdeacon of Bologne, made a fifth, in the year 1226. The second part of the Cursus Canonicus, or Course of Canon Law, being a collection of the Decretal Epistles, drawn up by the order of pope Gregory the IXth, takes in the epistles of several popes, and particularly those epistles which were written from the year 1150, the time in which Gratian published his decree, till the year 1230, in which this collection of Decretals was published; to this second part likewise

wise are added the constitutions of councils, and some decisions of the fathers: this collection was put in order by Raymond de Pegnafort, the pope's penitentiary, and is divided into five books. The first book treats principally of the ecclesiastical Law in general, and of the several sorts of judges who have jurisdiction in the church. The second treats of civil process, or the forms of prosecuting an action. The third and fourth give directions about sentence and passing judgment in civil matters, taking in the cases in which the clergy are concerned, together with those relating to marriage. The fifth enlarges both upon the matter and form, concerning trial and judgment in criminal causes. The third part of the Cursus Canonicus, or Course of Canon Laws, consists of a collection of new decretals, and contains the Sextus, the Clementines, and the Extravagants. The Sextus, i. e. the sixth book of the decretals, was drawn up by pope Boniface the VIIIth's order in the year 1298: this collection is divided into five books, like that of Gregory the IXth, the matter being thrown into the same order, and divided under the same heads. The Clementines were formed into a body by pope Clement the Vth, some time after the celebration of the council of Vienna, held in 1311, and published in the year 1317, by his successor John the XXIId. The Extravagants of John the XXIId are the decretal epistles of that pope, which were so called, because, being not yet inserted into the body of the Law, they seemed as it were outliers, and to range out of the confines of the Cursus Canonicus, which name has continued upon them; afterwards the decretals of several popes were called the Common Extravagants, to the year 1483, and, in this latter body of the canon Law, there are more of the constitutions of pope John the XXIId, than in the collection that goes under his name. The third period of the canon Law takes in the constitutions of councils and popes made since the last collections of the decretals, with other regulations which have the force of Law in ecclesiastical affairs; this last division of Law is either common, i. e. as Morery speaks, received by all Catholics, or else particular to some community. There are two sorts of common Law; the one relates to discipline, and the other to the forms and process of courts. The first consists of the decrees of general councils, held since Clement the Vth, and the bulls of popes, not yet taken into the body of the Law, the greatest part of which has been put together by Laertius and John-Mary Cherubins; from whence Petrus Matheus, a lawyer of Lyons, has extracted a collection, which he calls the seventh book of the decretals. The second part of this common Law takes in the forms and regulations of the apostolic Chancery, made since John the XXIId, amounting to the number of seventy-one, the three principal of which are received in France, upon the score of being founded upon natural equity. That branch of the civil Law, which is called proper or particular, is that, which besides the general Law of the whole church, is peculiar to particular nations, provinces, churches, dioceses, chapters, and communities: as to France, continues Morery, that part of the canon Law, which is particular to us, is, in the first case, taken from the antient decrees, usages, or customs of the universal church, being preserved by our forefathers with greater care, than by the neighbouring nations; and in these usages and regulations that which we call the privileges or immunities of the Gallican church principally consists. In the second place, that part, which makes the canon Law particular to France, consists of royal ordinances made by the kings of the third race, either with the concurrence of the states of the realm, or their own proper authority, or else in concert with the holy See, such as the pragmatic sanction, the ordinances of Orleans, Blois, and others, so far as the church is concerned; the concordat, made in the year 1516, between pope Leo the Xth and Francis the Ist, which was concluded to soften that which shocked the court of Rome, in the pragmatical sanction: to this we may add the German concordat, made in the year 1447, between pope Nicholas the Vth and the emperor Frederic the IIId, and which is still observed in Lorraine and Alsace. The third branch of ecclesiastical Law, which, though particular to France, is not observed all the kingdom over, is made up of the canons of late provincial courts, synodal constitutions, and regulations of corporations or communities. *Doujat Histoire du Droit Canonique.*— There is a new edition of the body of canon Law, and decretals, printed in 1687, with notes and corrections of Petrus and Franciscus Pithæus, two eminent lawyers, printed from an original in the library of M. le Pelletier, minister of state, comptroller general of the finances, and great grandson to Petrus Pithæus; this edition was some time since printed at Paris.

Roman or Civil LAW.— Under this denomination, we are to understand Laws made by the Romans for the support of their government, and the administring justice to private persons. Romulus, who built Rome, gave the first beginning of these regulations in his leges curiatæ, so called, because they were made by the consent of a general meeting of the people, divided into thirty parts or wards, called curiæ. The other kings, who succeeded him, made several Laws during their respective reigns, which, in all, lasted 244 years. These Laws being drawn into a body, by Sextus Papyrius, in the 245th year of Rome, the collection was called Jus Papyrianum. But, these Laws being soon after repealed by the Lex Tribunitia, there are none of these royal Laws to be met with, in the books of the Jus Romanum. About the year of Rome 303, there were ten learned men pitched upon to travel to the republics of Greece, and to transcribe all the Laws which they believed serviceable to their own government. These ten men, called decem-viri, made ten Laws, to which, the year after, they added two more. These Laws being engraven upon plates of ivory, and hung up in public places of the town, were called the Laws of the twelve tables. But, notwithstanding this publication, the people, were obliged in several cases, to apply to the lawyers for explanation and direction; whose opinions, upon cases put, being approved by custom, came, at last, to be called Law. Much about the same time, there were forms of process settled, for the grounding of actions, and stating the method of prosecution; and these they called actions of Law. These forms, being published by Cn. Flavius, made them be called the Flavian civil Law. Some time after, Sextus Ælius wrote another book of actions, or forms of process, which were called Jus Ælianum. And thus, at that time of the day, the Roman Law was made up of the twelve tables, the civil Law, and, as they called it, the actions of the Law. The people of Rome, falling afterwards into a misunderstanding with the senate, and retiring to mount Aventine, made, during this separation, Laws called plebiscita, which were afterwards received by the whole commonwealth. After the people or plebeians had yielded the senate the power of making Laws, the senatus consulta appeared, i. e. the ordinances or statutes made by the senate. To these, in the year 387 of Rome, were added the edicts of prætors, who were magistrates, chosen every year for the administration of justice, whose edicts or decrees were called jus honorarium; Julianus, an eminent lawyer, made a collection of these decrees, which was called the perpetual edict, and approved by the emperor Adrian in the year 130, according to the Christian computation. The form of the Roman government being changed a little before the birth of our Saviour, the authority of making Laws devolved upon the emperors, whose constitutions were drawn into two codes, by Gregorius and Hermogenes, two learned lawyers, under the reign of Dioclesian, in the year 290. These two collections, called the Gregorian and Hermogenian code, took in the imperial constitutions, from Adrian to Constantine the Great. The emperor Theodosius the younger ordered a third collection to be drawn up, called the Theodosian code, in which all the constitutions of the succeeding emperors, from Constantine to himself, were inserted. The writings, likewise, and opinions of some eminent lawyers, made part of the Roman Law: for, since the reign of Augustus, there were several of that profession named by the emperors, to give their judgment upon cases put, whose resolutions, upon the point, were looked upon as Law, because they were authorised by the princes commission to give their opinions. The most considerable of these lawyers, were Publius Papyrius, Appius Claudius, Sempronius, Sextus Ælius, Q. Mutius Scævola, Ateius Capito, Antistius Labeo, Papinianus, Ulpianus, Junius Paulus, Pomponius, Modestinus Africanus, &c. In the year of our Lord 530, the emperor Justinian, perceiving the civil Law very confused, ordered a review of it, that the insignificant part of it should be cut off, and put into the method and condition it is in at present. In this great work, he employed the ablest lawyers of his time; the names of which were, Trebonianus, Constantinus, Theophilus, Dorotheus, Anatolius, Cratinus, with some others. This committee, after having selected what was most useful in the XII tables, in the plebiscita, and senatus consulta, in the edicts of prætors, the resolutions of eminent lawyers, the constitutions, or rescripts of emperors; after having done this, I say, they divided the body of Law into four books, viz. the Digest, the Institutes, the Code, and the Novels. The Digest, otherwise called the Pandects, is a collection which contains the old Law, together with the resolutions of eminent lawyers. The Institutes contain the elements or principles of the Roman Law. The Code is a collection of all the constitutions, from Adrian to Justinian, for there are few imperial constitutions older than Adrian; so that it takes in the three codes, the Gregorian, Hermogenian, and Theodosian. It was called the Justinian Code, from that emperor's name, who got it drawn up. The Novels is a supplemental book to the Code, and contains the constitutions of Justinian, which were made after the Code was published. These Novels are faithfully translated from the Greek into the Latin, and commonly called Authenticæ, to shew the exactness of the version, and to distinguish them from the epitome of Julianus, consul of Constantinople, and likewise from those which Irenerius, a lawyer, inserted into the Code in the reign of the emperor Frederick the Ist, in the year 1155; which performance is often, not very carefully and judiciously, managed. The civil Law of the Romans, being put in this good condition by the care of the emperor Justinian, took place only in Greece, Illyricum, and part of Italy; because the Goths, Lombards, Vandals, Franks, and other barbarous nations, had possessed themselves of the western parts of the Roman empire. About the year 868, the emperor Basilius made an abridgment of the Justinian

nian code, and his son Leo, the philosopher, published the Basilicæ, in 888, which passed for Law, till the ruin of the eastern empire, which happened in the year 1453, Justinian's body being no longer read in the schools, nor pleaded at the bar in Constantinople. After these Basilicæ, the emperor Leo set forth an hundred and thirteen new constitutions, which treat of several things undecided by the Laws of Justinian. The Greek lawyers made glosses and explanations upon the Basilicæ, but not so voluminous as those of the Latins upon the civil Law. Michael Attaliottes, a lawyer, who flourished in the year 1070, published another abridgment of the Justinian code, which he called the Abridgment abridged, i. e. an abridgment of what Basilius the emperor had set out before. About the same time, Michael Psellus made another little collection of the Basilicæ, afterwards translated by Leunclavius in the year 1580. And, lastly, in 1143, Constantine Herminopulus furnished out another abridgment of the whole Law, which he called Promptuarium: but the taking of Constantinople by Mahomet the IId, in 1453, put an end to the eastern empire, and to the use of the Laws observed there. And thus we have seen the state of the Roman or civil Law in Greece: as for Italy, as has been remarked already, it was little observed there, for the space of 506 years, after the death of the emperor Justinian: for the Goths made themselves masters of Italy about sixty years after the reign of that emperor, and the Lombards, having chaced the Goths out of that country, reigned there about 200 years. During this time, the Visigoths and Vandals held the government of Spain; and the Goths, Huns, and other barbarous people, seized upon part of Gaul; Charlemaigne, having conquered Desiderius king of the Lombards, in the year 774, was chosen emperor of the Romans, by the senate and people of Rome, in the pontificate of Leo the IIId. This emperor had then a design of reviving the practice of the Roman or civil Law, but the men of that profession could not furnish him with a copy of what Justinian had published; but at last, in the year 1137, in the reign of Lotharius the IId, emperor of the West, and in the popedom of Innocent the IId, they found a copy of the Digests at Amalfi in Puglia, which was called the Florentine pandects, for a reason to be given by and by. The emperor Lotharius and pope Innocent, joining in a war against Roger, king of Sicily and Naples, desired assistance from the then republic of Pisa. In the course of this war, the town of Amalfi being taken by storm, and plundered, Justinian's copy abovementioned, being found there, was given to the Pisans, for the good services they had done on this occasion. These books remained in the hands of this commonwealth, till they were conquered by the Florentines, who carried off the pandects, from Pisa, to Florence; where they are still carefully preserved, as the only, or at least the most authentic original of the Roman law. After the discovery of these pandects, the emperor Lotharius the IId publishes an edict, commanding the Roman or civil Law to be taught in public schools, and that causes should be tried by it; and, in the year 1150, gave Irenerius leave to read upon it, in the university of Bononia, after whom, it was taught and cultivated, in the same place, by several eminent professors, as, Placentinus, Azo, Accursius, &c. There have been, likewise, a great many other famous civilians in several parts of Europe, as Bartholus, at Pisa and Perugia; Baldus, at Bononia and Pavia; Alciat, Coverruvius, Antonius Augustinus, &c. The most eminent civilians among the French, are, Budæus, Duarenus, Du Moulin, Cujacius, Hottoman, Brissonius, Tiraqueao, Chopinus, Pithæus, &c. The Roman or civil Law was not received in Germany till the XVth century, but since that time, it has made its way farther there than elsewhere, upon the account of the emperors of this country stiling themselves the Roman emperors. *Histoire du Droit Romaine.*

LAWN (*Dict.*)— Many persons have preferred the lime-tree for this purpose, on account of their regular growth: but as the leaves of this tree often change their colour, and begin to fall very soon in the autumn, occasioning a great litter in the garden; and from the end of July the trees make but an indifferent appearance; so they are not to be esteemed for these plantations.

The elm, oak, beech, and chesnut, among the deciduous trees, are to be preferred to all others, as they keep their leaves late in autumn: and these are all of them large-growing trees; so are very proper for this purpose.

If there are some clumps of ever-green trees intermixed with the deciduous trees in this plantation, it will add to the beauty of it, especially in the winter season: the best sorts for this purpose, are, the lord Weymouth's pine, the silver and spruce firs, which will grow fast, and become large trees: and, as the two latter sorts always grow pyramidically, so they will have a good effect to the sight, when properly disposed with the deciduous trees: but, as these generally feather out their branches near the ground, they should be planted where they do not obstruct the view of any distant objects.

But, as most persons who take pleasure in beautifying their seats in the country, are in haste for shade, they generally plant the trees too close together, and often in such a manner, as to render it difficult, when the trees are advanced, to reduce their number, without injury to the design; therefore those trees should be first planted, which are designed to remain; and then there may be some few others planted for present shade, which may afterwards be taken away. When persons who are beautifying their seats meet with full grown trees on the spot, it is a great pleasure; for these should not be destroyed, if they can possibly stand. *Miller's Gard. Dict.*

LA'YING *of trees*, a very necessary operation, and thus performed:

1. Take some of the boughs, and lay them into the ground about half a foot deep in fine fresh mould, leaving them with the end of the layer about a foot or a foot and a half out of the ground, and keep them moist during the summer-season, and they will probably have taken, and be fit to remove, in autumn; and, if they have not by that time taken root, they must lie longer.

2. Tie a piece of wire hard round the bark of the bough, at the place you intend to lay in the ground; and twist the ends of the wire, so that they may not untie; and prick the place above the wire, through the bark, with an awl in several places; and then lay it in the ground, as before directed.

3. Cut a slit upwards at a joint, as is practised in Laying of carnations, which, by gardeners, is called tonguing the layers.

4. Twist the place which you design to lay in the ground like a withy, and lay it into the ground, as directed in the first way of Laying.

5. Cut a place round about the bough, that is designed to be laid, an inch or two, at the place that is most convenient to lay into the ground, and manage it, as is directed in the first method of Laying.

The season for Laying hardy trees, that shed their leaves, is in October; but, for such as are tender, in March; for evergreens, June or August are good seasons.

Though layers may be laid at any time in the year, the before-mentioned seasons are most proper, for the reasons following: because they have the whole winter and summer to prepare and draw root; for at those times of the year the sun has sufficient power on the sap of the tree, to feed the leaf and bud, but has not power sufficient to make a shoot.

And if that small quantity of sap that does arise be hindered, as it will by some of the preceding ways of Laying, the leaves and buds will gently crave of the layer, and, by that means, will prepare the layer to take root, or put forth roots a little to maintain itself, finding it cannot have it from the mother-plant.

And, therefore, because it wants but little nourishment at that time of the year, it is better to lay layers of trees, or to set cuttings, than at other times, either in the winter, when the sap stirs but little, or in the summer, when the sap abounds, or in the spring, when it begins to rise; because it is then apt to come too suddenly to draw sap from the layer, before the layer has drawn or prepared for root.

However, the spring or summer may do well for small plants; because such plants, being but short-lived, draw root the quicker.

If you would lay young trees from an high standard, the boughs of which cannot be bent down to the ground, then you must make use of osier-baskets, boxes, or pots, filled with fine sifted mould, mixed with a little rotten willow-dust, which will keep moisture to assist the layer in taking root: this basket, box, &c. must be set upon a post or tressel, &c. and the bough must be laid according to either of the four first ways of Laying; but too much head must not be left on, lest that be injured by the wind, or by its own motion rub off the tender root; and the smaller the boughs are, the less way they should be set out of the ground, and care must be taken to keep them clear from weeds.

The harder the wood is, the better will the young wood take root; but if the wood be soft, the older boughs will take root the best. *Miller's Gard. Dict.*

LEACH *brine*, a word used by the English salt-workers, to express the brine, which runs out from the salt, when it stands in the baskets to drain, immediately after being taken out of the pan: and also the liquor left in the pan, when no more salt will shoot. This is also called the mother brine, and bittern. In the German salt works they always throw this liquor away. In our brine salt works in Cheshire they always preserve it, and add it to the next boiling; and, in the Newcastle, and other sea-water salt works, they save it for the making the bitter purging salt, called Epsom salt.

LEAD (*Dict.*)— This metal may be procured from its ore, of whatever kind that be, by a stratification with charcoal. The method of doing it in assay is this: take for a docimastical centner of the ore a hundred half ounces, or three pounds and four half ounces, that, by this means, each half ounce may stand in lieu of the docimastical pound; beat this to a coarse powder, or lumps not larger than a pea. Put it at first into a large earthen or iron frying-pan, and heat it first by a gentle fire, which must be increased gradually, that the greatest part of the sulphur may be dissipated. Now, have at hand a melting furnace, with its bed made of lute and dust of charcoal. Apply to this, on the outside, another bed, joined to it by lute, that the matter running out of the inferior hole, when open, may be received into it. Surround this outer bed

 with

with burning and fresh coals; and fill the whole furnace with the same fuel, that it may be dried. Then, with a pair of bellows, excite the fire for a quarter of an hour, then put in the ore at several times; nor will it be amiss to add to it some scales of iron; but the ore must be put in so as to be above the coals, facing the hole, through which the blast of the bellows is made; but let it not touch the wall of the furnace. Fill the furnace at least two thirds with charcoal, and let it be in pieces of a moderate bigness; and, after every portion of ore is put in, add a larger of charcoal above it. When all the ore is put in, continue to blow till all the fire is consumed; then pour water upon the foremost bed, drop by drop, to cool the Lead gathered in it, and see among the scoriæ if there be any Lead lodged among them; and, if there be, separate it, and weigh all together, and you will, from this, know the value of the ore, and what the smelter may obtain from it. *Cramer's Art of Assay.*

It has been proved, by the experiments of different chemists, that Lead contains a real running mercury. Kunkel and Becher both separated mercury from it; and Mr. Grosse, of the Paris academy, has justified their experiments, by producing the same effect, by means, not only very different from theirs, but absolutely opposite and contrary. They suppose that the mercury contained in Lead is fixed there, either by acids or by sulphurs, and therefore they used alkaline materials to disengage and support it. On the contrary, Mr. Grosse used only acids, and by means of these procured a pure running mercury from this metal. His method was to dissolve thin plates of Lead in spirit of nitre, weakened with an equal quantity of water. He then observed a grey-coloured powder precipitate, which, when tried on gold or copper, shewed itself to be mercurial, and even in the powder he saw small globules of quick-silver. *Mem. de l'Acad. des Scienc.* 1733.

LEAF (*Dict.*)— The distinction of Leaves, made by those who have written on botany, are:

A simple Leaf is that which is not divided to the middle.

A compound Leaf is divided into several parts, each resembling a simple Leaf, as in liquorice, &c.

A digitated Leaf is a compound Leaf divided into several parts, all of which meet together at the tail, as in the hemp, black hellebore, &c.

A trifoliated Leaf is a digitated Leaf, consisting of three fingers, as the trefoil, &c.

A quinquefoliated Leaf is a digitated Leaf, consisting of five fingers, as in the quinque folium.

A pennated Leaf is a compound Leaf divided into several parts, each of which is called a lobe, placed along the middle rib, either alternately, or by pairs. When the middle rib is terminated by an odd lobe, it is said to be unequally pennated, as in the goats rue, &c. and equally pennated, when it is not terminated by an odd lobe, as in the cassia: when the lobes are all nearly of the same form and bigness, it is called an uniform pennated Leaf, as in the liquorice; when they are not so, it is said to be difform, as in the agrimonia.

A winged Leaf is, as it were, divided into several pennated Leaves, as in the orobus, &c.

A ramose Leaf is that which is still farther divided than the winged Leaf, as in the osmund royal, female fern, &c.

An entire Leaf or lobe is that which has no division on its edges, as in the apple-tree, &c.

A sinuated Leaf is that which is cut about the edges into several long segments, as in common mallows.

A serrated Leaf is that which is cut about the edges into several acute segments, resembling the teeth of a saw, as in the nettle, &c.

A crenated Leaf is that which is cut about the edges into several obtuse segments, as in the betony, &c.

A laciniated or jagged Leaf is that which is cut about the edges into several pretty deep portions, in an irregular manner, as in the horned poppy, &c.

Leaves are a part of a plant that is ordinarily very thin and flat, growing in the spring, and falling off at the autumn; though there are some plants without Leaves, as the truffles and mushrooms. *Miller's Gard. Dict.*

The Leaves of plants are of the utmost consequence to the life of the whole. Air evidently passes in at the Leaves, and goes through the whole plant, and out again at the roots. If the Leaves have no air, the whole plant will die, as is easily proved by the air-pump; but, in these experiments, if the Leaves be left on the outside of the receiver, and parted by a hole cemented with wax, and have air, the plant will thrive, and grow, though its roots and stalk are kept in vacuo in water. The Leaves of plants perform the necessary work of altering the water, received in at the roots, into the nature of the juices of the plant; and hence it is, that the life of the plants depends so immediately upon their Leaves. The husbandman often suffers for want of this knowledge. A crop of saintfoin is a very valuable thing, and, its root being perennial, will yield him increase many years; but it is often destroyed at first, by suffering it to be indiscreetly fed upon by the sheep, which eating up all the leaves, the root remains without the means of a supply of air, and the whole perishes.

Leaves being thus necessary to plants, nature has, in all perennial plants, provided a reversionary stock of them. The Leaves of these plants are always formed in autumn, though they are not unfolded till the following spring. They then open and increase gradually, in proportion to the motion of the sap, and the quantity of pabulum it then receives to be circulated. These Leaves may also, though not wholly appearing out of the bud, be sufficient for the extremely small motion of life, which the sap of perennial plants, that drop their Leaves, has in winter. *Tull's Horse-hoeing Husbandry.*

LEA'O, in natural history, a mineral substance approaching to the nature of the lapis lazuli, found in the East-Indies, and of great use in the Chinese porcelain manufacture, being the finest blue they are possessed of. This is found in the strata of pit coal, or in those of a yellowish or reddish earth in the neighbourhood of the veins of coal. There are often pieces of it lying on the surface of the ground, and these are a sure indication, that more will be found on digging. It is generally found in oblong pieces, of the size of a finger, not round, but flat. Some of this is very fine, and some coarse, and of a bad colour. The latter is very common, but the fine sort is scarce, and greatly valued. It is not easy to distinguish them at sight, but they are found by experiment, and the trying one piece is generally sufficient for judging of the whole mine; for all that is found in the same place, is usually of the same sort.

Their manner of preparing it for use is this: they first wash it very clean, to separate it from the earth, or any other foulness it may have; they then lay it at the bottom of their baking furnaces; and when it has been thus calcined for three or four hours, it is taken out and powdered very fine in large mortars of porcelain with pestles of stone faced with iron. When the powder is perfectly fine, they pour in some boiling water, and grind that with the rest; and, when it is thoroughly incorporated, they add more, and finally pour it off, after some time settling. The remainder at the bottom of the mortar, which is the coarser part, they grind again with more water, and so on, till they have made the whole fine, excepting a little dirt or grit. When this is done, all the liquors are mixed together, and well stirred. They are suffered to stand two or three minutes after this, and then poured off, with the powder remaining in them. This is suffered to subside gradually, and is the fine blue they use in their best works, our common smalt serving for the blue of all the common low-priced China ware. *Observat. sur les Coutumes de l'Asie.*

LECH, in metallurgy, a term used by the miners, to express the gold ore which has been powdered, and washed, and afterwards run with the assistance of lime-stone. The Lech is afterwards burnt in a fire of charcoal, in order to render it fit for the separation of the metal, by means of lead, which, absorbing and scorifying the extraneous matter, renders the gold pure.

LEECH. See HIRUDO.

LEEK, *porrum*, in botany.—We have two kinds of Leek commonly cultivated amongst our gardens, the one called the common Leek, and the other a broader-leaved one, commonly called the London Leek. There are some reasons to suspect that these are only varieties of the same species of plant, both arising from the same seed.

The method of propagating these is by seeds, and they are commonly sown along with onions. The onions grow up first; and after they are pulled up, the Leeks have time enough to grow to their size. *Miller's Gard. Dict.*

LEER, in glass-making, a sort of third furnace, intended to anneal and cool, by proper degrees, the vessels when made. This properly comprehends two parts, the tower and Leer. The tower is that part which lies directly above the melting furnace, with a partition between them of a foot thick; in the midst whereof there is a round hole, placed exactly over the furnace, through which the flame and heat pass into the tower. On the floor of this tower the vessels are set to anneal. There are two openings, by which the vessels are put into this tower, and after standing there some time, they are put into iron pans, which, by degrees, are drawn out all along that part of this furnace, which is properly called the Leer; which is five or six yards long, that the vessels may cool by degrees. This Leer is continued to its tower, and arched all along, and is about four feet wide, and high within. The glasses are cool by that time they are come to the mouth of this, which enters into a room where the glasses are placed, when taken out. *Neri's Art of Glass.*

LEETCH *of a sail*, in a ship, the outward edge or skirt of the sail from the earing to the clew, or rather the middle of the sail between these two.

LEETCH-*lines*, in a ship, small ropes fastened to the Leetch of the top-sails (only) and then reeved into a block at the yard, just by the top-sail ties. Their use is to hail the Leetch of the sails, when the top-sails are to be taken in; which is always first done, and then the sail can be taken in with the greater ease.

LE'GATE-*note*, in the Italian music. Notes are said to be Legate when this ⌒, or this ⌣ mark is found over or under the heads of them. This is what we call tying them, and is done, when they are properly but one note, but obliged to be separated into two, because part is found at the end of one bar, and

and the other part in the beginning of the following bar; or because the two halves of a note are in different parts of the measure.

LE'GER-*line*, in music, is used to signify a line added to the staff of five lines, when the ascending and descending notes run very high or very low. We often meet with several of these lines both above and below the staff.

LEMU'RIA, a feast of ghosts and phantoms, solemnised the ninth day of May, to pacify the manes of the dead, who were the lemures that came in the night to torment the living. The institution of this feast is ascribed to Romulus, who to rid himself of the phantom of his brother Remus, whom he had ordered to be murdered, ordained a feast called after his name, Remuria and Lemuria. They offered sacrifices for three nights together, during which time all the temples of the gods were shut up, and there was no wedding.

LE'NÆA, Λήναια, in antiquity, a festival of Bacchus, surnamed Lenæus, from ληνὸς, i. e. a vine-press. Besides the usual ceremonies at feasts sacred to this god, it was remarkable for poetical contentions, and tragedies acted at this time. *Potter, Archæol.*

LE'NTES *lapidea*, *fossil lentils*, the name given by many writers to a very remarkable fossil substance, usually found immersed in hard stone, and of a roundish but flatted shape, resembling, not unaptly, a pea or lentil flatted by pressure.

LENTI'SCUS, *the lentisk or mastich-tree*, in botany, the name of a genus of trees, very nearly allied to the terebinthus or turpentine-tree in its characters, but differing, in that the leaves are pinnated; but there is no single leaf to terminate the end of each compound one. *Tourn. Inst.* See MASTICH in the Dictionary.

LEO, *the lion*, in zoology. See LION.

LEO-*pulex*, a name given by Mr. Reaumur to a species of insect which feeds on the pulex arboreus, or common tree-puceron, in the same manner that the creature, called the formica Leo, does on the ants: this being also, like that, an animal, yet in an imperfect state, and finally to be changed into a different creature, this author has kept up the remembrance of this analogy between them, by giving this a similar name.

LE'OPARD, in zoology, the English name of a voracious beast of prey, beautifully spotted, and virgated.

This creature, when carefully examined, is found to be very like a cat; particularly its head, teeth, tongue, feet, and claws. Its actions also are all like a cat's; it boxes with its fore feet, as a cat does her kittens; leaps at its prey, as the cat does; and will spit much in the same manner.

All the Leopard kind, as they walk, keep the claws of their fore feet turned up from the ground, and sheathed, as it were, in the skin of the toes, whereby they preserve them sharp for the seizing of their prey.

Notwithstanding the natural fierceness of the Leopard, numbers of them are bred up tame, and kept for the great cham of Tartary's use, for the hunting of deer and other beasts.

They are most numerous in Africa and Syria. *Grew's Muf.*

LE'TTUCE; see LACTUCA.

LERICOI'UM, *stock-gilliflower*, in botany, a genus of plants, whose characters are:

The flower is composed for the most part of four leaves, which are placed in form of a cross: out of the flower cup rises the pointal, which becomes a long flat pod, divided into two cells by an intermediate partition, to which the valves adhere on both sides, and are furnished with flat smooth seeds, which are orbicular, and bordered round their edges: to which may be added, the flowers are specious, and sweet-smelling.

All the sorts of stock-gilliflowers are propagated by seeds: the best time for sowing them is in the beginning of April, upon a border of fresh light earth, where they may be exposed to the morning sun; for, if they are too much exposed to the sun in the heat of the day, they are very subject to be eaten by a sort of fly; as they often are, while young, upon an hot dry soil. To remedy which, you should always sow a few radishes amongst them, which will secure them from this mischief: for the flies will always prey upon the radishes, whereby your gilliflower plants will be preserved; but then you must not suffer the radishes to be too thick amongst them; for that would draw them up very weak, and cause them to be long-shanked. When your plants have gotten six leaves, they must be transplanted into other borders of the like fresh earth, and exposed to the morning sun at about four inches distance; observing to water and shade them until they have taken root; after which they will require no farther care, than only to keep them clear from weeds until the latter end of August, or the beginning of September, when you must transplant them into the borders of the pleasure-garden; which should be done, if possible, in moist weather, that they may the sooner strike root, whereby they will be securely fastened in the ground before the frost comes on; which would prevent their taking root, and thereby either quite destroy them, or at least cause them to flower very weak the succeeding spring.

LE'WING, in metallurgy, the sifting the ores of metals in water. This is done in fine sieves moved backwards and forwards under water; and is the method of separating the finer part of the ores which had subsided among the larger lumps, under that part of it separated for use in the various washings. The coarser matter, left in the sieve, is powdered again with the larger masses, and all thus sifted together for the blowing-house. *Ray's English Words.*

LIBE'LLA, in natural history, the name of a very large genus of four-winged flies, called by us adder-flies and dragon-flies.

These flies have also two very large and reticulated eyes, covering the whole surface of the head. They fly very swiftly, and prey upon the wing, being of great use to mankind, in clearing the air of innumerable little flies.

LI'BRARY (*Dict.*)— Some authors refer the origin of Libraries to the Hebrews, and observe, that the care they took for the preservation of their sacred books, and the memory of what concerned the actions of their ancestors, became an example to many other nations, and particularly the Egyptians. Osymandrias, king of Egypt, is said to have taken the hint first, and had a Library built in his palace with this inscription over the door ψυχῆς ἰατρεῖον. The Ptolemies of that country were also very curious in books. The scripture, Esdras the Vth and VIth, speaks of a Library of the kings of Persia, which some imagine to have consisted of the historians of that nation, and of memoirs of the state; but it appears rather to have been a depository of laws, charters, and ordinances of the kings. The first who erected a Library at Athens was the tyrant Pisistratus; yet, Strabo says, Aristotle was the first. That of Pisistratus was transported by Xerxes to Persia, and afterwards brought by Seleucus Nicanor to Athens. Long after it was plundered by Sylla, and re-established by Hadrian. Plutarch says, that, under Eumenes, there was a Library at Pergamos containing 200,000 books. Tarannion, a celebrated grammarian, cotemporary with Pompey, had a Library of 3000 volumes. That of Ptolemy Philadelphus, according to Ammianus Marcellinus, contained 7000 all in rolls, burnt by Cæsar's soldiers. Constantine and his successors erected a magnificent one at Constantinople, which, in the eighth century, contained 300,000 volumes, all burnt by order of Leo Isauricus, and, among the rest, one wherein the Iliad and Odyssey were written in letters of gold on the guts of a serpent. The most celebrated Libraries of ancient Rome were the Ulpian and the Palatine. Antiently, every large church had its Library. One of the most complete Libraries in Europe is said to be that erected, at Florence, by Cosmo Medicis: though it is now exceeded by that of the French king, begun by Francis the First. The Emperor's Library, according to Lambecius, consists of 80,000 volumes, and 15,940 curious medals. The Bodleian Library at Oxford, built on the foundation of that of duke Humphrey, exceeds that of any university in Europe, and even those of all the sovereigns of Europe, except the emperor's and French king's, which are each of them 100 years older; it was first opened in 1602, and has since found a great number of benefactors. The Vatican, the Medicean, as that of Bessarioni at Venice, and those just mentioned, exceed the Bodleian in Greek manuscripts, which yet out-does them all in Oriental manuscripts. As to the printed books, the Ambrosian at Milan, and that at Wolfenbuttel, are two the most famous, and yet both inferior to the Bodleian. The Cotton Library consists wholly of manuscripts, particularly such as relate to the History of Antiquities in England, which, as they are now bound, make about 1000 volumes.

LI'CHEN, *liverwort*, in botany, the name of a genus of mosses, the characters of which are these: they have the most perfect fructification of all the mosses, having evident flowers as well as seeds. Their flowering heads are of various figures, and have a number of monopetalous flowers in them, divided into a different number of segments; these have several filaments, and among them have a large quantity of farina, which, when examined by the microscope, appears of a globular figure. The seeds are produced in other parts of the plant, and are contained in certain cups, which stand without pedicles on the surface of the leaves; these are sometimes on the same individual plant with the flowering heads, but sometimes they are on different plants of the same species.

LICHENOI'DES, in botany, the name of a genus of mosses, the characters of which are these: they are composed of parts of different figure and structure, not simple and uniform as the byssi; they have usually no stalk, but grow on the branches of trees, on stones, and other bodies, either in form of a mere crust, or of leaves variously divided and raised. They have tubercles on the several parts of these, serving in the place of flowers or seeds, and growing closely upon the leaves without pedicles. Micheli has described the flowers and seeds of these plants from microscopic observations, but these are too minute to form generical distinctions on. These plants have the name Lichenoides, from their resemblance to the lichen, or liverwort, as they consist, like it, of leaves diffused every way. They have hence been called by some lichens; but the difference between the two genera is very great, these having very imperfect flowers, the others the most perfect of all the mosses.

LI'CTORS, among the ancient Romans, were officers who attended the magistrates, when they appeared in public.

They were twelve in number, and carried bundles of rods, in which was tied up an ax, the head whereof appeared a-

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mongſt the rods. Their office was to go before the king and clear the way for him. Afterwards, when Rome was become a commonwealth, the conſuls, dictators, and prætors, and other magiſtrates who had a right to command the Roman armies, had alſo Lictors going before them; the conſuls and dictators twelve; the prætors ſix. At triumphs the Lictors marched before the conqueror's chariot, carrying their bundles wreathed about with laurels, and holding a branch of the ſame in their hands. They were alſo common executioners: I, Lictor, colliga manus, expedi virgas, plecte ſecuri. They were ready to undo their bundle of rods, whether it were to whip, or to cut off the head of the condemned offender: they were thus called a ligando, becauſe they bound the hands and feet of the condemned perſon before his execution. *Rollin's Roman Antiquities.*

Expectation of LIFE, a term uſed by Mr. De Moivre, for the time which a perſon of a given age may juſtly expect to continue in being, that is, when the chance for his living or dying becomes equal.

According to that gentleman's calculation, upon the ſuppoſition of an equal decrement of Life, the expectation of Life would be expreſſed by $\frac{1}{2} n$, if n denotes the complement of Life. Thus the expectation of Life for a man of 50 years of age will be $18 = \frac{36}{2}$: that is, he had an equal chance, or of 1 to 1, of living 18 years. But, if that interval be once attained, there ariſes a new expectation of $\frac{1}{2} n$, and afterwards of $\frac{1}{2} n$, &c.

Hence he gives the ſolution of the following problem: to find the expectation of two joint Lives, that is, the time which two Lives may expect to continue together in being.

For this, the rule is, from one half of the ſhorteſt complement ſubtract the ſixth part of its ſquare divided by the greateſt complement, the remainder will expreſs the number of years ſought.

Thus, ſuppoſing a Life of 40, and another of 50; the ſhorteſt complement will be 36; the greateſt 46; $\frac{1}{2}$ of the ſhorteſt will be 18; the ſquare of 36 is 1296, whereof the ſixth part is 216, which being divided by 46, the quotient will be $\frac{216}{46} = 4.69$; and this being ſubtracted from 18, the remainder 13.31 will expreſs the number of years due to the two joint Lives.

LIFTING-*pieces*, in a clock, are thoſe parts which lift up and unlock the detents in the clock part.

LIFTS, in a ſhip, ropes belonging to the yard-arms of all yards. Their uſe is to ſtop the yard-arms, i. e. to make the end of the yards hang higher or lower, as occaſion ſerves.

LIGHT (*Dict.*)—It is evident that the intenſeneſs of the ſun's Light, falling upon any given ſurface, is greater or leſs, according as his rays fall in greater or leſs quantity; or, in other words, any ſurface is more or leſs illuminated, according as the light falls thicker or thinner upon it; now, that this denſity of the ſun's Light is reciprocally, as the ſquares of the diſtances of the illuminated bodies from the ſun, is thus demonſtrated: let S (*Plate* XLI. *fig.* 10, in the Dictionary) be the ſun ſending forth rays of Light every way round, in the ſtraight lines S A, S B, S C, S D, &c. all theſe rays, at the diſtance S *a*, are ſpread uniformly over the ſpherical ſurface *a b c d e*; at the diſtance S A, the ſame rays are ſpread uniformly over a larger ſpherical ſurface A B C D E; the Light then muſt be as much thinner upon this larger ſpherical ſurface than it is upon the ſmaller one, as the larger ſpherical ſurface is greater than the ſmaller one: now the ſurfaces of ſpheres are as the ſquares of their diameters; that is, the ſpherical ſurface A B C D E is to the ſpherical ſurface *a b c d e*, as the ſquare of S A is to the ſquare of S *a*: therefore the Light at A is to the Light at *a*, as the ſquare of S *a* is to the ſquare of S A: which was to be proved.

The prodigious velocity of Light has always been looked upon as one of the greateſt difficulties attending the Newtonian ſyſtem. This difficulty the learned Dr. Knight has attempted to remove, by ſuppoſing that Light is propagated by the progreſſive motion of a repellent fluid; and has ſhewn that all the phænomena of Light and colours will be the ſame, whether we ſuppoſe the propagation of Light performed by a progreſſive motion of its particles, or by the vibrations of a repellent fluid. See REPELLENT *Fluid*.

For, ſays this ingenious author, it makes no difference, in reſpect to the action of a body impinging upon another, whether the impinging body has moved already through a great ſpace, or is only juſt put in motion, provided the velocity and direction be exactly the ſame in both caſes. Therefore a particle of Light will ſtrike upon the retina of the eye with the very ſame effect, when it receives its motion from the next contiguous particle, as when it has moved all the way from the ſun, with the ſame direction and velocity. And it is much eaſier to comprehend how a tremor may be propagated from one end of a ſeries of elaſtic bodies to the other, in the ſame time that Light takes up in coming from the ſun to us, than to conceive how a particle of Light can continue its motion and direction unaltered, through ſo vaſt a ſpace, and with ſo great a velocity; whilſt innumerable other particles are everywhere moving in different and often contrary directions. Is it poſſible that it can move ſo far, and not frequently impinge upon other particles, when every minute part of ſpace muſt contain thouſands of them? What confuſion muſt neceſſarily ariſe in the direction of its motion from ſuch a variety of percuſſions! But, ſuppoſing the motion propagated through our repellent fluid, theſe difficulties immediately vaniſh. In that caſe, the motion may be conveyed in all directions at once, without danger of confuſion; becauſe, as before obſerved, the motion of the intermediate particles from their places will be inconſiderable; and from the nature of percuſſion, amongſt equal elaſtic bodies, one particle is no ſooner removed from its place, but the particle which removed it, takes poſſeſſion of the ſame, and remains there at reſt. The moſt obvious objection to this doctrine is, that in a repellent fluid a particle in motion will not only act upon the next that lies exactly in the direction of that motion, but alſo upon all thoſe that are placed but a very little way out of that direction; and by this means ſeveral other vibrations will commence, which will be communicated in ſuch directions as correſpond with the degrees of obliquity with which the particles act: whereby Light will not only be propagated from one body to another, in right-lines, but will at the ſame time be communicated ſide-ways, in almoſt all directions. And this will not only create confuſion in regard to viſion, but alſo make it impoſſible that there ſhould be any darkneſs in the night. To this I anſwer, that, even granting a particle of the repellent fluid will act upon ſuch particles as lie but a little way out of the direction of its own motion, yet it will not act on them with the ſame force as it does on thoſe directly in its way; therefore theſe lateral vibrations will be much weaker than the direct ones, which give us the ſenſation of Light: however, though theſe vibrations may be too weak for our organs, yet they may be well enough ſuited to the delicate ſtructure of the eyes of many inſects and animalcula, and even of ſome larger animals; for doubtleſs what is darkneſs to us, is not ſo to many of them. The ſame thing happens in regard to ſounds: for, if all the vibrations of the air were capable of affecting our organs of hearing, there could be no ſuch thing as ſtillneſs or ſilence; becauſe the particles of air muſt be put in continual vibrations in all directions, by every little percuſſion that happens among bodies. All nature is perpetually in motion; and every motion, in ſuch an elaſtic fluid as the air, muſt be attended with a greater or leſs vibration of that fluid. As to the objections that may be drawn from the analogy betwixt the waves in water, and the undulations of an elaſtic fluid, they will be anſwered all at once, by denying the exiſtence of theſe undulations; at leaſt with regard to the propagation of ſound or Light. I will not ſay, that the air is never made to undulate: the winds themſelves have often a wave-like motion; but this is not ſound: a large body in motion through the air may make undulations in it. The oſcillations of a pendulum, or the ſtring of an inſtrument, may do the ſame. But none of theſe are the immediate cauſe of ſound. The moving body, pendulum, and ſtring are all ſilent. Only it generally happens in the laſt caſe, that, whilſt the ſtring performs its oſcillations, its component corpuſcles, being elaſtic, are put into a tremulous motion, which motion they communicate to the circumambient air. Touch the ſtring with a ſoft unelaſtic body, and the tremulous motion of the parts ceaſes. But the ſtring continues to oſcillate for a long time after with as much ſilence as a pendulum.

From the whole of what has been ſaid, I think it is ſufficiently evident, that the effect of Light will in all caſes be the ſame, when its motion is propagated through a repellent fluid, as when it is progreſſive, in the manner that Sir Iſaac Newton has ſuppoſed. So that the whole theory of optics, demonſtrated by that excellent philoſopher, continues the ſame as before. Only one thing, that is of any conſequence, remains to be reconciled, I mean his doctrine of colours. He ſhews the diverſity of colours to be owing to the different momenta of the particles of Light, and ſuppoſes their momenta to differ on account of their different magnitudes. I have ſuppoſed all the particles of Light to be of the ſame ſize. This was done for the ſake of ſimplicity, which muſt always take place, as far as the nature of things will admit. And the momenta of the particles of Light will differ, though their ſizes are the ſame, if Light be propagated by vibrations. For in the ſame manner as the tones in muſic make a difference in ſound, according as thoſe vibrations are quicker or ſlower; ſo the momenta of the particles of Light will differ, according as they vibrate with more or leſs force. A great many will be ready to object, that if the particles of Light are equal, and yet their momenta different, they muſt move with different velocities: and, conſequently, that the red rays will come from Jupiter to us, in leſs time than the blue. I grant the premiſſes, but deny the conſequence: for ſound moves with equal velocities, let the tone be what it will. What I advance may at firſt ſight appear a very great paradox. But it ſeems evident to me, that, in two different ſeries of equal and elaſtic bodies, thoſe of one ſeries may move with greater velocity than thoſe of another, and yet the propagation of motion from one to the other be performed in equal times. *Knight's attempt to demonſtrate that all the phænomena in nature may be explained by two ſimple active principles, Attraction and Repulſion.*

LILIACEOUS, in botany, a term uſed to expreſs the flowers of of some plants, which approach to those of the lily in shape. The characters of a Liliaceous flower are these: it is composed of six leaves, or else of three leaves divided into six, but this is more rarely the case; the pistil, or cup of this flower, always becomes finally a seed vessel divided into three cells.

Of this sort are the flowers of the tulip, hyacinth, asphodel, ephemerum, and the like; many of which, though they less resemble the lily flowers than the others, yet are to be distinguished by this title, because they leave behind them the Liliaceous seed-vessel, which is long, and divided into three cells. *Tourn. Inst.*

LI'LIUM, *the lily*, in botany, the name of a large genus of plants, the characters of which are these: the flower is a sort of bell-fashioned shape, but is composed of six leaves which are more or less expanded and bent back. The pistil stands in the center of the flower, and finally becomes an oblong and trigonal fruit, which is divided into three cells, and contains a number of marginated seeds, arranged in a double order one on another. To this it is to be added, that the root is of a bulbous form, and is composed of a number of fleshy scales affixed to an axis.

All sorts of lilies and martagons are propagated by sowing their seeds; and, if the seeds are carefully saved from good flowers, the martagons very frequently afford very beautiful varieties.

The manner of sowing them is this: some square boxes should be provided of about six inches deep, with holes bored in the bottoms to let out the wet; these must be filled with fresh light sandy earth, and the seeds must be sown on them pretty thick in the beginning of August, soon after they are ripe, and covered over about half an inch deep with light sifted earth of the same kind. They should be then placed where they may have the morning sun; and, if the weather prove dry, they must be watered at times, and the weeds carefully picked out. In the month of October, the boxes are to be removed to a place where they may have as much sun as possible, and be secured from the north and north-east winds. In spring the young plants will appear, and the boxes are then to be removed into their former situation; they should be watered at times during the summer, and in August the smallest roots are to be emptied out of these boxes, and strewed over a bed of light earth, and covered with about half an inch depth of light earth sifted over them; they must here be watered and shaded at times, and defended from the severity of the winter, by a light covering of straw, or pease-haulm, in the hardest weather. In February the surface of the bed should be cleared, and a little light earth sifted over it. When the leaves are decayed, the earth should be a little stirred over the roots, and in the month of September following a little earth sifted on. In the September of the following year, the roots must be transplanted to the places where they are to remain, and set at eight inches distance, the roots being placed four inches below the surface: this should be done in moist weather. They will now require the same care as in the preceding winters; and, the second after they are transplanted, the strongest roots will begin to flower. The fine ones should then be removed at the proper season into flower-beds, and planted at great distances from one another, that they may flower strong. *Miller's Gard. Dict.*

The roots of the white lily are emollient, maturating, and greatly suppurative. They are used externally in cataplasms for these purposes with success. The common form of applying them is boiled and bruised; but some prefer the roasting them till tender, and then beating them to a paste with oil, in which form they are said to be excellent against burns. Gerard recommends them internally in dropsies.

Water-Lily. See Nymphæa.

LI'MBERS, in artillery, a sort of advanced train joined to the carriage of a cannon upon a march. It is composed of two shafts wide enough to receive a horse betwixt them, which is called the fillet horse; these shafts are joined by two bars of wood, and a bolt of iron at one end, and have a pair of small wheels; upon the axle-tree rises a strong iron spike, upon which the train of the carriage is put. But, when a gun is upon action, the Limbers are run out behind her.

Limber-*holes*, in a ship, are little holes cut through her floor timbers, serving to let the water to the well of the pump, which otherwise would lie between those timbers where the keel rope runs.

LIME (*Dict.*)—Lime makes the greatest improvement upon light sandy lands, or upon a dry gravel: but a cold clay is seldom much benefited by it. If it be mixed with dung, or with mud drawn from the bottom of rivers, it makes an excellent mixture, especially where the soil is very sandy; and in Westmoreland they procure fine crops of barley from their sandy lands, by manuring them with Lime and cow-dung mixed together. The nature of Lime on land is like that of chalk, it works downwards, as the farmers express it; it is therefore best to treat it in the same manner, laying it upon a lay the year before it is to be plowed up. Lime is reckoned to make corn grow with a thick husk; but it is not a lasting manure, seldom holding for more than five crops. When Lime is used to land which lies upon a descent, it should be mixed with dung, and laid principally on the higher part of the land; the consequence of which will be, that the rain will wash out the virtue of the Lime and dung together, and carry the whole to the lower parts, as it runs down. Dung and Lime mixed together will do better for any land, than either of them alone.

Lime is made of chalk, or of any stone, that is not too cold, or sandy, as free-stone, and the like. All the soft stones that are of a tolerable close texture, will burn to good Lime, as will also marble, slate, sea-shells, corals, and flints; but this last kind of stone is more difficult to be burnt to Lime than the others, except in a reverberatory kiln, for they are apt to run to glass. The harder the stones of which Lime is made, the better the Lime is; and, when it is made of chalk, that is much better which is made of the hard stony kind, than that which is made from the soft; but, the harder the stones are, the more fire is required to burn them: both sorts may be burnt with wood, coals, turf, or fern, which makes a very fierce fire. The kilns used for chalk, or stone, they commonly make in a large pit, which is dug either round or square, according as they have convenience; and is of such a size, as will be proper for the quantities they intend to burn. They are widest at the top, and narrower, by degrees, as they come nearer the bottom. The inside of this pit is lined with a wall built of Lime-stone; at the outside, near the bottom, they have a hole, or door, by which they take out the ashes, and, above that, some have an iron grate, which comes close to the wall all about it: but others arch it over with stone, or large pieces of chalk; and upon this they lay a layer of stone, or of whatever else they burn in the pit; upon this they place a layer of wood, or coals, and so on, layer over layer, to the top of the pit; only they observe, that the outermost layer be always of the fuel, not of the stone. When the kiln is thus filled, they give fire at the hole underneath, and the Lime is finished in a different time, according to the nature of the substance. That made of chalk is commonly burnt into Lime in twenty-four hours; but Lime stone generally takes sixty hours in burning. Ten bushels of sea-coal, or one hundred of faggots, three feet long, will burn forty bushels of chalk, and this will yield thirty bushels of unslaked Lime. Where chalk is scarce, they work up the chalk rubbish into a sort of stiff paste with water, and make it into a sort of bricks, which they dry in the air, and then burn them into Lime in the common way; but this is not quite so good as the other. Hot Lime taken out of the kiln, and mixed into a very soft paste with water, and then mixed with sand, makes a kind of mortar very much superior to the common sort. *Mortimer's Husbandry.*

All Lime is a very good manure, but that made of stone is much better than what is made of chalk. The common allowance is a bushel to a pole square, or a hundred and sixty bushels to an acre.

This they cover with earth, and so leave it till the rains fall and slake it, and after that they spread it as evenly as possible upon the ground. They always find that, if it be carried hot out of the kiln, and laid upon the land to cool, it does much better than in any other way.

The improvement it makes upon land is owing chiefly to its heat, and the salt it contains. It is in much the same manner that coal-ashes and the soot of coal become useful upon the like sort of lands; but the farmers always find that a mixture of good earth and Lime, that has lain a considerable time together, is better for this purpose than fresh Lime alone. *Morton's Northampt.*

Lime-*galls*, in natural history, a sort of galls or vegetable protuberances, formed on the edges of the leaves of the Lime-tree in spring-time; they are very common in the plantations of Limes, and are irregularly shaped, but usually oblong and rugged, and of a reddish colour; they occupy only the edges of the leaves, and are of a red colour, sometimes very beautiful. As these are very plentiful, Mr. Reaumur was of opinion, that they might be of service in the dying trade; he made trial by rubbing them on some parts of his linen, and found that they gave a very beautiful red colour, which did not come out in the first washings afterwards. It is extremely probable, that there wants only inquiry to prove that we have many valuable productions of this kind, which, though disregarded at present, might prove of great use in the several mechanical arts as well as in medicine.

These galls of the Lime leaves are formed by a worm, which inhabits them during its term of life, being found in them of all sizes, from the most minute to that of the full growth, which is about half an inch in length; but, when its period of life, as a worm, draws near, it deserts this habitation, and goes elsewhere to pass into its chrysalis state. This also is the case with the worms that inhabit many galls, which are frequently found to contain them in the worm state, but never in that of the chrysalis, which they always pass into elsewhere. *Reaumur's Hist. Inf.*

Lime-*tree*.—The several species of the tilia, or Lime-tree, are all easily propagated by layers, which in one year will take good root, and should then be removed to the nursery, planting them at four feet distance in rows, and the plants two feet asunder in each row. The best season for removing them is Michaelmas. They should remain four or five years in the nursery, and should afterwards be removed to the places where

where they are to remain. The foil they love beft is a ftrong fat loam, in which they will grow very faft. *Miller's Gard. Dict.*

LI'MMA λεῖμμα, *refiduum*, in the antient mufic, is the difference of the diatefferon and the ditonus. It is expreffed by $\frac{243}{256}$.

LI'MON, the lemon-tree, in botany, a genus of trees whofe characters are thefe:

It hath large ftiff leaves like the citron, without any appendage at the bottom; the flower confifts of many leaves which expand in form of a rofe: the fruit is almoft of an oval figure, and divided into feveral cells, in which are lodged hard feeds furrounded by a thick flefhy fubftance, which, for the moft part, is full of an acid juice.

All forts are propagated by budding or inarching them either on ftocks of lemons or citrons produced from feeds, but they will not fo readily unite on orange ftocks; for which reafon the citrons are preferable to either oranges or lemons for ftocks, as they readily join with either fort; and, being of larger growth, caufe the buds of the other forts to be much ftronger than if they were on ftocks of their own kind.

The culture of the lemon being the fame with that of the orange-tree, it would alfo be needlefs to repeat it here: therefore I fhall only obferve, that the common lemons are fomewhat hardier than the oranges, and will bring their fruit to maturity with us better than they will do, and require to have a greater fhare of frefh air in winter; for which reafon they fhould always be placed nearer to the doors or windows of the green-houfe: and in fome curious gardens thefe trees have been planted againft walls, where, by covering them with glaffes in winter, and protecting them from fevere froft, they have produced plenty of large fruit: as thefe trees do generally produce ftronger fhoots, fo they require more water to be given them than the orange; but, as to the tender forts, they muft be treated with a little more care, otherwife their fruit will fall off in winter, and come to nothing. See the article ORANGE in the Dictionary.

LIMO'NIUM, *fea-lavender*, in botany, a genus of plants whofe characters are:

It hath a fibrous root; the ftalks are naked and branched; the cup of the flower is long and tubulofe, but expanded at the top; the flower in fome fpecies confifts of one leaf, but in others of feveral, and is fhaped like a clove-gilli-flower: the pointal, which arifes out of the flower-cup, becomes an oblong fruit, wrapped up in the flower-cup, as in an hufk.

LIN'ARIA, *toad-flax*, in botany a genus of plants whofe characters are thefe:

The leaves are oblong, and produced alternately on the branches: the cup of the flower confifts of one leaf, which is divided into five long acute fegments; the flower, which confifts of one leaf, is of an anomalous perfonated figure, ending in a tail behind, and in the fore-part divided into two lips, of which the upper is cut into two or more parts, and the under into three: the ovary (which rifes from the center of the flower-cup) becomes a roundifh fruit or hufk, divided into cells or apartments by an intermediate partition, and full of feeds, which are fometimes flat and bordered, fometimes cornered and roundifh, adhering to the placenta.

LINA'RIA, in zoology, the name of the linnet, a genus of birds, of which there are feveral fpecies. The general characters of the genus are thefe: the birds of it are fomewhat fmaller than the chaffinch; their general colour is a greyifh brown; their tail is a little forked, the outer feathers of it having white extremities; they all fing very fweetly. We have in England four fpecies of this bird. 1. The common brown linnet, well known to every one. 2. The Linaria rubra major, or greater red-headed linnet. This has a fine red head, a grey neck, a dufky reddifh brown back, and its breaft and belly are fomewhat reddifh. The female of this fpecies, however, has no rednefs on its head, or breaft, but has fomewhat of a greenifh caft among the brown of her back, and is yellowifh on the breaft, with fome brownifh fpots. 3. The Linaria rubra minor, or leffer red-headed linnet. This is fmaller than the former, and on the back is of the fame colour with the common linnet. The back part of its head is red, as is alfo its breaft, but the lower part of its belly is whitifh. In this fpecies the female, as well as the male, has a red head, and both have their beaks much fharper, and their feet and legs blacker than in the larger kind. This alfo is a gregarious bird; the larger kind commonly flies fingle. 4. The laft fpecies is the Linaria montana, or mountain linnet. This is the largeft of all the linnets. Its beak is very fmall; its head and back are of the fame colour with thofe of the common linnet, and the feathers of the breaft and belly are black in the middle, and edged with a whitifh colour. The rump is of a fine and beautiful red, and is the only part of the bird which is fo. This is common in Derbyfhire, but feems not fo frequent in other places. *Ray's Ornitholog.* See LINNET.

Angling LINE.—The beft materials for making thefe Lines are fine and even horfe-hairs: the hair fhould be round and twifted even, for that greatly ftrengthens it; and all the hairs fhould be of an equal bignefs, or as nearly fo as may be. They fhould be laid in the water about a quarter of an hour after twifting, that it may be feen which will fhrink: they are then to be twifted over again. In this laft twifting fome intermingle filk among them, but that is not fo well. The beft colours for a Line are forrel, white, and grey; the two laft are beft for angling in clear waters; the former in muddy ones. The pale watery green is alfo a very good colour, and may be made thus: boil in a quart of alum water a large handful of marygold flowers; there will arife a fcum, which muft be taken off; then add to this liquor copperas and verdigreafe, of each half a pound, beat to powder together; boil thefe up together; then put the hair into this liquor, and let it lie ten or twelve hours; it will obtain a watery bluifh green colour, which will not wafh out afterwards.

LINES, in heraldry, the figures ufed in armories to divide the fhield into different parts, and to compofe different figures.

They are of different forms, and, were it not for this, many arms would be one and the fame; for a chief wavey differs from a plain chief, by the lines which compofe them, and the heralds fhew particular reafons for all thefe different forms of Lines.

LING, in ichthyology, the Englifh name for a kind of fifh, which is a fpecies of the afellus, according to the generality of authors, and is generally called afellus longus. According to the new Artedian fyftem, it is a fpecies of the gadi, and is diftinguifhed by the expreffive name of the gadus, with two fins on the back, with a bearded mouth, and with the upper jaw longeft.

Ling is efteemed, both frefh and cured, for the table. It is a long-bodied fifh, more approaching to the merlucius or hake than to any other fpecies. It is covered with very fmall fcales which are fcarce vifible, as they adhere fo clofely to the fkin. The back and fides are of a bluifh or greenifh brown, and the belly white. Its head is flat and large, and its fnout confiderably long. The upper jaw is longer than the under, and both are furnifhed with feveral rows of fhort teeth, and the lower with one range of longer; and in the palate there are a large number of fmall teeth, among which there are four or five large and long ones intermixed. The mouth opens very wide, and in the angle of the lower jaw has a fingle fhort beard. It has two fins upon the back, one near the head, the other not far behind it, and reaching down almoft to the tail. The gill-fins are fmall, the belly fins are placed high, and the tail is not forked. *Ray's Ichthyog.*

LI'NNET, *linaria*, in zoology, the name of a well known finging bird.

It is remarkable of this bird, that when it builds in hedges, and when in furz bufhes on heaths, in both which places the nefts are very common, they are made of different materials. When they build in hedges, they ufe the flender filaments of the roots of trees, and the down of feathers and thiftles; but, when they build in heaths, they ufe mofs, principally, for the outer part, finifhing it within with fuch things as the place will afford. Thefe birds will have young ones three or four times a year, efpecially if they are taken away before they are able to leave their nefts.

When they are intended to be taught to whiftle tunes, or to imitate the notes of any other bird, they are to be taken from the old one when they are not more than four days old; for at this time they have no idea of the note of the old ones, and will readily be taught to modulate their voice like any thing that is moft familiar to their ears, and within the compafs of their throats. There requires more care in the feeding them when they are taken thus young, than when they are left in the neft till nearly fledged; but they will be reared very well upon a food half bread, half rape-feed, boiled and bruifed: this muft be given them feveral times a day. It muft be made frefh every day, and given them fufficiently moift, but not in the extreme. If it be in the leaft four, it gripes and kills them; and, if too ftiff, it is as mifchievous by binding them up.

LI'ON, *leo*, in zoology.—The head of the Lion appears very large, in proportion to its body, and is the moft flefhy of the heads of all the known animals. Its jaw bones alfo are remarkably large. The beaft alfo appears very large, but this is only owing to the great quantity of long hair that covers it, for the fternum is fmaller than that of moft animals of the fame fize. The tail, which is very long, appears alfo of the fame thicknefs all the way, but this is wholly owing to the growth of the hair. The tail itfelf is largeft at the bafe, and thence goes taper to the point; but the hair, being very fhort near its bafe, and continuing to grow longer all the way, as that decreafes in thicknefs, is fo exactly proportioned in this growth, that it always gives the whole tail this regular appearance. See *Plate* XXXII. *fig.* 5.

The long hair that grows about the neck and breaft, and makes what is called the mane of the Lion, only differs from the hair of the reft of the body in length, having no greater thicknefs, or rigidity, like that of the manes of other animals. The claws of the Lion have no cafes, as Pliny pretends that they have, for the animal to withdraw them into in walking; but Plutarch, Solinus, and fome others, are much more in the right, in faying that the Lion draws them up backwards when he walks, and places them clofely among the articulations of the toes.

It is certain that the laft joint but one of every toe in this creature has a peculiarly eafy joint for motion, and by means of of this the laſt joint, with the claw that is affixed to it, are very readily drawn up, and hid upon the foot, and placed wholly out of the way of being hurt in walking. This creature, therefore, does not put the extremities of its toes to the ground in walking, but the termination of each toe, as to its touching the earth, is the joint of the laſt piece with the laſt but one. This drawing up of the laſt joint of every toe, by means of which each claw is hid between the toe it belongs to and the next, is the effect of a ligament, which in its natural ſtate is ſo ſhortened, as to keep them in this poſition; and it is only by the action of a very ſtrong muſcle, that this joint can be pulled downward, when the claws are to be uſed, the ligament beforementioned always drawing them naturally into their firſt poſition again, as ſoon as the force of the muſcle is over.

The Lion has fourteen teeth in each jaw, four inciſores, four canine, and ſix molares. The inciſores are ſmall; the canine are unequal in ſize, two being very large, and two very ſmall; the large ones are an inch and half long, and are the only ones the antients allowed to be canine teeth. The molares alſo are irregular in ſize, the anterior ones being very ſmall, the others large, and terminated by three or four points, forming a ſort of flower-de-luce.

Ariſtotle, Ælian, and others ſay, that the neck of the Lion is all compoſed of one unjointed bone. It appears indeed very rigid in this creature, but it does not proceed from ſo ſtrange a cauſe, but is found owing to this, that the ſpinoſe apophyſes of the vertebræ of the neck are long, and faſtened together by extremely ſtrong and rigid ligaments.

The tongue of the Lion is very rough and rigid, being covered with a great number of prominences of a hard matter, reſembling that of a cat's claws, and nearly of the ſame ſize, the baſe of each being a round fleſhy prominence on the ſurface of the tongue.

The eyes of the Lion are clear and bright, even after the creature is dead. The common obſervation that this creature ſleeps with its eyes open, is founded on this, that it has a very thick membrane lodged in the greater canthus of the eyes, which it can extend over the whole eye upon occaſion, as birds do their membrana nictitans, and thus will have no occaſion to ſhut its eye-lids, in order to exclude the light. It is very remarkable that the common cat has all the ſingular ſtructure of the ſeveral parts as the Lion has, its claws, feet, tongue and eyes, being of the ſame kind, and its internal parts bearing as ſtrong a reſemblance.

The heart of the Lion is greatly larger than that of any other creature of the ſame ſize, being ſix inches long, and four in diameter, in the largeſt part, and terminating in a very ſharp point. The brain is as remarkably ſmall; and, upon the compariſon of this with the great quantity of brain in a calf, and purſuing the obſervation through ſeveral other creatures, as to the proportion of brain they have, it does not appear that a ſmall quantity of brain is a mark of folly, but uſually of great ſubtlety, and of a cruel diſpoſition. *Mem. pour l'Hiſtoire des Anim.*

LION-*puceron*, in natural hiſtory, the name given by Mr. Reaumur to a genus of worms which deſtroy the pucerons in the ſame manner that the formica leo does the ants.

Theſe little inſects are prey alſo to a ſort of worm hatched from the egg of a two-winged fly. This has no legs, and is of ſeveral colours.

Though theſe Lion-pucerons be all hexapodes, yet they are of different origin; ſome being produced from the eggs of a four-winged fly, others from thoſe of a beetle. As the formica leo has two horns, the extremities of which ſerve him by way of mouth, our Lion-puceron has the ſame kind alſo; but as the former of theſe inſects can only move backwards, but is forced to make ſnares for his prey, not being able to hunt it; this creature runs very nimbly in the common way, and ſeizes its prey, without having recourſe to ſuch ſtratagems. The body of the Lion-puceron is longer than that of the formica leo, and is flat; the breaſt is the thickeſt and broadeſt part of it, and from this it gradually tapers off to a point at the tail. It has two legs fixed to the breaſt, the other four to the anterior rings of the body, and, when it moves, the poſterior end of the body ſerves it in the place of a ſeventh leg, for it always bends it downward, and draws it along the ſurface it walks upon. The back of this creature is not ſmooth or gloſſy, but is every-where rough, and full of wrinkles, and ſeems as if every ring of it was compoſed of ſeveral other ſmaller rings.

Mr. Reaumur put twenty of theſe creatures together into a box, where they had no other food, and where they could not eſcape one another, and theſe were very ſoon reduced to three or four. It is eaſy to conceive that a creature, which feeds ſo very faſt, muſt ſoon arrive at its full growth; and this is the caſe with theſe animals, for, within five or ſix days of their being hatched from the egg, they are ready for their final transformation, or the putting on the form of the animals to whoſe eggs they owed their origin. In order to this, the creature leaves the place where he has hitherto fed, and ſeeks the folds of a leaf, or ſome other ſuch convenient receptacle, where it ſpins a web of very fine ſilk, every way ſurrounding its body with it, and, under this cover, paſſes the ſtate of a nymph or chryſalis. The ſilk of this web is not only very ſtrong, but the threads are very cloſely laid together, ſo that it is much firmer than the webs of any of the caterpillar kind. It is of a roundiſh figure, and is ſomewhat ſmaller than a pea.

The eggs of this fly are a very ſingular object, and cannot have eſcaped the eye of any perſon who is converſant among the inſects which live on trees; though, of the many who have ſeen them, perhaps few or none ever found what they really were. It is common to ſee on the leaves and pedicles of the leaves of the plum-tree, and ſeveral other trees, as alſo on their young branches, a number of long and ſlender filaments, running out to about an inch in length, and being of the thickneſs of a hair; ten or twelve of theſe are uſually ſeen placed near one another, and a vaſt number of theſe cluſters are often found on the ſame tree. The end of each of theſe filaments is terminated by a ſort of ſwelling or tubercle of the ſhape of an egg. People who have obſerved theſe, have generally ſuppoſed them to be of vegetable origin, and that they were a ſort of paraſitical plants, growing out of others, as the miſletoe, moſſes, &c. from the oak and other trees. They very much reſemble in figure thoſe ſpecies of mouldineſs, which Malphigi and others have figured under the ſhape of little muſhrooms, only they are much larger than thoſe little plants, and bear the heat of the ſun and other accidents uninjured, which would deſtroy the tender plants of that kind. There is a time, when theſe egg-like balls, which terminate every one of theſe filaments, are found open at their ends, and in this ſtate they very much reſemble flowers; and they are in this ſtate figured by ſome authors, under the name of flowers of a ſingular kind, found on the leaves of the willow. All this, however, is wholly erroneous, and the purſuing the hiſtory of our Lion-pucerons ſhews their true origin to be from the fly of that creature. What theſe authors took for flowers of the willow, were only the eggs of this fly, out of which the young animals had been hatched, and had made their eſcape. The leaves and branches on which theſe eggs are found, are uſually ſeen covered over with the pucerons; and the creature, providing a place where her young ſhall find nouriſhment as ſoon as hatched, places her eggs in the midſt of theſe harmleſs and defenceleſs animals, fixing each on a ſlender pedicle, yet ſufficiently ſtrong to ſupport its weight. If theſe eggs be nicely examined, a worm may be diſcovered in them while yet whole; but the moſt certain way of judging them, is, to put ſeveral of them into a box, in which caſe every one of them is found at a proper time to hatch, and to give an inſect; which, when viewed by the microſcope, appears plainly to be a Lion-puceron in all its parts, and requiring only increaſe in ſize, without any change of ſhape, to be one of thoſe we have already deſcribed, as feeding ſo voraciouſly on the pucerons.

The manner in which the parent fly places her eggs in this ſingular way on the trees, is a ſubject that greatly excited the curioſity of Mr. Reamur. He often watched the animals in vain, in order to ſee them employed in it; and, in fine, ſhut up ſeveral of them in boxes. The conſequence of which was, that they fixed their eggs on long pedicles, to the ſides of the box, in the ſame manner that they before had to the ſides of the branches, or leaves of trees; but he never could find them employed about it. The manner in which he ſuppoſes it done, however, appears very rational, and is as follows: The egg is ſuppoſed, while in the body of the inſect, to be covered with a tough glutinous matter, capable of drying very ſuddenly in the air. The creature, when the egg begins to come forth, applies the extremity of it to ſome ſolid body, as a leaf, or ſtalk of a plant; and, then drawing herſelf away, there follows a thread or filament of this viſcous matter, which is faſtened at one end to the leaf, and at the other to the egg in her body. When ſhe has drawn this out, to an inch in length, ſhe ſtops a moment, and the whole will harden into a ſolid matter; and, on her next motion, will draw out the egg from her body, and will become a pedicle to it. In this condition it will remain till the egg is hatched, and then the young inſect needs only to deſcend downward on the leaf, on which the pedicle is fixed, and it will find itſelf in the midſt of plenty of food. *Reaumur's Hiſt. Inſ.*

LI'ONESS, *leæna*, a female lion. See LION.

The Lioneſs has no mane, or long hairs upon the neck and breaſt, which ſo remarkably characteriſes the lion. The noſe alſo is longer in the Lioneſs, and the head more flatted in the upper part; the claws alſo much ſmaller than thoſe of the male lion. This creature, when full grown, is about three feet high, from the fore feet to the ridge of the back; and about five feet long from the end of the noſe to the inſertion of the tail, which is about two feet and a half long. The claws are of a fibroſe texture, the fibres being very hard in themſelves, but eaſily ſeparable from one another. In other particulars, the Lioneſs very little differs from the lion. See *Plate* XXXII. *fig.* 6.

LIPOTHY'MIA, in medicine, the name of a diſeaſe uſually confounded with the ſyncope, but really different from it in many particulars.

The Lipothymia is a very conſiderable abolition of the vital and animal faculties, at leaſt to appearance: and the ſyncope is a plenary or total abolition of them, as far as appears to us at the time. It is eaſy to ſee, however, that theſe are only two

two different stages of the same distemperature. The lipothymy is sometimes an idiopathic, sometimes a symptomatic disease, and most frequently attends the scurvy, malignant fevers, and other disorders; the syncope is idiopathic, and attacks persons in health as well as those that are diseased. The lipothymy is always easily distinguished from a convulsed state of the body, by this, that the limbs are all flaccid in it. The syncope differs from death only in degree; and the body being flaccid in this, and growing rigid under the last convulsions in death, is the only distinction of them in extreme cases.

Anodyne mineral LIQUOR, the name given by Hoffman to a liquor of his own invention, famous at this time in Germany, and supposed by Burggrave to be made in this manner: take oil of vitriol and Indian nitre, of each four ounces; distil the spirit gradually from this by a retort; pour two ounces of this spirit cautiously and successively into fifteen ounces of spirit of wine highly rectified; distil this, and there comes over a very fragrant spirit. This is to be again distilled, to render it perfectly pure, adding first to it a small quantity of oil of cloves, and a quantity of water, equal to that of the spirit; after this, as soon as the watery vapours begin to arise, the whole process is to be stopped, and the spirit kept alone in a bottle well stopped. This has great virtues, as an anodyne, diaphoretic, antiseptic, and carminative. It is not certain, that it is exactly the same with Hoffman's, that author having never published his manner of making it; but it appears the same to the smell and taste, and has the same virtues.

LI'QUORICE (*Dict.*)— The ground designed for Liquorice must be well dug, and dunged the year before, that the dung may be thoroughly rotted in it; and, just before it is planted, the earth is to be dug three spades deep, and laid very light. The plants to be set should be taken from the sides or heads of the old roots, and each must have a very good bud, or eye, or otherwise they are subject to miscarry; they should also be about ten inches long, and perfectly sound. The best season for planting them is the end of February, or the beginning of March, and this must be done in the following manner: the rows must be marked by a line drawn a-cross the bed, at two feet distance; and the plants must be set in these by making a hole of their full depth, and something more, that the eye of the root may be an inch below the surface: they must also be set two feet distance from each other in the rows. When this is done, the ground may be sowed over with onions, which, not rooting deep, will do the Liquorice roots no injury for the first year. In October, when the stalks of the Liquorice are dead, a little very rotten dung should be spread over the surface of the ground. Three years after the time of planting, the Liquorice will be fit to take up for use; and this should be done just when the stalks are dead off; for, if taken up sooner, the roots are very apt to shrink greatly in their weight. The roots about London look browner than those which have been propagated in a less rich soil, but then they are much larger, and grow quicker to their size. *Miller's Gard. Dict.*

LIS, *or Notre Dame de Lis*, an order of knighthood of Navarre, instituted, in 1408, by Garcius IV, king of Navarre, upon occasion of an image of the blessed virgin found in a flower-de-luce at Nagera, and whereof he declared himself and his successors the sovereigns. The order consisted of 38 knights, of noble extraction, that took a vow to oppose the Moors, the enemies of the kingdom. They wore upon their breasts an embroidered flower-de luce of silver, and, on solemn festivals, a collar, interlaced with divers Gothic M's, with a flower-de-luce of gold, enamelled white, and springing from a green plat, hanging at the end of it, and a great M over it. *Favin. Hist. de Navarre, & Theatr. de Honneur & de Cheval.*

LI'TÆ, Λιται, according to Homer, are goddesses, the daughters of Jupiter, whose office was to procure for men the good things they desired either of God, or of other men. Homer represents them to be lame, squint-eyed, and wrinkled, the allegorical meaning whereof is not to be rejected. These Litæ are nothing else but our prayers and supplications; for that is the signification of the Greek word λιτη, whence comes the word λιτανεια, or litany, and the Latin word litare, which imports the offering up an acceptable service or prayer to God. Now our prayers are represented lame, to denote, that God doth not immediately grant men their desires, and therefore the need we have of fervour and perseverance in our prayers; they are squint-eyed, to represent the corrupt and selfish respects of our prayers, as in them we commonly do not purely and directly regard the glory of God; and they are wrinkled and shrivelled, to set out to us the weakness, staggerings, and doubtings wherewith they are accompanied, as commonly wanting the strength, vigour, and liveliness of faith. If we would apply this picture of prayer to those petitions we address to men, they also are lame, to declare to us the difficulty we have to approach persons of whom we would desire any favour or kindness. They are squint-eyed, by reason of the dissimulations, flatteries, by-ways, and sinister respects we are fain to make use of, to obtain of them what we desire; and they are wrinkled, to give us an idea of the trouble, disappointment, grief, and vexation it costs us, either before we can resolve to desire any thing of men, and, when we have desired it, before we can obtain it.

LITHAN'THRAX, in natural history, is used as the name of the common pit-coal

LITHI'DIA, in natural history, the name of a large class of fossils, including the flint and pebble kinds.

LITHO'LABON, a name given by some chirurgical writers to an instrument used in the operation of lithotomy; it is a forceps intended for taking hold of the stone.

LITHONTRI'PTICON *Tulipii*, the name of a famous diuretic medicine, invented by Tulipus, and given with great success in cases of the stone, but requiring great judgment and caution in the administring it.

The preparation is this: take a drachm of cantharides without their wings, and a drachm of lesser cardamoms without their husks; powder them fine, and pour upon them an ounce of rectified spirit of wine, and half an ounce of spirit of nitre: set them to infuse, without heat, for five or six days, stirring them from time to time. The phial must not be stopped close; because, if it be, the continual fermentation will burst it. The dose is from fourteen to fifteen, or twenty drops, in a glass of wine and water; it is to be taken in a morning, an hour after the eating a mess of broth, and may be repeated for three or four days.

It is remarkable, that this mixture never ceases fermenting for many years; but, if it be too fast corked, will break the glass; if but slightly stopped, it only throws out the cork with an explosion. *Mem. Acad. Par.*

LITHO'PHYTON, *coral*, in botany; see CORAL.

LITHOPHO'SPHORUS *fublensis*, in natural history, a name given by some authors to a species of spar, which, when it has been heated over the fire, retains a property of giving light in the dark. This is a quality that seems more or less in degree to be inherent in several sorts of spars.

LI'TTER.—When a horse comes tired into a stable, fresh Litter has the virtue always to occasion him immediately to stale. This is known to be a very great advantage to a horse in a tired state; and when the Litter is old and dirty, it never has any such effect upon him. If the owner knew how refreshing it is to a horse to discharge his urine on his return from labour, they would be more careful in giving him all means and occasions of it than they do. This staling, after fatigue, prevents those obstructions in the neck of the bladder or urinary passages, which horses are subject to; the bladder being often inflamed by the long retention of the heated urine in it, and the creature perishing by it. Some of our farmers act wrong in this case of the Litter, not through carelessness or accident, but by principle; they order the old Litter to be left a long time in the stables, that it may be impregnated with more and more of the urine, &c. of the animal, and be made richer for the fields. It is not to be doubted but the manure is greatly improved by this; but the damage done to the horse, by it, is greatly over-proportioned to the benefit. The heat which the dung acquires, by thus lying together, spoils the feet of the creature, and makes it unfit for any service, and occasions many distempers, which are ignorantly continued and increased by the continual addition of heat in the fermenting dung, till at length the horse perishes.

LI'VER (*Dict.*)— From the structure of the Liver, duly considered, it will be easy to understand the distempers to which this organ is subjected in a particular manner: the first, and most acute of these, is an inflammation, called hepatitis; which, perhaps, occurs more frequently than is generally apprehended; but, however, not so often as one would be subject to imagine, from the conformation of the part, unless it were considered, that the hepatic artery is not very large, and, therefore, cannot convey to the Liver a great quantity of blood; and that the force of the blood, circulating through the ramifications of the vena portæ, is not so considerable as to subject this organ very much to inflammations.

An inflammation of the Liver is seated in the extremities of the ramifications of the vena portæ, or hepatic artery; and it is evident, from the disposition of these vessels, that an inflammation in either of them must soon be succeeded by one in the other.

The antecedent causes of both these species of inflammation are the same as the general causes of inflammations (see INFLAMMATION) determined to this organ. But there are other causes, which are local, and relate more immediately to the particular part: thus an extraordinary degree of fatness, in the omentum, may raise an inflammation in the Liver, not only by compressing it, but this fat may also dissolve by exercise, motion, and heat, and, being absorbed by the vessels, and conveyed to the Liver in too large quantities, may there cause an inflammation.

This effect may, also, be produced by an atrabilarious temperament of the blood or bile; for when such a temperament is induced by an intimate union of the earth and oil, and a dissipation of the spirituous and aqueous particles of the blood or bile, either of these humours become subject to form concretions and stagnations in the minute extremities of the branches of the hepatic artery, or vena portæ.

The Liver, also, suffers from disorders in remote parts of the body; for, if acrimonious pus, ichor, or a scorbutic sanies, is deposited in any other organ or member, these, upon the accession of heat, a fever, violent motion, an improper diet, ill-

ill-applied medicines or poisons, are colliquated, moved, returned into the circulation, and, by this means, conveyed to, and deposited in, the Liver.

Besides these causes, the bile, when pinguious, acrimonious, and exalted, or what the ancients called adust, if put in motion by adequate causes; a stone, chalky concretions, a scirrhus, callus, steatoma, abscess, or worms, occupying any part of the Liver, gall-bladder, or biliary ducts, upon the accession of any cause sufficient to put them in motion, by compressing the small ramifications of the hepatic artery and vena portæ, excite therein an inflammation.

Cold, also, applied to the Liver, when, by any means overheated, contracts the vessels, inspissates the fluids, and thus produces an immediate inflammation; and this cold has much the same effect, whether it is applied by means of the air, liquors drank, or bathing.

An abstinence from diluting liquors, during excessive motion, great heat, and profuse sweating, will also cause an inflammation of the Liver; for, when the blood is deprived of its aqueous parts, without a fresh supply, it becomes thick, and, consequently, inclining to stagnate in the capillary vessels. Abstinence, likewise, especially from drink, in burning fevers, will, for the same reason, produce a like effect: and the same disorder may be brought on by violent passions and perturbations of the mind, which induce spasmodic strictures in the vessels of the Liver, and an irregular circulation; as it frequently happens, in some degree, during hysteric disorders, as Sydenham remarks.

Among the causes of an inflammation in this organ, excessive motion, excited by emetics, must, farther, be reckoned as one; for, by these, some vessels in the Liver may be ruptured; or the blood, contained in all the abdominal viscera, may be impelled with violence into the vena portæ, and thence being conveyed, in too large quantities, into the Liver, or too forcibly, or both, in either case excite an inflammation.

Lastly, inveterate hypochondriac disorders will produce inflammations of the Liver.

The effects of inflammations of the Liver, arising from any of these causes above specified, are various, and determined by the various preceding dispositions of the Liver, the variety of the matter which is moved and fixed upon the Liver, the material cause of the inflammation, and the different causes which excite the matter to action, and impel it upon the Liver.

When the case is only a simple inflammation, the small vessels are obstructed; and, in consequence of this, the fluids, which ought to circulate through them, are stopped in the part: hence a tumor arises, which compresses the adjacent parts, and, by that means, propagates the tumor to them; thus it proceeds, till almost the whole organ is affected, which then compresses the stomach, and is again compressed by the stomach when full; which compression is attended with pain in the inflamed Liver. It also affects the diaphragm, and sometimes excites pain and inflammation in that part by compressing it, on account of its near situation. Besides, all the blood received by the cœliac artery, and the two mesenteric arteries, is intercepted and stopped at the Liver; and, in consequence of this, the circulation of all the venous, arterial, and lymphatic fluids, in the principal viscera of the abdomen, is utterly obstructed; and the generation, secretion, excretion, and circulation of the bile are entirely hindered. Hence a jaundice is produced, with all its consequences; putrefactions of the abdominal viscera, together with their contained fluids; and a great number of ill consequences, which are obvious; for the uses of the bile, and the functions of the parts are thus destroyed.

LI'VERWORT; see LICHEN in the Dictionary and Supplement.

LIXI'VIUM *martis*, a new form of medicine introduced into practice in the late London Dispensatory. The manner of preparing it is to set the matter remaining in the retort after the subliming the flores martis, in a damp place, where, by means of the moisture of the air, it will run into a liquor. *Pemberton's Lond. Dis.*

LIXIVIUM *tartari*, the name given in the London Dispensatory to the liquor called, by most authors, oil of tartar per deliquium. This is made of tartar which is to be calcined to a whiteness, and then set in a damp place, where it will liquify by the moisture of the air. The liquor thus procured is more pure, than if the calcined tartar were dissolved directly in water. *Pemberton's Lond. Dis.*

LI'ZARD *lacertus*, in zoology, the name of a large genus of animals, comprehending all those quadrupeds which are oviparous, and have long tails continued from their bodies. The term oviparous is to be understood however in a larger sense, expressing some among these, which, though they have true and proper eggs within them, yet never deposit them as such, but keep them in their bodies till they are hatched, and bring forth living young ones. Some of the serpents, as well as some of the Lizards, are of this kind, and the observation is as old as Aristotle, who calls the creatures, whose generation is of this kind, internally oviparous, externally viviparous. *Ray's Syn. Quad.*

LOAD, in mining, is used, especially in the tin mines, for a vein of ore.

In Cornwall and Devonshire the Loads all hold their course from eastward to westward, though, in other parts of England, they frequently run from north to south. The miners report, that the sides of the Load never bear in a perpendicular, but always over-hang either to the north or south. The mines seem to have been so many channels, through which the waters pass within the earth, and, like rivers, they have their small branches opening into them, in all directions; these are by the miners termed the feeders of the Load. Most mines have streams of water running through them, and, when they are found dry, it seems owing to the water having changed its course, which it seems sometimes to have been compelled to by the Load's having filled up the course, and sometimes to have fallen into other more easy channels. *Philos. Transact.* Nº. 401.

LOAM, in husbandry, a common superficial earth, that is a mixture of sand and clay, commonly of a yellowish colour, though there is some Loam that is blackish. Some call Loam the most common superficial earth met with in England, without any regard to the proportion it bears to sand or clay; but most generally the appellation of the Loam is applied to a soft fat earth, partaking of clay, but easy to work.

It is found by experience, that plants of all sorts will grow in it; and, where-ever it is found, it appears to be a more beneficial soil to plants than any other. A clay used in grafting is also called Loam.

LO'CKSPIT, among miners, is the small cut or trench made with a spade of about a foot wide, to mark out the first lines of a work.

LO'CRIAN, in ancient music, the seventh species of the diapason. It was also called hypodorian and common.

LOCU'LAMENTS, in natural history, little distinct cells, or partitions, within the seed-vessels of plants.

LO'CUSTS, *locustæ*, a genus of insects, comprehending the Locust, simply so called, the several species of other Locusts and grasshoppers, with the crickets of the house and field.

Willughby observes, that in these animals there are always more males than females, which is contrary to the order of nature in other insects, where the females are much the most numerous; and Swammerdam observes, that it is only the males that make a noise, which he says they do by a swift vibration of their wings, either against one another, or against their legs.

The nympha, or worm of the Locust, scarce at all differs from the creature in its perfect state. It moves and eats in the nymph state, and all the visible difference is, that the wings are not expanded as in the perfect Locust, but are gathered up in a small compass, and form four little buttons on the shoulders. Swammerdam observes, that the want of attention to this particular, in former writers, had been the occasion of a very unnecessary multiplication of names; as Aldrovand, Johnson, Mouffet, and others, have described these Locusts in the nymph state under the names of bruchi, attebali, and aselli, supposing them to be so many distinct species of animals. It is observed, that towards the end of summer the males are very tender of the females, three or four of them being frequently seen gathered about one of that sex, and seeming to do her all the kind offices in their power, fluttering about with their wings, and rubbing her with their fore legs. The males are always more brisk and nimble than the females; and, amongst all the kinds of Locusts, there are a great many naturally imperfect; particularly, many have only one hinder leg, yet these hop almost as well as the rest.

The country of the Cossacks or Ukrain is, in dry summers, much infested with swarms of Locusts driven thither by an east or south-east wind. The number of these insects is so great, that they darken the air, and devour all the corn of the country. They lay their eggs in autumn, and then die. It is said that each of these creatures lays two or three hundred eggs, which hatching the ensuing spring, produce such a number of Locusts, that they do far more mischief than before, unless the rains fall, which kill both the eggs and the insects, or unless a strong north or north-west wind arises, which drives all into the Euxine sea. The hogs of the country are fond of these eggs, and devour great quantities of them. In the night, when these insects rest on the ground, they cover it to the height of three or four inches. If a wheel passes over them, they emit an intolerable stench. *Phil. Transf.* Nº. 8.

Water LOCUST, *locusta aquatica*, the name given by authors to a species of water insect, somewhat resembling the Locust kind in shape. It is about three inches long, its tail an inch and a quarter, and its legs are of different lengths; the anterior pair being shortest of all. Its body is slender, and its fore legs are always carried straight forward, so as to reach beyond the head in the form of antennæ. These, as well as the other legs, end each in two claws. The eyes are small and not very prominent, and the upper wings are crustaceous, the under ones membranaceous, thin, and transparent. The middle joint of the leg is such, that the creature can only move them upwards, not downwards; and there runs an acute tongue or

proboscis

proboscis under the belly, as is the case in the water scorpion and notonecta. *Ray's Hist. Inf.*

LOG, in the Jewish antiquities, a measure which held a quarter of a cab, and consequently five sixths of a pint. There is mention of a Log, 2 Kings VI. 25, under the name of a fourth part of a cab. But, in Leviticus, the word Log is often met with, and signifies that measure of oil, which lepers were to offer at the temple after they were cured of their disease.

Dr. Arbuthnot says, that the Log was a measure of liquids, the seventy-second part of the bath or ephah, and twelfth part of the hin, according to all the accounts of the Jewish writers.

To rectify the LOGA'RITHMIC *Curve*. Let it be required to find the length of the Logarithmic arc E *e* (*Plate* XXX. *fig.* 1.) draw the perpendiculars L L A, *e l a*, to the asymptote, and having drawn the tangents E F, *e f*, take A L equal to the excess of the tangent above the sub-tangent A F; and *a l* equal to the excess of the tangent *e f* above *a f*; then having drawn L M, *l m*, parallel to the asymptote, if the difference of the tangents E F — *e f* be added to the difference of the parallels *l m* — L M, the aggregate will be equal to the arc E *e*. *Cote's Harm. Mens.*

LO'GARITHMS (*Dict.*)—Under this article in the Dictionary, we have shewn, that if the infinite root be extracted out of any number, the difference between that root and unity will be the Logarithm of that number.

But because the infinite root of $1-x,^{\frac{1}{n}}$ or $\overline{1-x}\,^{\frac{1}{n}}$, is $1-\frac{1}{n}x-\frac{1}{2n}x^2-\frac{1}{3n}x^3-\frac{1}{4n}x^4$, &c. therefore $\frac{1}{n}$ multiplied into $x+\frac{1}{2}x^2+\frac{1}{3}x^3+\frac{1}{4}x^4+\frac{1}{5}x^5$, &c. will be the Logarithm of the ratio of 1 to $1-x$, or the Logarithm of a number less than unity; and, whereas the infinite index n may be taken at pleasure, the several scales of Logarithms to such indexes will be reciprocally as $\frac{1}{n}$, or the several indices, and if the index be taken 10000000, &c. the respective Logarithms will be, simply,

$$x \mp \frac{1}{2n}x^2 + \frac{1}{3n}x^3 \mp \frac{1}{4n}x^4 + \frac{1}{5n}x^5, \text{ \&c.}$$

Let a represent the least of any two given numbers, and b the greatest, z the sum of the two numbers, and d the difference; and let us suppose the ratio of a to b to be divided into that of a to $\frac{1}{2}z$, and of $\frac{1}{2}z$ to b; that is, into the ratio of a to the arithmetical mean between the two numbers and the ratio of the said arithmetical mean to the greater number b; then, because $\frac{a}{\frac{1}{2}z}\times\frac{\frac{1}{2}z}{b}=\frac{a}{b}$, the log. of $\frac{a}{\frac{1}{2}z}$ + log. $\frac{\frac{1}{2}z}{b}$ = log. $\frac{a}{b}$, or because $\frac{\frac{1}{2}z}{a}\times\frac{b}{\frac{1}{2}z}=\frac{b}{a}$, the log. of $\frac{\frac{1}{2}z}{a}$ + log. $\frac{b}{\frac{1}{2}z}$ = log. $\frac{b}{a}$, that is, the sum of the Logarithms of these two ratio's will be Logarithms of the ratio of a to b; and to find the value of each of these ratio's, in the terms of 1 and $1\pm x$, we must say, $\frac{1}{2}z : a :: 1 : 1-x$, whence $x=\frac{\frac{1}{2}z-a}{\frac{1}{2}z}=\frac{d}{z}$, and again as $\frac{1}{2}z : b :: 1 : 1+x$, whence $x=\frac{b-\frac{1}{2}z}{\frac{1}{2}z}=\frac{d}{z}$ and substituting $\frac{d}{z}$ in the room of x, in each of the former series, we shall have $\frac{1}{n}\times\frac{d}{z}+\frac{d^2}{2z^2}+\frac{d^3}{3z^3}+\frac{d^4}{4z^4}+\frac{d^5}{5z^5}$, &c. for the Log. of the ratio of a to $\frac{1}{2}z$, and $\frac{1}{n}\times\frac{d}{z}-\frac{d^2}{2z^2}+\frac{d^3}{3z^3}-\frac{d^4}{4z^4}+\frac{d^5}{5z^5}$, &c. for the Logarithm of the ratio of $\frac{1}{2}z$ to b; and consequently the sum of these two series $\frac{1}{n}\times\frac{2d}{z}+\frac{2d^3}{3z^3}+\frac{2d^5}{5z^5}$, &c. or $\frac{1}{n}\times 2\times\frac{d}{z}+\frac{d^3}{3z^3}+\frac{d^5}{5z^5}+\frac{d^7}{7z^7}+\frac{d^9}{9z^9}$, &c. will be the Logarithm of the ratio of a to b, whose difference is d, and sum z; whence, to find the Logarithm of any prime number, we have this general rule:

To the given number add 1 for a denominator or divisor, and subtract 1 from the same given number for a numerator or dividend; then, of the vulgar fraction thence resulting, compose all the odd powers thereof, these will form a series of numbers, which being divided by their respective exponents, viz. 1, 3, 5, 7, 9, &c. will produces a series of quotients, whose sum will be the natural Logarithm of the number proposed, according to Neper's form.

This rule is not only very easy to be retained in the memory, but very proper for the practice of making Logarithms, which it performs with very great expedition, as will appear hereafter; and is so very plain that it may be taught to persons of a mean capacity.

It was first published by Mr. James Gregory, in a treatise of his, written by himself, and printed in the year 1668, wherein that excellent geometrician has shewn the analogy between the Logarithms and certain hyperbolic spaces, and by shewing us how to square the one, has taught us how to construct the other; and the truth of the same law has long since that time been demonstrated independent of the hyperbola, from a consideration of the properties of the Logarithms only, and by the help of Sir Isaac Newton's general theorem, for extracting of roots and raising of powers.

Let it be required to find the Logarithm of 2, the first prime number.

Because $a=1$, and $b=2$, therefore, $d=b-a=2-1=1$, and $z=a+b=1+2=3$; wherefore $\frac{d}{z}=\frac{1}{3}$, and $\frac{d^2}{z^2}=$:

Hence $\frac{1}{3}+\frac{1}{3}\times\frac{1}{27}+\frac{1}{5}\times\frac{1}{243}+\frac{1}{7}\times\frac{1}{2187}$, &c. equal to $\frac{1}{3}+\frac{1}{81}+\frac{1}{1215}+\frac{1}{5209}$, &c. will be the natural Logarithm of 2, and consequently $\frac{2}{3}+\frac{2}{81}+\frac{2}{1215}+\frac{2}{15309}$, &c. will be the Logarithm of the same number in Neper's form, wherefore if the several fractions be added together, and reduced into an equivalent decimal, we shall have the Logarithm of the number given; but because to multiply by $\frac{1}{9}$, and divide by 9, will produce the same effect, if the first fraction be reduced into a decimal fraction, and that be divided by 9, and each successive quotient by the same, we shall have a series of quotients, which being divided by the several co-efficients 1, 3, 5, 7, 9, &c. the sum of these last quotients will give the Logarithm of the number given; and in order to obtain the Logarithm true to any number of places, it is necessary to continue the fraction to one or two more places than the intended number of places the Logarithm is to consist of; so that, to have the Logarithm true to 10 places, it will be convenient to find the value of $\frac{1}{3}$ in decimals to 11 or 12 places.

The operation is as follows.

$\frac{1}{3}$ =	333.333.333.333 =	333.333.333.333	+
$\frac{1}{9}$	37.037.037.037 its $\frac{1}{3}$ =	12.345.679.012	+
$\frac{1}{9}$	4.115.226.337 its $\frac{1}{5}$	823.045.268	—
$\frac{1}{9}$	— 457.247.371 its $\frac{1}{7}$	— — 65.321.053	
$\frac{1}{9}$	— 50.805.263 its $\frac{1}{9}$	— — 5.645.029	+
$\frac{1}{9}$	— 5.645.029 its $\frac{1}{11}$	— — 513.185	—
$\frac{1}{9}$	— 627.225 its $\frac{1}{13}$	— — 48.248	
$\frac{1}{9}$	— 69.691 its $\frac{1}{15}$	— — 4.646	
$\frac{1}{9}$	— — 7.743 its $\frac{1}{17}$	— — 456	—
$\frac{1}{9}$	— 860 its $\frac{1}{19}$	— — 45	+
$\frac{1}{9}$	— — 96 its $\frac{1}{21}$	— — 5	—
The nat. Logarithm of 2 is		346.573.590.280	
		2	
The Neper's Log. of 2 is	—	693.147.180.560	

Hence 346. 573. 590. 280. the natural Logarithm of 2 being doubled, will give 693. 147. 180. 560. for the natural Logarithm of 4; and this again, being doubled, will give 1386. 294. 361. 120, &c. for the natural Logarithm of 16, &c. in like manner 1386. 294. 361. 120. the double of 693. 147. 180. 560. the Neper's Logarithm of 2 will give the Neper's Logarithm of 4, and this again, being doubled, will give 2772. 588. 722. 240. for the Neper's Logarithm of 16, &c.

Again, as the natural Logarithm of 2 being multiplied by 3, will produce 1039. 720. 770. 840. for the natural Logarithm of 8; so the Neper's Logarithm of 2 being trebled, will give 2079. 441. 541. 680. for the Logarithm of 8, &c.

Again, if the Logarithm of 8 be multiplied by the Logarithm of 1 $\frac{1}{4}$, we shall have the Logarithm of 10; and to find the Logarithm of 1 $\frac{1}{4}$, we have given $a=1$, $b=1\frac{1}{4}$, $=\frac{5}{4}$, whence $z=\frac{9}{4}$, and $d=\frac{1}{4}$, and consequently $\frac{d}{z}=\frac{1}{9}$, and $\frac{d^2}{z^2}=\frac{1}{81}$

$\frac{1}{9}$ =	111.111.111.111 =	111.111.111.111	
$\frac{1}{81}$	1.371.742.112 its $\frac{1}{3}$	— 457.247.371	
$\frac{1}{81}$	— 16.935.087 its $\frac{1}{5}$	— — 3.387.017	
$\frac{1}{81}$	— 209.075 its $\frac{1}{7}$	— — 29.868	
$\frac{1}{81}$	— — 2.581 its $\frac{1}{9}$	— — 287	
$\frac{1}{81}$	— — 32 its $\frac{1}{11}$	— — 3	
The natural Log. of 1 $\frac{1}{4}$ =		111.571.775.657	
		2	
The Neper's Log. of 1 $\frac{1}{4}$ =		223.143.551.314.	

As 1039. 720. 770. 840. the natural Logarithm of 8 being added to 111. 571. 775. 657. will give 1151. 292. 546. 497. for the natural Logarithm of 10; so 2079. 441. 541. 680. the Neper's Logarithm of 8 being added to 223. 143. 551. 314. the Neper Logarithm of 1 $\frac{1}{4}$ will give 2302. 585. 092. 994. for the Neper's Logarithm of 10.

As these Logarithms which are called Neper's Logarithms, were those that were first published by Neper the inventor himself, in the year 1614; so these that are called the natural Loga-

Logarithms were those that were published, in the year 1619, by John Spidel, then a professor of mathematics in London, to which they fixed tables of artificial sines, tangents, and secants; but as these being found not so proper for the business as could be wished for, the inventor himself, with the assistance of Mr. Henry Briggs, altered the form, and made the Logarithm of 10 to be 1,0000000000, &c. and not 2,30258509299, &c. that is, he made the number 10 the 10000000000th, &c. term is the series, whence the Logarithm of 100 will be 20000000000, &c. that is, the number 100, will be placed in the 20000000000th place in the series, and the Logarithm of 1000 will be the 30000000000, &c. that is, the number 1000 will be the 30000000000th term in the series, &c. whence the Logarithms of all numbers between 1 and 10 will begin from 0, that is, they will have 0, for the first term towards the left hand, inasmuch as they are each of them less than the Logarithm of 10, which has unity in the first place; in like manner the Logarithm of all numbers between 10 and 100 begin from unity, inasmuch as they are all greater than 1,000000000, &c. and less than 2,0000000000, &c. for the same reason, the Logarithms of all numbers between 100 and 1000 begin from 2, since they are all greater than the Logarithm of 100, which is fixed at 2, and less than the Logarithm of 1000, which is made equal to 3; after the same manner the Logarithms of all numbers between 1000 and 10000 will begin from 3, and the Logarithms of all numbers between 10000 and 100000 will begin from 4, that is, they will have a 4 for the first figure towards the left hand, &c. The first figure of every Logarithm towards the left hand, which is separated from the rest by a point, is called the index or characteristic of that Logarithm, inasmuch as it shews or points out the highest or remotest place of that number from the place of unity in the infinite scale of proportionals towards the left hand. Thus, if the index of the Logarithm be 1, it shews that its highest place towards the left hand is the tenth place from unity. If the index be 2, it shews that its highest place towards the left hand from the place of unity is the hundredth place; and as all the Logarithms that have 1 for their index will be found between the 10th and 100th place from unity, in the order of numbers; so all the Logarithms which have 2 for their index, will be found between the 100th and 1000th place, in the order of numbers, &c. whence the index or characteristic of any Logarithm is always less by one than is the number of figures, which correspond or answer to the given Logarithm.

Now, inasmuch as all scales of Logarithms are made up of similar quantities, it will be easy from any scale of Logarithms whatsoever to form another scale of Logarithms in any given ratio, and consequently to reduce any table of Logarithms into another of any given form, by saying, as any one Logarithm in the given form is to its correspondent Logarithm in the new form; so is any other Logarithm in the given form to its correspondent Logarithm in the required form; and hence we are taught how to reduce either Neper's or the natural Logarithms into the form of Briggs's and the contrary.

For as 2,302, 585, 092, 994, the Neper's Logarithm of 10, is to 1.0000000000, the Brigg's Logarithm of 10; so is any other Logarithm in Neper's form to the correspondent tabular Logarithm in Briggs's form; and, inasmuch as the two first numbers constantly remain the same, if the Neper's Logarithms of any one number be divided by 2.302, 585, &c. or multiplied by 434, 294, 481, 903, the ratio of 1,000,000, &c. to 2, 302, 585, &c. as is found by dividing 1,000,000, &c. by 2302, 58, &c. the quotient in the first case, and product in the last case, will give the correspondent Briggs's Logarithm, and the contrary.

It has been already shewn, that $\frac{1}{n} \times x - \frac{1}{2}x^2 + \frac{1}{3}x^3 - \frac{1}{4}x^4$, &c. equal to $\overline{1+x}^{\frac{1}{n}} - 1$, will be the Logarithm of the ratio of 1 to $1+x$, where n represents an infinite index, and x any number taken at pleasure. Now, if L be put for the Logarithm itself, then $\overline{1+x}^{\frac{1}{n}} - 1$ will be equal to L, consequently, $\overline{1+x}^{\frac{1}{n}}$ will be equal to $L+1$, and $1+x$ equal to $\overline{L+1}^{n}$; and because $\overline{L+1}^{n} = 1 + nL + \frac{nn-n}{2}L^2 + \frac{n^3+3n^2+2n}{6}L^3 + \frac{n^4-6n^3+11n^2-6n}{24}L^4$, &c. by the general theorem, when n is finite, when n becomes infinite to $\overline{L+1}^{n}$ will be equal to $1 + nL + \frac{1}{2}n^2L^2 + \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 + \frac{1}{120}n^5L^5 + \frac{1}{720}n^6L^6 + \frac{1}{5040}n^7L^7$, &c. $= 1+x$. In like manner, because $\frac{1}{n} \times x + \frac{1}{2}x^2 + \frac{1}{3}x^3 + \frac{1}{4}x^4 + \frac{1}{5}x^5 + \frac{1}{6}x^6$, &c. equal to $1 - \overline{1-q}^{\frac{1}{n}}$ is the Logarithm of the ratio 1 to $\overline{1-x}$, $1 - \overline{1-x}^{\frac{1}{n}}$ will be equal to L, consequently $\overline{1-x}^{\frac{1}{n}} = \overline{1-L}$, and $1-x = \overline{1-L}^{n}$, wherefore, by the same general theorem, $1-x = \overline{1-L}^{n}$ will be equal to $1 - nL + n^2L^2 - \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 - \frac{1}{120}n^5L^5 + \frac{1}{720}n^6L^6 - \frac{1}{5040}n^7L^7$, &c.

Whence $1 \pm x = 1 \pm nL + \frac{1}{2}n^2L^2 \pm \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 \pm \frac{1}{120}n^5L^5$, &c. which is a general theorem for finding the number from the Logarithm given, of any form whatsoever.

And because $n = 1000000$, &c. in Neper's form, $1 \pm x = 1 \pm L + \frac{1}{2}L^2 \pm \frac{1}{6}L^3 + \frac{1}{24}L^4 \pm \frac{1}{120}L^5$, &c. will give the number answering to any Logarithm in Neper's form.

Hence any one term of the ratio whereof L is the Logarithm, being given, the other term will be obtained readily; for, putting a for the lesser of the two terms, and b for the greater, $a \times 1 + L + \frac{1}{2}L^2 + \frac{1}{6}L^3 + \frac{1}{24}L^4 + \frac{1}{120}L^5$, &c. will give the greater; and $b \times 1 - L + \frac{1}{2}L^2 - \frac{1}{6}L^3 + \frac{1}{24}L^4 - \frac{1}{120}L^5$, &c. will give a the lesser, in Neper's form. Or, $a \times 1 + nL + \frac{1}{2}n^2L^2 + \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 + \frac{1}{120}n^5L^5$, &c. $= b$: and $a \times 1 - nL + \frac{1}{2}n^2L^2 - \frac{1}{6}n^3L^3 + \frac{1}{24}n^4L^4 - \frac{1}{120}n^5L^5$, &c. $= a$, in any form.

Let d stand for the difference between the given Logarithm, and the next nearest tabular Logarithm; then will $a \times 1 + d + \frac{1}{2}d^2 + \frac{1}{6}d^3 + \frac{1}{24}d^4 + \frac{1}{120}d^5$, &c. $=$ N. Or, $b \times 1 - d + \frac{1}{2}d^2 - \frac{1}{6}d^3 + \frac{1}{24}d^4 - \frac{1}{120}d^5$, &c. $=$ N, the number required in Neper's form. Or, $a \times 1 + nd + \frac{1}{2}n^2d^2 - \frac{1}{6}n^3d^3 + \frac{1}{24}n^4d^4 - \frac{1}{120}n^5d^5$, &c. $=$ N. And, $b \times 1 - nd + \frac{1}{2}n^2d^2 - \frac{1}{6}n^3d^3 + \frac{1}{24}n^4d^4 - \frac{1}{120}n^5d^5$, &c. $=$ N, the correspondent number in Logarithms of any species.

Let it therefore be required to find the number answering to 7.5713740282 in Briggs's form.

Because 7.5713710453, the nearest tabular Logarithm to this, is less than the given number, put 37271000 the number answering to it, equal to a, and the difference between the two Logarithms 0000029827 equal to d, then will n equal to 230258, &c. multiplied by d, produce 0000068683; which being increased by 1, and multiplied by 37271000, the next nearest number in the table will give 37271255.988 for the number answering to the given Logarithm: or, if 0000068683 be multiplied by a, equal to 37271000, the product 255.998 increased by a, equal to 37271000, will give 37271255,988 for the number required, and after the same manner may the number answering to any given Logarithm be found.

Hence, and from the general theorem, may the number answering to any Logarithm be found, and consequently an antilogarithmic canon be constructed, shewing the natural numbers answering to every Logarithm, set down in a natural order from 1 to 100.000, whence the number answering to any Logarithm might be found with the same ease as we find the Logarithm for any number in the logarithmic canon.

Imaginary LOGARITHM, is used for the Logarithm of negative and imaginary quantities, such as $a - \sqrt{-a}$, &c. Thus also the fluents of certain imaginary fluxionary expressions, such as $\frac{\dot{x}}{x\sqrt{-1}}$, $\frac{a\dot{x}}{2bx\sqrt{-1}}$, &c. are imaginary Logarithms.

The expression $\frac{\dot{x}}{x}$ represents the fluxion of the Logarithm of x, and the fluent thereof $\frac{\dot{x}}{x}$ is the Logarithm of x; but no Logarithm can represent the fluent of $\frac{\dot{x}}{x\sqrt{-1}}$, which is therefore called an imaginary Logarithm.

However, when these imaginary Logarithms occur in the solutions of problems, they may be transformed into circular arcs or sectors; that is, the imaginary Logarithm, or imaginary hyperbolic sector, becomes a real circular sector.

LONGITU'DINAL *Vessels*, in plants, are such as are extended in length through the woody part of trees and plants, into which the air is supposed to enter, and mix with the juices of the plant, and thereby augment its bulk.

LONI'CERA, *upright honeysuckle*, in botany, a genus of plants, whose characters are:

The flower is tubulous, and of one leaf, which is deeply cut into several segments, which are reflexed: from the empalement arise six long stamina, surrounding the pointal, which are extended the length of the petals: the ovary rests on the empalement, which afterwards turns to a berry, in which are included one or two compressed seeds, surrounded by a glutinous pulp.

LOOL, in metallurgy, a vessel made to receive the washings or ores of metals. The heavier or more metalline part of the ores remaining in the trough in which they are washed; the lighter, and more earthy, running off with the water, but settling in the Lool. *Ray's English Words.*

LOOME, at sea. If a ship appears big, when seen at a distance, they say she Loomes, or appears a great sail.

LOOP, in the iron works, is a part of a sow or block of cast iron broken or melted off from the rest, and prepared for the forge

forge or hammer. The usual method is, to break off the Loop of about three quarters of a hundred weight. This Loop they take up with their slinging tongs, and beat it with iron sledges upon an iron plate near the fire, that so it may not fall to pieces, but be in a condition to be carried under the hammer. It is then placed under the hammer, and, a little water being drawn to make the hammer move but slowly, it is beat very gently, and by this means the dross and foulness are forced off, and after this they draw more and more water by degrees, and beat it more and more till they bring it to a four-square mass, of about two feet long, which they call a bloom. *Ray's English Words.*

LOO'PING, in metallurgy, a word used by the miners of some counties of England, to express the running together of the matter of an ore into a mass, in the roasting, or first burning, intended only to calcine it so far as to make it fit for powdering. This accident, which gives the miners some trouble, is generally owing to the continuing the fire too long in this process. *Ray's English Words.*

LO'PPING.—It is very observable that most old trees are hollow within; which does not proceed from the nature of the trees, but is the fault of those who have the management of them who suffer the tops to grow large before they lop them; as the ash, elm, hornbeam, &c. and persuade themselves, that they may have the more great wood; but, in the mean time, do not consider that the cutting off great tops endangers the life of a tree; or, at best, wounds it so, that many trees yearly decay more in their bodies, than the yearly tops come to; and, at the same time that they furnish themselves with more great wood, they do it at the loss of the owner. And, indeed, though the hornbeam and elm will bear great tops, when the body is little more than a shell; yet, the ash, if it comes to take wet at the head, very rarely bears more top after the body of the tree decays. Therefore, if once these trees decay much in the middle, they will be worth little but for the fire; so that, if you find a timber-tree decay, it should be cut down in time, that the timber be not lost.

The Lopping of your trees, that is, at ten or twelve years old at most, will preserve them much longer, and will occasion the shoots to grow more into wood in one year, than they do in old tops at two or three. Great boughs, ill taken off, often spoil many a tree; for which reason they should always be taken off close and smooth, and not parallel to the horizon; and cover the wound with loam and horse-dung mixed, to prevent the wet from entering the body of the tree.

When trees are at their full growth, there are several signs of their decay; as the withering or dying of many of their top branches; or if the wet enters at any knot; or they are anywise hollow, or discoloured; if they make but poor shoots; or if woodpeckers make any hole in them.

This Lopping of trees is only to be understood for pollard-trees; because nothing is more injurious to the growth of timber-trees, than that of Lopping or cutting off great branches from them. Whoever will be at the trouble of trying the experiment upon two trees of equal age and size, growing near each other, to lop or cut off the side branches from one of them, and suffer all the branches to grow upon the other, will in a few years, find the latter to exceed the other in growth every way; and this will not decay near so soon.

All sorts of resinous trees, or such as abound with a milky juice, should be lopped very sparingly; for they are subject to decay, when often cut. The best season for Lopping these trees is soon after Bartholomew-tide; at which time they seldom bleed much, and the wound is commonly healed over before the cold weather comes on. *Miller's Gard. Dict.*

The Lopping of young trees, that is, of such as are ten or twelves years old, will preserve them much longer, and will occasion the shoots to grow more into wood in one year, than they do in old tops in two or three. The taking off of large boughs in a careless manner destroys many a tree; they should therefore always be lopped with great care, and the wound covered with some loam to keep it from rotting, and prevent the wet from entering and getting into the body of the trees.

All sorts of resinous trees, or such as abound with a milky juice, should be lopped but very sparingly, for they are very subject to decay, when cut. The best season for the Lopping these is the end of August, when they will not bleed very much, and the wounds will heal before the hard weather.

The generality of the world are against pruning timber trees at all, and, where they naturally grow straight and regular, it is much better let alone. But all the common faults in shape may be regulated by this Lopping them while young, and it can be attended with no ill consequence to the timber; for the cut not lying near the timber pith cannot affect it, when grown up, and squared in the working for beams and other uses, or to be quartered; for all the defects, occasioned by such wounds, are in the superficial parts, and all the four quarters are perfectly sound within.

As to the large forest trees, they should not be lopped at all, except in cases of great necessity, and then the large boughs must not be cut, but only the side branches, and even these must be cut off close, that the bark may soon cover the wound, and yet a little slanting, that the water may run off, not lodge upon the cut part.

If there is a necessity of cutting off a large bough, as by its being broken or cankered, let it be cut off slanting at about four feet distance from the body of the tree, and that if possible near some place where there is a young shoot from it, which may receive the sap, and grow up in its place. No stump must be left standing out farther than this, because they are wounded parts which never can heal, and which will always be letting in the water, and will serve as pipes to convey that water into the heart of the body of the tree, and by degrees will utterly spoil it. All that grow upright, whether they be large or small branches, must in cutting be taken off slanting, never evenly, for the same reason; those boughs that bear from the head are to be cut with the slope on the lower side, and on any occasion that great wounds are given to a tree, they should be covered with a mixture of clay and horse-dung, which will make them heal much sooner than they otherwise would do. *Mortimer's Husbandry.*

LO'RICA, a name given by some chemical writers to a peculiar lute made for the coating over vessels, which are to bear a very vehement fire.

This is ordered to be made of the powdered glass of broken retorts mixed up into a paste with potters clay by means of warm water: the retort, or other vessel, to be loricated, is to be covered a third of an inch thick with this matter, and if it cracks in the drying, which must be done gradually before it is to be used, the cracks must be filled up with the same paste, and this must be left to dry as the former. *Collect. Chym. Lond.*

LO'RIMERS, one of the companies of London, that make bits for bridles, spurs, and such-like small iron ware.

LORE'TTO, the name of an order of knights, instituted by pope Sixtus V. in 1587, where he made the church of our lady of Loretto, a bishop's see; during his papacy, he made no less than 260 of them; the popes conferred this order indifferently on sword-men and lawyers, and honoured them with the titles of count palatines; they had all of them pensions, with a power of making doctors in all faculties, as also public notaries, and that of legitimating bastards.

LOT, or LOTH, in mining, is the thirteenth dish, measure, or part of the miner's ore, which the bar-master takes up for the king. *Houghton's Compl. Miner, in the explanation of the term.*

LO'TION, *lotio saponacea*, the saponaceous Lotion, the name of a form of medicine prescribed in the late London Pharmacopœia, being properly soap in a liquid form. It is ordered to be made thus: take damask rose water, three quarters of a pint; oil of olives, a quarter of a pint; ley of tartar, half an ounce in measure; rub the ley and oil together till they are mixed, and then gradually add the water. *Pemberton's Lond. Disp.*

LO'TUS, *bird's-foot trefoil*, in botany, a genus of plants, whose characters are:

It hath a papilionaceous flower: the ovary, which rises out of the flower cup, afterward becomes a pod; sometimes distinguished, as it were, into cells, by transverse partitions, which are full of seeds, for the most part roundish: to which may be added, the leaves grow by threes, but have two wings or little leaves at the origin of their foot-stalks.

There are two or three varieties of this bird's-foot trefoil, which grow wild in most parts of England: when these are upon dry gravelly and chalky land, they are very low humble plants, spreading on the surface of the ground: but in rich moist land they grow much larger; and one of the sorts will sometimes produce branches near two feet in length: the seeds of these plants have been sold, and recommended as profitable to sow for fodder, by some husbandry-quacks, by the name of ladies-finger-grass: but I never could yet find any animal that would eat it, either green or dry.

LOVE *Apple*, is the English name for the fruit of the lycopersicon, a plant cultivated in gardens with us, for the singularity of its appearance. The Portuguese call it tomato, and eat the fruit, either raw or stewed, as do also the Jew families in England.

LOW'ERING, is the distillers business, a term used to express the debasing the strength of any spirituous liquor by mixing water with it. The standard and marketable price of these liquors is fixed, in regard to a certain strength in them called proof; this is that strength, which makes them, when shook in a phial, or poured from on high into a glass, retain a froth or crown of bubbles for some time. In this state spirits consist of about half pure, or totally inflammable spirits and half water; and, if any foreign or home spirit is to be exposed to sale, and is found to have that proof wanting, scarce any one will buy it, till it has been distilled again, and brought to that strength; and, if it be above that strength, the proprietor usually adds water to it, to bring it down to that standard. This addition of water, to debase its strength, is what is called Lowering it. People well acquainted with the goods will indeed buy spirits at any strength, only Lowering a sample to the proof strength, and by that judging of the strength of the whole; but the generality of buyers will not

not enter into this, but muſt have it all lowered for them. *Shaw's Eſſay on Diſtillery.*

There is another kind of Lowering in practice among the retailers of ſpiritous liquors to the vulgar; this is the reducing it under the ſtandard of proof. They buy it proof, and afterwards increaſe their profit upon it, by Lowering it with water one eighth part. The quantity of ſpirit is what they generally allow themſelves for the addition of water; and whoever has the art of doing this, without deſtroying the bubble proof, as this is eaſily done by means of ſome addition, that gives a greater tenacity to the parts of the ſpirit, will deceive all that judge by this proof alone; that is, very nearly all who are concerned in the ſpirit trade. Such an additional quantity of water, as one eighth, makes the ſpirit taſte ſofter and cooler, and will make many prefer it to the ſtronger ſpirit which is hotter and more fiery; but, unleſs the ſpirit, thus lowered, were tolerably clean, or the proof be ſome other way preſerved, the addition of the water lets looſe ſome of the coarſe oil, which makes the liquor milky, and leaves a very nauſeous taſte in the mouth. *Shaw's Eſſay on Diſtillery.*

LO'XIA, in zoology, the name of a bird, called in Engliſh the croſs bill, and in ſome places the ſhell apple, ſuppoſed to be the tragon of the ancients.

LU'CERNE, in huſbandry, the name of a plant frequently cultivated by our farmers in the manner of clover. It is the ſame plant which the ancients were ſo fond of under the name of medica, and in the culture of which they beſtowed ſuch great care and pains.

Its leaves grow three at a joint, like thoſe of the clover; its flowers are blue, and its pods of a ſcrew-like ſhape, containing ſeeds like thoſe of the broad clover, but longer, and more kidney-ſhaped.

The ſtalks grow erect, and, after mowing, they immediately grow up again from the parts where they were cut off. The roots are longer than thoſe of the ſaint-foin, and are not ſingle, but ſometimes they run perpendicularly in three or four places from the crown.

It is the only plant in the world, whoſe hay is preferable to the ſaint-foin for the fattening of cattle; but its virtues, in that reſpect, are ſo great, that they are not to be credited by any that have not tried the plant. It is the ſweeteſt graſs in the world, but muſt be given to cattle with caution, and in ſmall quantities, otherwiſe they will ſwell and incur diſeaſes from it.

Though the common method of huſbandry will not raiſe Lucerne to advantage; yet, the horſe-hoeing huſbandry will raiſe it annually, increaſing in value to the owner, and make one of the moſt profitable articles of his buſineſs.

The ſoil to plant it on muſt be either a hot gravel, or a very rich and dry land, or ſome other rich and dry land that has not an under ſtratum of clay, and is not too near ſprings of water. The natural poorneſs of gravel may be made up by dung and the benefit of the hoe, and, the natural richneſs of the other lands being increaſed by hoeing and cleanſing them from graſs, the Lucerne will thrive with leſs heat; for what is wanted in one of theſe qualities muſt be made up in the other. The beſt ſeaſon for planting it in England is early in the ſpring, the earlier the better; for then there is always moiſture enough in the earth to make it grow, and not ſo much heat as would dry up its tender roots, and kill it after the firſt ſhooting. About a pound and a half of ſeed will be enough for an acre; and, if this be ſown in February, though ſome of the young plants will be deſtroyed by the froſts in March, yet there will be enough left of them for the making as thick a crop as is neceſſary. The planting it in autumn might do very well in hotter countries, but with us the long winters would kill a great part of the tender plants, and greatly ſtunt and injure thoſe they did not kill.

The number of Lucerne plants ſhould be leſs than thoſe of ſaint-foin to an acre, becauſe they grow much larger in this way of management, and each occupies a greater ſpace of ground, and produces a larger quantity of hay. The quick growth of this plant requires that it ſhould have large ſupplies of nouriſhment, and good room to grow in; and it is better in all things of this kind to err in ſetting the plants too far diſtant, than in ſetting them too near.

The moſt fatal diſeaſe incident to Lucerne is ſtarving; for this reaſon, good culture is neceſſary to it, and the often turning the earth with the hoe all about it. By this means, a plant, that in the common way of ſowing, would not have been more than four or five inches high, will be three feet, and will ſpread every way, ſo as to produce a quantity of hay, more like the cutting of a ſhrub than a plant.

The plants ſhould ſtand at five inches diſtance in ſingle rows, and the intervals between theſe rows muſt be left wide enough for the uſe of the hoe plough.

The rows of Lucerne plants muſt not be thinned till they are grown up to ſome height; for, while young, they are ſubject to be eaten by the fly, like turnips; and, if this deſtroyer ſhould ſeize them, after they are reduced to only a competent number, the crop would be rendered much too thin. The hoe plough is the only inſtrument that can bring this plant to perfection, and it muſt be frequently had in proportion to the number of crops it produces; but then it muſt be ſtill ſome years, leſt the plowed ground injure the hay that is made upon it; and when it is come to a turf, and the Lucerne wants renewing, the four-coultered plough is the only inſtrument that can prepare the turf to be killed, and cure the Lucerne. This plough muſt be uſed in the following manner: turn its furrows towards one row, and from the next; that is, plow round one row, and that will finiſh two intervals; and ſo of the reſt. The next plowing muſt be towards thoſe rows from which they were turned the firſt time, and care muſt be taken that the firſt furrows do not lie long enough on the rows to kill the plants, which will be much longer in winter than in ſummer.

Lucerne is to be made into hay in the ſame manner as ſaint-foin; but this is to be obſerved, that it is always to be cut, juſt before it comes to flower. The richeſt Lucerne hay of any is that cut while the ſtalks are ſingle, without any collateral branches, and in this caſe there uſually is not ſo much as the bud of a flower to be ſeen on the plants.

Lucerne can never be expected to ſucceed well any where, let the ſoil be ever ſo good, unleſs it be kept clean from natural graſs. *Tull's Huſbandry.*

LU'CIUS, in zoology, the name of the common river fiſh, called in Engliſh the jack, or pike, and by ſome the pickerel.

LUCIUS *terreſtris*, the land pike, in zoology, the name of a very ſingular ſpecies of American lizard, which has the ſhape, ſcales, &c. of the pike fiſh. In the place of the fins of that fiſh it has four legs, but theſe are ſo weak and ſlender that it makes no uſe of them in walking, but crawls along upon the ground in the manner of a ſnake, and draws its legs after it. It grows to about fifteen inches long, with a proportionable thickneſs. It is all over covered with ſmall, ſtrong, and gloſſy ſcales, of a ſilvery grey. In the night they retire into holes and caverns, and make a very diſagreeable and loud noiſe, much louder than the croaking of frogs. They ſeldom ſtir out of their holes, unleſs in the duſk of the evening; and, if they are ever met with in the day time, their ſtrange motion ſurprizes all that ſee them. *Rocheſort's Hiſt. Inſ. Antill.*

LU'FFA, *Egyptian cucumber*, in botany, a genus of plants, whoſe characters are:

It hath a bell-ſhaped flower, conſiſting of one leaf, which is divided into five parts to the center: there are male and female flowers on the ſame plant: the male flowers are produced on ſhort foot-ſtalks, having no embryo's; but the female flowers reſt on the top of the embryo's, which afterwards becomes a fruit like a cucumber to outward appearance, but is not fleſhy, the inner part conſiſting of many fibres, which are elegantly netted: and there are three cells, which are filled with ſeeds, which are almoſt of an oval ſhape.

This plant may be propagated after the ſame manner as cucumbers and melons, by ſowing the ſeeds on a hot-bed the beginning of March: and, when the plants are come up, they muſt be pricked into a freſh hot-bed to ſtrengthen the plants, obſerving to let them have freſh air every day in warm weather, and to refreſh them frequently with water.

The fruit, when it is young, is by ſome people eaten, and made into mango's, and preſerved in pickle; but it hath a very diſagreeable taſte, and is not accounted very wholſome: wherefore theſe plants are ſeldom cultivated in Europe, except by ſuch perſons as are curious in botany, for variety. *Miller's Gard. Dict.*

LUGS, the Engliſh name for a peculiar ſpecies of inſect, found in great plenty on the ſhores of Cornwall. It is of the nature of the ſcolopendra, and is called by Mr. Ray vermis ſcolopendroides. It grows to twelve inches long, and has inſtead of legs nineteen pair of ſtiff briſtles; theſe all ſtand towards the head part of the creature, the tail being of at leaſt five inches long when full grown, and having no mark of them. Its body is rounded, and much reſembles the body of the common earth worm, and is of a fleſh colour, or of a pale red; it has no forceps.

LUME'LLA, in the glaſs trade, the round hole in the floor of the tower of the leer, which is directly over the working furnace, and by which the flame is let into the tower. *Neri's Art of Glaſs.*

LU'MPUS, in zoology, the name of a thick and ſhort ſea fiſh, called in Engliſh the lump fiſh, and ſea own, and by the Scotch the cock paddle.

LUNA'RIS *Cochlea*, in natural hiſtory, the name of a genus of ſhells of the ſnail kind, the diſtinguiſhing character of which is their having a perfectly round mouth. Theſe are univalve, umbilicated ſhells, with a depreſſed clavicle, and a ſurface ſometimes ſmooth, but more frequently ſtriated, furrowed, laciniated, or covered with tubercles.

LU'PIA, in ſurgery, a name given by ſome authors to that ſort of ſwelling, called by others talpa and teſtudo; this is an encyſted tumor, more diſtinguiſhed by its ſituation than by its nature, ſince of whatever kind it be, whether aſteatomatous, or atheromatous, &c. if ſituated under the ſcalp, it is called by theſe names. *Heiſter's Surgery.*

LU'PUS, *the wolf*, in zoology. This is a beaſt of prey, but wholly of the dog kind, and the largeſt and fierceſt of that race of animals. It is extremely like the domeſtic dog in ſhape, and, if the head did not differ a little in figure, one would be apt to declare it the very ſame animal. It has a very fierce look about the face, its eyes are glaring and ſavage, and its teeth and the opening of its mouth fierce and frightful. The ancients

ancients had an opinion, that the neck of the wolf was all of one ſolid bone; but, on the contrary, this creature is able to turn and twiſt about better than the dog kind. *Ray's Syn. Quad.*

LUPUS, is alſo the name given by authors to a peculiar claſs of ſpiders, from the manner of their taking their prey, which is by open hunting and running down, and not by means of webs as the common ſpiders do theirs. Theſe are diſtinguiſhed into two kinds, the one properly the Lupus, or wolf ſpider; the other the crab ſpider.

All the ſpiders of the Lupus kind have large eyes and four ſmall ones. Their hinder pair of legs are longer than any of the others; and they uſually live upon the ground, ſeldom climbing into trees. Of the firſt kind, or the Lupi, properly ſo called, there are four principal ſpecies. Firſt, the black ſpider. This is of a middle ſize, the male and female are both black, the head is ſmall, and the legs are beautifully ſpotted. Secondly, the brown ſpider, with oblique ſtreaks upon the body: this is of a middle ſize, and has a black head. Thirdly, the plain yellowiſh ſpider, with a long-ſhaped pointed body. This is a very large ſpider, and its legs are long and robuſt; it lives among buſhes. Fourthly, the livid ſpider, with a long-pointed body undulated with white. This is a very larger ſpecies, and lives among trees and under hedges. *Ray's Hiſt. Inſ.*

LUPUS *marinus*, the ſea wolf, a voracious ſea fiſh, caught ſometimes in our ſeas, but more frequently in the Mediterranean, and very fierce and voracious. Its head is larger, in proportion to its ſize, than that of the ſhark and rounder. This, as alſo the back, ſides, and fins, are all of a bluiſh colour. The belly is white, the ſkin is ſmooth and ſoft, but his teeth ſo remarkably hard and ſtrong, that, if he bites againſt an anchor of a ſhip, or other iron ſubſtance, they make a loud noiſe, and leave their mark in the iron. In the rim of his under jaw, he has ten ſharp and round teeth diſpoſed in two rows, and twelve grinders on each ſide behind theſe, diſpoſed in the ſame manner in two rows. The upper jaw has twelve ſharp and round teeth before, and there are three orders or rows of grinders in his palate; the middle one conſiſting of twelve teeth, as the others, and having them harder than the human teeth, and running farther towards the jaw, and in the upper jaw he has two roughs and ſharp bones; to which a rough part near the roof of the tongue anſwers, and this like thoſe is beſet with ſharp teeth. *Willughby's Hiſt. Piſc.*

LUSTRA'TION (*Dict.*)—Lomeir has a volume expreſs on the Luſtrations of the ancients: Joh. Lomeieri Zutphanenſis Epimenides, ſive de veterum Gentilium Luſtrationibus; firſt printed at Utrecht in 1681, and ſince, with additions, in 1702, in quarto.

All perſons, ſlaves only excepted, he ſhews, were miniſters of ſome ſort of Luſtration.—When any one died, the houſe was to be ſwept after a particular manner, by way of purification; the prieſt threw water on new married people, with the like intention.—To purify themſelves, people would even ſometimes run naked through the ſtreets; ſuch was their extravagance. And, as if fancy was not fertile enough in inventing modes of Luſtration, they even uſed inchantments to raiſe the dead, in order to get inſtructions what they muſt do to purge themſelves of their ſins. Add, that they frequently raiſed the opinion of the ſanctity of their expiations by fictitious miracles. The birds, ſay they, practiſe Luſtration, both by waſhing themſelves, and throwing water on their neſt. The hen takes ſtraw, and uſes it to purify her chickens. — There was ſcarce any action, at the beginning and the end of which the Gentiles did not perform ſome ceremony to cleanſe themſelves, and appeaſe the gods. When they had no animals to ſacrifice, they made the figure of the beaſt they would offer in dough, metal, or other matter; and thus ſacrificed in effigy.

Some expiations were performed in the water; for which reaſon, certain fountains and rivers were in great reputation: others were performed in the air. — A certain heathen cauſed himſelf to be ſeriouſly ſifted in a ſieve, as we now ſift corn: another hung himſelf by a cord, and was toſſed backwards and forwards: another ſhut his eyes, and ſet himſelf blindfold to find out a noſegay tied to a cord: others played at ſee-ſaw, as a more efficacious way of appeaſing the gods.

Fire was much uſed for expiation: ſometimes the penitents were caſt into the fire; at others, only brought to the flame, or ſmoke.

It was common, on theſe occaſions, to ſhed human blood: The prieſts of Cybele, Bellona, and Baal, made cruel inciſions on themſelves. — Erectheus, king of Attica, ſacrificed his daughter to Proſerpina. Several had their throats cut at Rome, to obtain the emperor's health from the gods. Thoſe who commanded armies, offered one of their ſoldiers to appeaſe the anger of the gods, that he alone might ſuffer all the wrath the army deſerved.

All ſorts of perfumes, and odoriferous herbs, had place in Luſtration.—The egg was much uſed among them, as being the ſymbol of the four elements; its ſhell, they ſay, repreſents the earth; the yolk, a globe of fire; the white reſembles the water; and, beſides, it has a ſpirit which repreſents the air. For this reaſon it is, that the Bonza's, or Indian prieſts, believe to this day that the world came out of an egg.—There is ſcarce any pot-herb, pulſe, tree, mineral, or metal, which they did not offer the gods by way of expiation: nor did they forget milk, bread, wine, or honey: what is more, they made uſe of the very ſpittle and urine.

The poets had feigned that the gods purified themſelves, and they did not omit to purify their ſtatues.—They made a Luſtration for children, the eighth day after their birth.—When a man, who had been falſely reputed dead, returned home, he was not to enter his houſe by the door. — It was a ſettled cuſtom to offer no expiation for thoſe who were hanged by order of juſtice, or that were killed by thunder. Neither did they offer any for thoſe who were drowned in the ſea; it being the common opinion, that their ſouls periſhed with their bodies. And hence it was, that perſons in danger of ſhipwreck ſometimes thruſt their ſwords through their bodies, that they might not die in the ſea; where they thought their ſoul, which they ſuppoſed to be a flame, would be totally extinguiſhed.

The moſt celebrated expiatory ſacrifice was the hecatomb, when they offered an hundred beaſts; though they commonly did not offer ſo many, but contented themſelves with killing twenty-five; but, thoſe being quadrupeds, their feet came to an hundred.

Luſtrations and luſtratory ſacrifices were not only performed for men, but alſo for temples, altars, theatres, trees, fountains, rivers, ſheep, fields, and villages. When the Arval brothers offered a victim for the fields, their ſacrifice was called ambarvalia.

Cities were all to be purified, from time to time: ſome walked the victim round their walls, and then ſlew him.—The Athenians ſacrificed two men, one for the men of their city, and the other for the women. The Corinthians ſacrificed the children of Medea ſo; though the poets ſay, Medea killed them herſelf. The Romans performed the ceremony of purifying their city every fifth year; whence the name of luſtrum, given to the ſpace of five years.

Divers of the expiations were auſtere: ſome faſted; others abſtained from all ſenſual pleaſures: ſome, as the prieſts of Cybele, caſtrated themſelves; others, that they might live chaſte, eat rue, or lay under the branches of a ſhrub called agnus caſtus.

The poſtures of the penitents were different, according to the different ſacrifices: they ſometimes joined prayers to the ſolemnity; at other times, a public confeſſion of ſins was made. —The Indians, when they ſacrifice to Hercules, call him a thouſand reproachful names; and think they incur his anger, if any reſpectful term comes out of their mouth.

The prieſts changed their habits, according to the ceremonies to be performed: white, purple, and black, were the moſt uſual colours. They had their heads always covered, and long hair, except in the ſacrifices of Saturn, Hercules, Honour, and a few others: only the prieſts of Iſis were ſhaven, becauſe that goddeſs underwent the ſame operation, after the death of her huſband Oſiris. — In ſome ceremonies the prieſts were ſhod, in others barefoot: the poets expreſs the former by the word vincula. They had no girdles; nay, they durſt not pronounce the word ivy, becauſe ivy cleaves to every thing.—In the ſacrifices of Venus, and the moon, every one took the habit of the contrary ſex.— Every thing was to be done by odd numbers; becauſe they looked on an even number, which may be equally divided, as the ſymbol of mortality and deſtruction. The odd number was with them holy: hence Neptune's trident, Cerberus's three heads, and Jupiter's thunder-dart, with three points.

They caſt into the river, or at leaſt out of the city, the animals, or other things that had ſerved for a Luſtration or ſacrifice of atonement; and thought themſelves threatened with ſome great misfortune, when by chance they trod upon them. —At Marſeilles, they took care to feed a poor man for ſome time; after which, they charged him with all the ſins of the country, and drove him away: thoſe of Leucade faſtened a number of birds to a man charged with their ſins, and in that condition caſt him headlong from a high tower; and, if the birds hindered his being killed, they drove him out of the country.

Part of theſe ceremonies were aboliſhed by the emperor Conſtantine, and his ſucceſſors; the reſt ſubſiſted till the Gothic kings were maſters of Rome, under whom they expired; except that ſeveral of them were adopted by the popes, and brought into the church, where they make a figure to this day: witneſs the numerous conſecrations, benedictions, exorciſms, ablutions, ſprinklings, proceſſions, feaſts, &c. ſtill in uſe in the Romiſh church.

LU'STRICUS *Dies*, among the ancients, the day on which young children underwent the ceremony of luſtration and received their names.

LUTE'OLA, in zoology, a name given by many to a ſmall bird, called by others aſellus, and by others regulus non criſtatus; but this laſt is a name that has occaſioned ſome confuſion, as many have erroneouſly called our common wren the regulus, and, as it has no creſt, imagined it to be the bird meant by this name.

It is, excepting the creſted wren, the ſmalleſt of all European birds, and it very little exceeds that in ſize. Its head, neck, and back, are of a greeniſh brown; the rump is greener than the reſt. It has a yellow line on each ſide, extended from the noſtrils,

noſtrils, beyond the eyes, to the hinder part of the head. The breaſt, throat, and belly, are yellow, with a very faint caſt of green. The wings and tail are brown, and all their feathers are tipped with green at their ends: the under part of their wings has much of a very fine green. The beak is extremely ſlender, and half an inch long; the mouth yellow within. It makes a loud noiſe, like that of a graſshopper, and is principally found among willows: it is continually creeping, and ſinging among the branches of trees. It builds with ſtraw and feathers, and lays five eggs, which are white, and ſpotted with red. There is a conſiderable variation in the colours of theſe birds; ſome of them being much greener on the back, and much whiter on the belly, than others. *Ray's Ornitholog.*

LUTEOLA, *weld, would, yellow-weed*, or *dyer's-weed*, in botany, a genus of plants, whoſe characters are:

The leaves are oblong and intire: it hath an anomalous flower, conſiſting of many diſſimilar leaves: the fruit is globular, hollow, and divided into three parts.

The common weld is accounted a rich dyers commodity, and is of great advantage, conſidering the ſmall expence of its culture: it will grow upon the pooreſt ſort of land, provided it be dry; though, upon a middling ſoil, it will grow much larger. The ſeeds of this plant ſhould be ſown the beginning of Auguſt, ſoon after they are ripe; when it will come up with the firſt moiſt weather, and will grow very ſtrong the ſame autumn, provided it be ſown by itſelf; for moſt people ſow it with corn, which is very wrong; for that hinders its progreſs greatly, and occaſions the loſs of one whole year. When the plants are come up pretty ſtrong, you ſhould hoe them (as is practiſed with turneps) in order to deſtroy the weeds, as alſo to cut up the plants where they grow too thick, which will greatly improve them; and the ſucceeding ſpring, if the ground produces many weeds, you ſhould give it a ſecond hoeing in April, which will preſerve it clean from weeds; after that, the weld will grow, and prevent the weeds from coming to an head afterwards.

You muſt be very cautious, in the gathering of it, that the ſeed be not over-ripe, ſo as to fall out, and that neither the ſtalk or ſeed be under-ripe; becauſe, if it be, both will be ſpoiled. It muſt be pulled up and bound in little handfuls, and ſet to dry, as you do flax; and then houſe it carefully, that you ſhake not out the ſeed, which is eaſily beat out, and ſhould be ſown (as was before directed) ſoon after it is ripe.

This ſeed is commonly ſold for about ten ſhillings per buſhel, or more, a gallon of which will ſow an acre; for it is very ſmall. There are ſome who recommend the ſowing this ſeed in the ſpring, mixing it with a crop of barley or oats, and only harrowed in with a buſh, or rolled with a roller. But this is not a good method; for the barley or oats will ſtarve the weld, and make it very poor: and, many times, the ſeeds which are ſown in the ſpring do not grow or not come up, till the autumn following; whereas that ſown, in the beginning of Auguſt, rarely fails to come up ſoon after, and will be much ſtronger, and fit to pull the ſucceeding ſummer, when the other is always two years before it is pulled. The dyers uſe it for dying bright yellows and lemon colours. It is much ſown in Kent, eſpecially about Canterbury, and often yields, from forty ſhillings, to ten or twelve pounds an acre. This is ſuppoſed to be the plant that the ancient Britons dyed themſelves with. *Miller's Gard. Dict.*

LUTRA, in zoology, *the otter*. See OTTER.

LY'CIUM, in the materia medica, the name of a fruit called by the French baye d'Avignon, the Avignon berry, and by many authors the pyxacantha. The ſhrub which produces it, is the Lycium five pyracantha of Gerrard. The fruit is about the ſize of a grain of wheat, and is not round, but of an angular form when dried, ſometimes of three, ſometimes of four angles, and ſometimes dented in at one end like a heart. It is of a yellowiſh green colour, and of a bitter and aſtringent taſte. It ſhould be choſen freſh dried, and large. There was formerly a rob, or inſpiſſated juice made from theſe berries, much in uſe in medicine; but this was generally adulterated with a rob made of the berries of the woodbind, privet, ſloe, or other ſhrub, and is now quite out of uſe. The dyers of France and Holland uſe it for a yellow; and the Dutch have another uſe for it, which is, that they boil it in alum-water, and, mixing it with whiting, form it into twiſted ſticks, which they ſell to the painters in water colours, under the name of ſtil de grain. *Lemery Dict. de Drog.*

LYCOPE'RSICON, *love-apple*, or *wolf's-peach*, in botany, a genus of plants, whoſe characters are:

It hath a flower conſiſting of one leaf, which expands in a circular order, as doth that of the night-ſhade: the ſtyle afterwards becomes a roundiſh ſoft fleſhy fruit, which is divided into ſeveral cells, wherein are contained many flat ſeeds.

LYCOPODIOI'DES, in botany, the name of a genus of moſſes, the characters of which are theſe: it produces ſeeds in ſpikes, in the manner of the lycopodium, or wolf's claw moſs, but that in two ways; for ſome of the capſules incloſe a powder, which ſeems only a farina; others ſeem to contain true ſeeds; theſe always ſtand to the number of three in each capſule. It differs from the lycopodium alſo, in its general appearance and manner of growth, the leaves being all placed in the ſame plane, and expanded in the manner of fins, with an intermediate ſeries of ſmall leaves, which cover the upper ſide of the middle rib, or ſtalk.

LYCOPO'DIUM, in botany, the name of a genus of moſſes, the characters of which are theſe: it produces capſules in the alæ of certain leaves, which are very unlike the capſules of the other moſſes, having neither calypha, operculum, nor pedicle. Theſe do not ſtand as thoſe of the ſelago, in all the alæ of the leaves, but are collected together into a ſort of ſpike of a ſcaly ſtructure, and one capſule ſtands under every ſcale, or leaf. Theſe capſules are of the ſhape of a kidney, and, when ripe, they ſeparate longitudinally into two parts, and throw out a powder, conſiſting of round globules. It has been ſuppoſed by many, that this powder is the farina of the flower; but, as there are no ſeeds found in any other part the plant for it to impregnate, it ſeems a much more probable opinion, that this powder, as well as that of the capſules of all the other moſſes, is the true and genuine ſeed of the plant. In moſt of the ſpecies of this plant, the ſpikes are compoſed of leaves of a different figure from thoſe of the reſt of the plant, and are therefore called ſcales; but in ſome they are made of leaves of the ſame figure with thoſe of the other parts of the moſs. See *plate* XXXII. *fig.* 1.

LYNX, in zoology, the name of a very fierce beaſt of prey called in Engliſh the ounce, and by many Latin authors the lupus cervarius, or dear wolf, from its loving to feed on deer. The hairs of this creature, as well ſuch as appeared reddiſh, as thoſe which were grey, when nicely examined, are all found to be truly of three colours in each ſingle hair; the middle part being of a reddiſh tawny, the bottom grey, and the top white; but thoſe which compoſe the black ſpots are only of two colours, there being no white at their ends.

This creature's eyes are extremely bright and vivid, and ſhew plainly that it has a very piercing ſight. Its ears are like thoſe of a cat, but have this peculiarity, which diſtinguiſhes the creature from all the animals of the ſame claſs: they have a fine pencil of black hairs growing out at their extremities, ſmooth, and of a deep black like velvet, and two fingers long. Its tongue is rough like that of the lion. The Lynx is found wild in Italy and Germany, but the greater number are in Aſia, and theſe are much finer-coloured than the European. They all differ conſiderably from one another, at times, in the number and diſpoſition of their ſpots. *Ray's Syn. Quad.*

LY'RA, the name of a beautiful ſea ſhell of the genus of the concha globoſa, or dolium. There are three ſpecies of the lyra, or harp ſhell. Firſt, the common lyra, which has thirteen roſe-coloured ribs running along its body. Secondly, the eleven-ribbed Lyra. And, thirdly, the noble harp, or Lyra nobilis. This is a moſt elegantly variegated ſhell; its ground colour is a deep brown, and its variegations very elegant and black.

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MACA'W, or MACAO, in zoology, the name of a large species of parrot, distinguished also by the length of its tail. There are three different species of this bird brought over into Europe, which not only differ in size and other particulars, but also in colour. The first is the largest, and is finely variegated with blue and yellow. The second is somewhat smaller than this, and is principally red and yellow; and the third is red and blue. It is not uncommon also to see the Macaw perfectly white, and it is to that particular colour we give the name of cockatoon; though with some it is made the synonymous name of all the Macaw tribe.

MA'CKAREL, the English name for the scombrus, or scomber. See the article SCOMBER.

Horse MACKAREL. See the article HORSE-*Mackarel*.

MACRO'PTERA, in zoology, the name of a genus of birds of the hawk kind, remarkable for the length of their wings. The word is derived from the Greek μακρὸς, long, and πτέρον a wing.

The hawks of this genus have their wings so long, that, when closed, they reach to the end of the tail, or nearly so. Of this genus are the bald buzzard, the kite, the hen harrier, the honey buzzard, and common buzzard, the sacre, the jerfalcon, &c. *Willughby's Ornitholog.*

MACROTELO'STYLA, in natural history, the name of a genus of crystals, which are composed of two pyramids joined to the end of a column, both the pyramids, as also the column, being hexangular, and the whole body consequently composed of eighteen planes. The word is derived from the Greek μακρὸς, long, τέλειος, perfect, and στύλος, a column; expressing a perfect crystal with a long column. See *Plate* XXXII. *fig.* 2.

MA'DDER, (*Dict.*) — The method of cultivating this useful plant, as practised by the Dutch, is as follows:

In autumn they plow the land, where they intend to plant Madder in the spring, and lay it in high ridges, that the frost may mellow it; in March they plow it again; and at this season they work it very deep, laying it up in ridges eighteen inches asunder, and about a foot high; then about the beginning of April, when the Madder will begin to shoot out of the ground, they open the earth about their old roots, and take off all the side-shoots, which extend themselves horizontally, just under the surface of the ground, preserving as much root to them as possible: these they transplant immediately upon the tops of the new ridges, at about a foot apart, observing always to do this when there are some showers, because then the plants will take root in a few days, and will require no water.

When the plants are growing, they carefully keep the ground hoed, to prevent the weeds from coming up between them; for, if they are smothered by weeds, especially when young, it will either destroy or weaken them so much, that they seldom do well after. In these ridges they let the plants remain two seasons, during which time they keep the ground very clean; and at Michaelmas, when the tops of the plants are decayed, they take up the roots, and dry them for sale.

This is what I could learn of their method of cultivating this plant; to which I will subjoin a few observations of my own, which I have since made upon the culture of Madder in England. And, first, I find there is no necessity for laying the ground up in ridges in England, as is practised by the Dutch (especially in dry land) because the places where I saw it, were very wet land, which is often floated in winter; so that, if the plants were not elevated upon ridges, their roots would rot in winter. Secondly, they should be planted at a greater distance in England; the rows should be at least three feet distance, and the plants eighteen inches asunder in the rows; for, as they extend themselves pretty far under ground, so, where they are planted too near, their roots will not have room to grow. And, thirdly, I find, that, if all the horizontal roots are destroyed from time to time, as they are produced, it will cause the large downright roots to be much bigger, in which the goodness of this commodity chiefly consists: for, if the upper roots are suffered to remain, they will draw off the principal nourishment from the downright roots, as I have experienced; for I planted a few roots upon the same soil and situation, which were of equal strength, and rooted equally well: half of these I hoed round, and cut off the horizontal roots; and the other half I permitted the horizontal roots to remain on; and, when I took them all up, those which I had hoed about, and kept clear from horizontal roots, were almost as large again as the other, and the roots were double the weight; which plainly proves it necessary to cut off those superfluous roots: so that, where this plant is cultivated in quantity, it will be an excellent method to use the hoeing-plough, to stir the ground, and destroy the weeds; for with this instrument a large quantity of ground may be kept clean at a small expence: and, as this will stir the ground much deeper than a common hoe, it will cut the superficial roots, and thereby improve the principal roots.

The crop of Madder should be shifted into fresh land; for the ground which has had one crop, will not be fit to receive another in less than four years; during which time any other annual crop may be cultivated on the land.

The manner of drying and preparing these roots for use I am not acquainted with, having never had an opportunity of seeing that part, so can give no instructions concerning it: but whoever shall have curiosity enough to cultivate this useful plant, might easily inform themselves, by going over to Holland at the season of taking up the roots.

What I could learn from the people with whom I conversed in Holland on this affair, was, that they pared off the outside rind of the roots, which is dried by itself, and is called mull-Madder. Then they pared off another fleshy part of the root, which is made into another Madder, and is called number O: but the inside, or heart of the root, is called crop-Madder. The first sort is not worth above fifteen or sixteen shillings per hundred weight: the second sort is sold for about forty shillings; but the third sort will sell for five pounds per hundred. I have since been informed, that there is no necessity of dividing it into three sorts for use; for, if the whole is dried and ground together, it will answer the dyer's purpose full as well. These roots must be dried on a kiln, before they are ground to powder; for which purpose, I suppose, the same as are used for drying of malt might be made useful for this commodity.

By some few experiments which I made, I imagine that one acre of good Madder, when fit to take up for use, will be worth above one hundred pounds: so that if it were to stand three years in the ground, and to be planted on land of three pounds per acre, it would pay exceeding well; considering the annual culture (if performed by a plough) will be no great expence; the principal charge being in the first preparing of the land, and the planting: but whoever has a mind to cultivate this plant, might rent very good land for this purpose, for twenty-five or thirty shillings per acre, at a distance from London, but near some navigation.

MADRE'PORA, in botany, a genus of sea plants intirely like the coral, as to its hardness, which is equal to bone or marble. Its colour is white, when polished. Its surface is lightly wrinkled, and the wrinkles run lengthwise of the branches. Its inside is of a particular organization, having in the center a sort of cylinder, which is often pierced through its whole length by two or three holes.

From this cylinder are detached about 17 laminæ (*Plate* XXX. *fig.* 2. *k*, *k*) which run to the circumference in straight lines, *m*, *m*, *m*, *m*.

These laminæ are transversely intersected by other laminæ, *q*, *q*, which form many irregular cavities throughout the whole plant. The branches (*fig.* 3. *g*, *g*) are conical; and the basis of the cone is formed by the summit of the branch *e*, *e*. Every one of these summits has wrinkles on its outside, which runs in the longitudinal direction of the branches (*fig.* 4. *c*, *c*) and each wrinkle answers to a lamina (*fig.* 5. *c*, *u*, *c*, *u*) and each lamina is of the shape of a prism (*fig.* 6.) the basis of which is warty, and faces the outside (*fig.* 5. *c*, *u*) and its point is cut into teeth (*fig.* 6. *n*, *n*, *n*) and belongs to the inside. The cellule (*fig.* 4. *a*, *a*, *a*, *c*, *c*, *fig.* 5. *c*, *c*, *u*, *u*) which is of the shape of a chalice, is composed of these laminæ ranged into a circle.

In every one of these cellules is found a little polypus, represented in *fig.* 7. but considerably magnified; the mechanism of which is this:

Three different parts, unlike each other, compose this animal; *viz.* the feet, *a*, *i*, a trough, and an head (*fig.* 8. *n*.) Each foot begins by two conical appendices (*fig.* 9. *a*, *a*, *a*, *fig.* 10. *a*.) By the union of these appendices a rounded part is formed, which, in some degree, resembles the belly of a muscle

muscle (*fig.* 9. *i*,) by means of which the foot is shortened and lengthened. To this part (*fig.* 10. *x*) is annexed a little cylinder (*fig.* 10. *u*, *fig.* 9. *c*) the length of which is indeterminate.

These feet are ranged all around in great number, and annexed to the laminæ (*fig.* 4. *a*, *a*, *c*, *c*) and are all united to the trough (*fig.* 9. *c*) on the outside of which are seen ten cavities, with an equal number of prominences *t*, *t*, *t*, *s*, *s*, *c*, and in these is lodged the animal's head (*fig.* 8.) which has prickly rays, the precise number of which I could not determine, on account of the extreme velocity of the continual oscillatory motion of the head from right to left, and from left to right: yet I thought I could perceive the number of these rays to be eight, and the use of them may be for the animal to catch and hold its food. This part is not always to be observed, because it sometimes hides itself, by closing up the trough (*fig.* 9. *s*, *s*, *t*, *c*) about it; and, by thus covering itself, it is safe in its habitation.

As the figure of this animal bears no resemblance to the urtica marina, I cannot see, how one could class the polypus of the madrepora with the urtica.

This animal is extremely tender, and generally transparent, and very beautiful for its variety of colours. I have observed it in spring and autumn in the neighbourhood of Rovigno and Orsera, where it is often fished up. *Philosophical Transactions*, Vol. XLVII.

MAGELLA'NIC *Clouds*, whitish appearances like clouds, seen in the heavens towards the south pole, and having the same apparent motion as the stars.

They are three in number, two of them near each other. The largest lies far from the south pole; but the other two are not many degrees more remote from it than the nearest conspicuous star, that is, about eleven degrees.

Mr. Boyle conjectures, that, if these clouds were seen through a good telescope, they would appear to be multitudes of small stars, like the milky-way. *Boyle's Works abr.* Vol. I.

MA'GI (*Dict.*)—The priests of the Magi were the most skilful mathematicians and philosophers of the ages in which they lived, insomuch, that a learned man and a magian, became equivalent terms. This proceeded so far, that the vulgar, looking on their knowledge to be more than natural, imagined they were inspired by some supernatural power, and hence those who practised wicked and diabolical arts, taking upon themselves the name of magians, drew on it that ill signification which the word magician now bears among us. The royal family among the Persians, as long as this sect subsisted, was always of the sacerdotal tribe. There is a remnant of these magians still subsisting in Persia and India, called by the natives geberrs. See GEBERRS.

MA'GIC (*Dict.*)—Pliny gives the reason why this science, vain and deceitful as it is, should have gained so much authority over men's minds. It is, says he, because it has possessed itself of three sciences of the most esteem among men, taking from each all that is great and marvellous in it. No body doubts but it had its origin in medicine, and that it insinuated itself into the minds of the people, under a pretence of affording extraordinary remedies. To these fine promises it added every thing in religion that is pompous and splendid, and that appears calculated to blind and captivate mankind. Lastly, it mingled judicial astrology with the rest, persuading people, curious of searching into futurity, that it saw every thing to come, in the heavens.

MAGNI'FICAT, the name or title of an hymn used by the virgin Mary, after the salutation of the angel; in which she expresses her great joy and gratitude for the great honour conferred upon her. It begins, Magnificat anima mea, &c. My soul doth magnify the Lord, &c. This hymn was so respected among the primitive Christians, that they used it as a part of their devotions; and the christian church has always retained it in her divine service, as proper to express the pious affections of godly and devout minds.

MAGNI'SSA, in minerology, a name given by some of the antients to the white pyrites, called by others leucolithos and argyrolithos. Many have supposed the Magnissa to be the same with the magnesia, that is, magnese, but this is an error; nor is there the least similitude between the two stones. It is plain, indeed, that the antients called a white and silvery-looking stone also by the name magnesia; but neither does this appear to have been the Magnissa here described, for Theophrastus describes it as a stone that artificers used for turning things out of, which is utterly impossible to be done with the pyrites; the shattery texture of which would make it fall to pieces, on the slightest attempt to cut it into shape by the wheel. The chemists of the preceding ages have plainly understood this word Magnissa of the pyrites, and have made these two words and the sory synonymous. Pliny mentions a gold-coloured and silver pyrites; these therefore were distinctions sufficient for the white and yellow pyrites; but Dioscorides has only mentioned one kind of the marcasite or pyrites, which is the yellow or brassy one, the most common of all the species. When the word pyrites, therefore, was only the name of this yellow stone, it is not wonderful that the white one should be called by another name, as Magnissa.

MAG'NETISM (*Dict.*)—The magnet can communicate directive and attractive qualities to iron, and we ought to consider the iron which has imbibed these qualities, as a real magnet, which can communicate its virtue to other iron. A vigorous magnet will give virtue to a weak magnet, and render its effects as sensible and lively as those of a good load-stone. It is in general sufficient to touch, or even hold the pole of a good stone near the body, to which we design to communicate the magnetic virtue, and it immediately becomes magnetical: the iron indeed which only receives its virtue from a momentary touch of the load-stone, loses it almost as soon as it is separated from it; but its virtue may be rendered more durable by keeping the iron longer near the magnet, or heating it red-hot and suffering it to cool in that situation; in this case the part, presented to the north pole of the magnet, becomes a south pole, and would in like manner become a north pole, on the application of the south pole of the magnet. But, as these simple means do not procure any great virtue, other means more efficacious are made use of.

1st. It has been discovered that iron, rubbed on one of the poles of the magnet, acquires much more virtue than when rubbed on any other part of the stone, and that the virtue, communicated to the iron by the pole, is stronger when the magnet is armed, than when it is naked. 2dly. The more slowly the iron is rubbed on the pole of the magnet, and the more it is pressed upon it, the more it imbibes of the magnetic virtue. 3dly. It is better to render the iron magnetical on one pole of the load-stone, than successively on both, because the iron receives the magnetic virtue of both poles, in contrary directions, the effects of which destroy each other. 4thly. A piece of iron is better made magnetical by passing it uniformly and in the same direction on the pole of the magnet, its whole length, than by rubbing it only in the middle; and it is observed that the extremity retains most strength, which touches the pole last. 5thly. A piece of polished steel, or iron, receives more magnetic virtue than an unpolished piece of the same figure; and, all other things being equal, a piece of iron which is long, thin, and pointed, imbibes more magnetic virtue, than one of any other form; as, for example, a piece of a blade of a sword, or knife, imbibes much more virtue than a square piece of steel of the same weight, which has no other points but its angles. A piece of iron or steel, as we have observed, only imbibes or retains the magnetic virtue to a certain degree, and it is evident that this quantity of magnetic virtue, imbibed, is determined by the length, breadth, and thickness of the magnetised piece of iron or steel. 6thly. Since iron receives the magnetic power in proportion to its length, it is necessary this length should be somewhat considerable, if we would convey a great deal of the magnetic virtue to the iron or steel; the blade of a sword therefore receives more virtue than the blade of a knife rubbed upon the same stone. But there are certain proportions of thickness and length, without which the iron receives less magnetic virtue; as, for example, we magnetised six iron laminæ, four inches long and about $\frac{1}{16}$ parts of an inch thick; their respective breadth was 1, 2, 3, 4, 5, and 6 lines; these were rubbed three times each, in the same manner, on the pole of an excellent load-stone, and we made an experiment of the different weights they could lift.

The first which was the least raised	1	grain	[illegible]
The second 2 lines broad	10		[illegible]
The third 3 lines broad	7		[illegible]
The fourth 5 lines broad	2		
The fifth 5 lines broad	1		[illegible]
The sixth 6 lines broad	1		[illegible]

The following experiment will demonstrate that the magnetic power, which a piece of iron receives from a load-stone, depends also on its length; we took an iron lamina $\frac{1}{100}$ part of an inch thick, five lines broad, 13 inches $\frac{1}{2}$ long; rubbed it three times on the pole of a magnet, and it carried 25 grains; we reduced the length to 10 inches, magnetised it three times more, and it carried 33 grains; when reduced to 9 inches, it carried 19 grains, to 8 inches 17 grains, to 4 inches 1 grain and [illegible]; from whence it is evident, that the length of the bar ought to be determined at 10 inches, or between 10 and 13 $\frac{1}{2}$, with the given breadth and thickness, to imbibe or receive the largest quantity of the magnetic virtue.

When a lamina of iron or steel of a certain breadth and thickness is too short to receive a large quantity of the magnetic virtue by communication, it may be remedied by tying it on a longer piece of iron, nearly similar in breadth and thickness, so that the whole may be of a proper length to receive the greatest quantity of magnetic virtue possible, by rubbing it on the pole of a load-stone: you will then find, on separating the little bar from the great one, that its magnetic force is considerably augmented: the following experiment plainly demonstrated the increase of the magnetic force, by this method of application. The end of a sword-blade one foot in length, being magnetised on another piece of a blade 2 feet, 7 inches, and eight lines in length, lifted 7 ounces, 3 drachms, and 36 grains, which, when magnetised alone, would lift no more than 4 ounces, 2 drachms, and 36 grains.

We must observe however, that two laminæ, being thus magnetised together, do not receive so much magnetic virtue, as one whole lamina of similar dimensions and equal length; this

this was proved by dividing a bar into two equal parts, one of which was kept whole, the other fawed into feveral fquare pieces; thefe pieces we put as clofe together as we could, to make the fame length nearly equal to that before they were fawed, and fixed them in this pofition; by the fide of them was placed the half which had not been fawed; thefe were both magnetifed equally: we found the whole part received much more magnetic virtue than the other, and that the part which had been cut into pieces, received more or lefs of the virtue of the load-ftone, as its parts were more or lefs contiguous.

Exclufive of thefe methods of communicating the magnetic virtue to iron by means of the load-ftone, there are others which we have mentioned under the article *Artificial* MAGNET, in the Dictionary: but we cannot pafs over in filence a method of communicating a very confiderable magnetic virtue to iron, and even increafing that of weak magnets, to fuch a degree as to make them very ftrong. The learned Dr. Knight is the author of this difcovery, though he has not yet made it public: the following experiments fhew the great quantity of magnetic virtue he communicated to bars of fteel, which could not have been procured by means of the beft load-ftones in the ordinary method. 1ft. A fmall bar of fteel about 3 inches $\frac{7}{10}$ long, weight about half an ounce, took up at one of its ends eleven ounces, without being armed. 2dly. Another bar of fteel in the form of a parallelopiped 5 $\frac{8}{10}$ of an inch long, $\frac{4}{10}$ of an inch broad, and $\frac{2}{10}$ of an inch thick, weighing 2 ounces 8 pennyweights and $\frac{1}{2}$, lifted 20 ounces at one of its extremities, without being armed. 3dly. Another bar of the fame form, and 4 inches long, armed with fteel like a load-ftone, contained within a hoop of filver, weighing in all 1 ounce 14 pennyweights, took up, at the bottom of its mounting, 4 pounds. 4thly. A bar of fteel in the figure of a parallelopiped, 4 inches long, $\frac{3}{10}$ broad, and $\frac{1}{10}$ thick, armed at its extremities with a brafs hoop to keep on the mounting, the whole weighing 14 ounces 1 pennyweight, took up, by the feet of the mounting, 14 pounds 2 ounces and $\frac{1}{2}$. He alfo made an artificial magnet, with twelve bars of fteel armed in the common manner, which lifted, by the feet of the mounting, 23 pounds 2 ounces and $\frac{1}{2}$. Thefe 12 bars were each fomewhat more than four inches long, $\frac{1}{2}$ of an inch broad, and $\frac{15}{100}$ of an inch thick; each of thefe laminæ weighed about 25 pennyweights, and were placed one upon another, fo that they formed a parallelopiped of about two inches in height: all thefe bars were bound very tight with cramps of brafs, and, mounted in fteel in the ordinary method, the whole weighed 20 ounces. Dr. Knight's particular method of communicating the magnetic virtue, in a furprizing manner, is not confined to iron and fteel; he alfo increafes the virtue of a weak load-ftone to fuch a degree, as to make it become excellent; he exhibited one before the Royal Society, which, when it was mounted, weighed in all feven pennyweights fourteen grains, which could hardly lift two ounces; but, after he had magnetifed it in his manner, it lifted almoft 7 ounces. He communicates the magnetic virtue to a weak dead ftone fo powerfully, that he quite effaces the virtue of its poles, and fubftitutes new ones in their ftead, which are more powerful and directly oppofite; he changes the fouthern into the northern pole, places the poles of a load-ftone where the equator was before, and vice verfa. In a cylindrical magnet he places the northern pole, all round the circumference of the circle, which makes one of its bafes, and the fouthern pole in the center of the fame circle, fo that all the circumference of the other bafis is a fouthern pole, and the center a northern pole. He places the poles of a magnet at pleafure in any part defired, as, for example, he makes the middle of a ftone the northern pole, and the two extremities the fouthern pole: in a parallelopiped magnet he places the poles at the two extremities in fuch a manner, that the upper half of the furface becomes the fouthern pole, and the lower half the northern pole; the upper half of the other extremity is the northern, and the lower half the fouthern pole.

Thefe experiments are performed by the help of large artificial magnets, of his own making, whofe magnetic virtue prodigioufly exceeds that of the natural load-ftone.

The communication of the magnetic virtue does not fenfibly exhauft the magnet from which the virtue is borrowed; whatever number of pieces of iron are magnetifed by the fame ftone, it lofes nothing of its ftrength; though inftances have been known of a magnet's communicating power to a piece of iron, of a greater weight than the magnet itfelf could raife, yet the power of the ftone has not appeared at all leffened.

Neither is the iron at all enriched at the expence of the load-ftone, whatever virtue it acquires, as the niceft fcales have proved. It is obferved thofe magnets which lift the greateft weights, do not communicate the greateft virtue; experience has taught us that fome magnets, though very weak in themfelves, yet communicate great virtue; it is true, fome kinds of iron imbibe very little virtue from a good ftone, while others imbibe a great deal. But this truth is moft evident in artificial magnets, which in general communicate a great deal of virtue, though they lift but a fmall weight of iron.

MAGNO'LIA, *the laurel-leaved tulip-tree*, in botany, a genus of plants, whofe characters are:

The flower hath no empalement, but is compofed of an uncertain number of petals, which expand in a circular order; and greatly refembles the flower of the water-lily; having a great number of ftamina clofely embracing the conical pointal, which is fituated in the center of the flower: the pointal afterwards becomes a conical fruit, having many fcaly protuberances, each being a cell including a large flattifh feed, which, when ripe, fall out, and are fufpended by threads.

MA'HOMET *Pigeon*, the common Englifh name of a fpecies pigeon, called by Moore the columba Numidica alba. It is of the fame fhape and fize with the Barbary pigeon, and has all the characters of that fpecies, but is always perfectly white, which gives the red circle about the eyes a more lively look. *Moore's Columbarium.*

MAHO'METANS, (*Dict.*)—The Mahometans divide their religion into two parts, viz. faith, or theory; and religion, or practice. Faith, or theory, is contained in this formulary, There is but one God, and Mahomet is his prophet. This confifts of fix diftinct branches, viz. belief in God, in his angels, his fcriptures, his prophets, in the refurrection and judgment, and in God's abfolute decrees. They reckon five points relating to practice, viz. prayer, wafhings, alms, faftings, and pilgrimage to Mecca. The Mahometans have very juft notions of God and his attributes, as appears very plain from the koran itfelf, and the writings of the Mahometan divines; notwithftanding what fome fuppofe, that their God is only a fictitious deity or idol. They believe the angels to have pure and fubtile bodies, created of fire, and that they have various forms and offices: they affign to each perfon two guardian-angels. Mahomet borrowed his whole doctrine concerning the angels from the Jews, who had it of the Perfians. As to the fcriptures, the koran teaches, that God, in divers ages of the world, gave revelations of his will in writing to feveral prophets. They reckon 104 facred books, which, however, are all loft, except the pentateuch, pfalms, gofpel, and koran; and the three firft of thefe, they fay, have undergone fo many alterations and corruptions, that very little credit is to be given to the prefent copies of them: as to the koran, God has promifed to take care of that, having left the others to the care of men. They reckon they have 224,000 prophets, of whom 313 were apoftles, fent with fpecial commiffions to reclaim mankind; and fix of them brought new laws or difpenfations, which fucceffively abrogated the preceding; thefe were Adam, Noah, Abraham, Mofes, Jefus, and Mahomet. The Mahometans have a high opinion of Chrift. They allow that he was a greater prophet than Mofes; that he was the fon of a virgin, who conceived by the fmell of a rofe prefented to her by the angel Gabriel: they believe that he never finned; nay, in their koran, they term him the breath and word of God; they punifh all that blafpheme him; and no Jew is capable of being a Turk, but he muft be firft made a Chriftian: they believe a general refurrection, and a future judgment; but, before thefe, they think there is an intermediate ftate both of the foul and body after death. Mahomet borrowed his doctrine of the refurrection from the Jews: he alfo taught, that the body is intirely confumed by the earth, except only the rump bone, which is to ferve as a bafis of the future edifice of a new body, or as a feed from which the whole is to be renewed. This is to be effected by a forty days rain, which will cover the earth to the height of twelve cubits, and caufe the bodies to fprout forth like plants. For this likewife he is beholden to the Jews, who fay the fame thing of the bone luz. The fixth great point of the Mahometan faith is God's abfolute decree and predeftination of good and evil. Of this doctrine Mahomet made great ufe for the advancement of his defigns, as it was one of the ftrongeft motives to induce his followers to fight without fear, and even defperately, for the propagation of the faith. The koran forbids the drinking of wine and ftrong liquors, and alfo gaming: indeed the Mahometan cafuifts except chefs, becaufe it depends wholly on fkill and management, and not at all on chance. They comply better with the prohibitions of gaming, than that of wine. The koran prohibits the eating blood and fwine's flefh, and whatever dies of itfelf, or is ftrangled, or killed by a blow, or by another beaft; which prohibitions he plainly copied from the Mofaical law; as he did likewife that of ufury, which is ftrictly forbidden.

MAJORA'NA, *marjoram*, a genus of plants whofe characters are: It is a verticillate plant, whofe flower is compofed of one leaf: the galea, or creft, is upright, roundifh, and divided into two parts: the barba, or beard, is cut into three fegments, fo as to appear almoft like a quinquefid flower: the flowers are collected into a fhort thick round head, and come out of a four-fold order of leaves, which are placed like fcales or plates.

Marjoram is an attenuant, diffolvent, and detergent. It is good in nervous cafes, and diforders of the breaft and lungs. Its flowery tops, dried and powdered, and given a fcruple for a dofe, are greatly recommended in epileptic cafes. The dried plant is only kept in the fhops.

The common fweet-marjoram, though a plant fo commonly cultivated with us, never ripens its feeds in England: and, as it is an annual plant, we are obliged yearly to have a fupply of its feeds from Marfeilles, and other places in the fouth of France, where it grows wild in great abundance.

PLATE XXIX. *Engraved for the Supplement.* *Facing Malt-distillery.*

Printed for J. Hinton in Newgate Street.

MA'KING-UP, a term used by the distillers to express the bringing spirits to a certain standard of strength by the additions of water.

MAIZ.—The Indians in New England, and many of our other settlements in America, had no other vegetable but Maiz, or Indian corn, for the making their bread of. They call it weachin; and, where our colonies are at this time numerous, there is yet much of the bread of the country made of this grain, not of the European corn.

The ear of the Maiz yields a much greater quantity of grain than any of our corn ears. There are commonly about eight rows of grains in the ear, often more, if the ground be good. Each of these rows contains at least thirty grains, and each of these gives much more flour than a grain of any of our corn. The grains are usually either white or yellowish, but sometimes they are red, bluish, greenish, or olive-coloured, and sometimes striped and variegated.

The manner of planting Maiz is in rows, at equal distances, every way about five or six feet. They open the earth with a hoe, taking away the surface to five or six inches deep, and of the breadth of the hoe; they then throw in a little of the finer earth, so as to leave the hole four inches deep, or thereabouts; and in each of these holes they place four or five grains at a little distance from one another.

If two or three of these grow up, it is very well; some of them are usually destroyed either by the birds or other animals. When the young plants appear, they hoe up the weeds from time to time; and, when the stalk gathers some strength, they raise the earth a little about it, and continue this at every hoeing, till it begins to put forth the ears; then they enlarge the hill of earth, round the root, to the size of a hop-hill, and after this they leave it till the time of harvest without any farther care.

When they gather the ears, they either immediately strip off the corn, or else hang up the ears, tied in traces at distances from one another; for, if they are laid near together, they will heat and rot, or else sprout and grow; but, kept cool and separate, they will remain good all the winter. The best method of all others is to thrash out the corn as soon as the harvest is over, and then lay it up in holes of the ground, well lined with mats, grass, or the like, and afterwards covered at top with more earth. The most careful among the Indians use this method, and this sort of subterranean grainary always proves good.

The uses of this plant among the Indians are very many. The great article is the making their bread of it; but, besides this, the stalks, when cut up before they are too much dried, are an excellent winter food for cattle; but they usually leave them on the ground for the cattle to feed on. The husks about the ear are usually separated from the rest, and make a particular sort of fodder, not inferior to our hay. The Indian women have a way of slitting them into narrow parts, and they then weave them artificially into baskets and many other toys.

The original way of eating the grain, among the Indians, was this: they boiled it whole in water till it swelled and became tender, and then they fed on it either alone, or eat it with their fish and venison, instead of bread. After this, they found the way of boiling it into a sort of pudding, after bruising it in a mortar; but the way of reducing it to flour is the best of all. They do this by parching it carefully in the fire, without burning, and then beating it in mortars, and sifting it. This flour they lay up in bags, as their constant provision, and take it out with them when they go to war, eating it either dry or with water.

MA'LOPE, *bastard mallow*, in botany, a genus of plants, whose characters are:

The flower which is shaped like that of the mallow, hath a double empalement, the outer being composed of three heart-shaped leaves, and the inner is of one leaf cut into five segments: the flower is of one leaf, divided into five parts to the bottom, where they are joined; but it seems to have five leaves: in the center arises the pointal, having a great number of stamina surrounding it, which are joined closely, and form a sort of column: the pointal afterward becomes a fruit composed of many cells, which are collected into an head; in each of which is lodged a single seed.

MALPI'GHIA, *Barbadoes cherry*, in botany, a genus of plants, whose characters are:

It hath a small quinquefid calyx, which consists of one leaf, having bifid segments: the flower consists of five leaves, which expand in form of a rose, having several stamina collected in form of a tube: the ovary in the bottom of the flower-cup becomes a globular fleshy soft fruit, in which is a single capsule, containing three stony winged nuts.

As these plants are natives of the warmest parts of America, they will not live through the winter in England, unless they are preserved in a warm stove: but, when the plants have obtained strength, they may be exposed in the open air, in a warm situation, from the middle or latter end of June, till the beginning of October, provided the weather continues so long mild; and the plants so treated will flower much better than those which are constantly kept in a stove.

They are all propagated by seeds, which must be sown upon a good hot-bed in the spring; and, when the plants are fit to transplant, they must be each put into a separate small pot filled with rich earth, and plunged into an hot-bed of tanner's bark, and must be treated in the same manner as hath been directed for other tender plants of the same country: and, for the two first winters, it will be proper to keep them in the bark-bed in the stove; but afterwards they may be placed upon stands in the dry stove in winter, where they may be kept in a temperate warmth, in which they will thrive much better than in a greater heat: these must be watered two or three times a week, when they are placed in the dry stove; but it must not be given to them in large quantities. *Miller's Gard. Dict.*

MALT (*Dict.*)—Almost every master has his secret of making Malt; but there are some necessary cautions to be observed by all, which will ensure success in the work; as, first, that the barley be newly thrashed, or at least newly winnowed. Secondly, that the whole be of one kind, not mixed up with several sorts. Thirdly, that it be not over steeped in the cistern, or so long as to make it soft. Fourthly, that it will be well drained. Fifthly, that it be carefully looked after in the wet couch, so as not to stop the first tendency of the blade to shooting. Sixthly, to turn the wet couch inside outermost, if the barley comes, that is, shoots more in the middle than on the sides. Seventhly, to keep it duly turning after it is out of the wet couch. Eighthly, to give it the proper heat in the dry heap. Ninthly, to dry and crisp it thoroughly on the kiln, but without a fierce fire, so as to be several days in drying a kiln of pale Malt. *Shaw's Lectures.*

Good Malt may be made of the grain of the maiz or Indian corn, but then a particular method must be taken for the doing it. Our barley Malt-makers have tried all their skill to make good Malt of it in the ordinary way, but to no purpose; that is, the whole grain will not this way be malted or rendered tender or floury, as in other Malt; for it is found, by experience, that this corn, before it be fully malted, must sprout out both ways, that is, both root and blade, to a considerable length, that of a finger at least, and, if more, the better. For this purpose, it must be laid in a heap a convenient time; and in this process, if it be of a sufficient thickness for coming, it will quickly heat and grow mouldy, and the tender sprouts will be so entangled, that the least moving of the heap will break them off; and the farther maturation of the grain into Malt, will be hindered by this means; and on the other hand, if it be laid thin, and often stirred and opened to prevent too much heating, those sprouts which have begun to shoot cease growing, and consequently the corn again ceases to be promoted to the mellowness of Malt. *Philos. Trans.* N°. 142.

To avoid all these difficulties, the following method is to be used: take away the top of the earth in a garden or field, two or three inches, throwing it up half one way, and half the other; then lay the corn for Malt all over the ground so as to cover it; the earth that was pared off is now to be laid on again, and nothing more is to be done till the field is all over covered with the green shoots of the plant. The earth is then to be taken off, and the roots of the grain will be found so entangled together, that they will come up in large cakes or parcels; it must be gently washed in order to take off all the dirt, and then dried on a kiln, or in a clean floor exposed to the sun. Every grain of the maiz will be thus transmuted into good Malt, and the beer brewed with it will be very pleasant and very wholesome, and of an agreeable brown colour, but very clear.

It may be worth trying whether the same process is not with due care applicable to the malting of turneps, potatoes, carrots, parsneps, and the like. It might possibly be of service also to attempt this less laborious way of making Malt of barley and other small grains; the disadvantages would be the not so easily separating the dirt from the grain as in that larger kind; and as barley requires the root only, not the ear, to shoot in order to the making of Malt, it would be some difficulty to know the exact time of taking it up; but with all these disadvantages, the method is worth a trial.

MALT-*distillery*, the art of converting Malt liquors into a clear inflammable spirit.

The reader will find every thing relating to brewing and fermenting Malt-liquors intended for distillation, under the articles BREWING, FERMENTING, and WASH.

Malt-wash being of a mucilaginous or somewhat glutinous nature, requires a particular encheiresis to prevent its scorching, and to make it work kindly in the still. If it should happen to be burnt in the operation, this would give the spirit a most disagreeable flavour, or empyreuma, that cannot be got off again, without the utmost difficulty, or some very particular treatment. To prevent any such ill effect, 1. The wash should be made dilute; 2. The fire be well regulated; and, 3. The liquor kept in a constant agitation.

The constant agitation of the wash, may be effected three different ways; viz. 1. By stirring it with a paddle or oar, till the liquor begins to boil, then immediately luting on the head. This is the common way. 2. By putting some moveable solid bodies into the still. And, 3. By placing some proper matter at the bottom and sides, or where the fire acts the strongest.

1. The

1. The usual method of stirring with the paddle is very defective, as being of no use after the still is once brought to work; whereas it often burns in the working. This method is greatly improveable by an addition to the structure of the still; whence the agitation may be commodiously continued during the whole operation: and this though the wash were made very thick, or wine-lees themselves were to be distilled. The method is this: solder a short iron or copper-tube in the center of the still-head; and below, in the same head, place a cross-bar, with a hole in the middle, corresponding to that a-top; through both which, is to run an iron-pipe, deep down into the still; and through this an iron rod: to the bottom whereof wooden sweeps are to be fastened; so that, this rod being worked a-top, backwards and forwards, with a winch, they may continually rake and clear the bottom plate and adjacent sides of the still: the interstices of the tubes being at the same time well crammed with tow a-top, to prevent any evaporation thereat.

2. The same effect may in good measure be secured by a less laborious way; viz. by placing a parcel of cylindrical sticks lengthwise, so as to cover the whole bottom of the still; or else by throwing in a parcel of loose faggot-sticks at a venture: for thus the action of the fire below, moving the liquor, at the same time gives motion to the sticks, and makes them continually act like a parcel of stirrers upon the bottom and sides of the still, so as to prevent the liquor from scorching.

3. But a better method still is upon a parcel of large cylindrical sticks to lay loose hay, to a considerable thickness; securing it from rising by two ash-poles laid a-cross, and pressing hard against the sides of the still; which might, if necessary, be furnished with buttons or loops, to secure the poles from starting. But care must here be had, not to press the hay against the sides, for that would presently make it scorch; which being otherwise defended by the sticks, it is not apt to do.

These are simple but effectual contrivances, which, in point of elegance, are easily improveable at pleasure.

There is a farther inconvenience attending the distillation of Malt-spirit, when all the bottoms or gross mealy feculent substance is put into the still, along with the wash: which thus coming to thicken a little, like starch in the boiling, and losing the thinner liquor, wherewith it was diluted, as the still works off; the mealy mass at length grows so viscous, as sometimes to scorch towards the end of the operation. To prevent this ill effect, it is very proper to have a pipe, with a stop-cock, leading from the upper part of the worm-tub into the still; so that, upon a half or a quarter turn, it may continually supply a little stream of hot water, in the same proportion as the spirit comes off, by which means the operation will be no ways checked or hindered.

But in Holland, where they work their wash thick, with all the Malt and meal along with it, they commonly use no art at all to prevent burning; only charge whilst the still is hot and moist, after having been well washed and cleansed. And yet they very rarely scorch, unless it be now and then in the winter. When such an accident happens, they are extremely sollicitous to scrape, scrub, and wash off the least remains of the burnt parts; by which means they effectually avoid the danger there would otherwise be of burning a second time.

But most effectually to prevent any accident of this kind, there is nothing comparable to the way of working by the balneum mariæ, if the distillers could have the address to find their account in it.

All simple spirits may be considered in the three different states of low-wines, proof-spirit, and alcohol: the intermediate states being of less general use, and to be judged of according as they approach to or recede from these. Low-wines, at a medium, contain a sixth part of totally inflammable spirit; five times as much water as perfect spirit necessarily rising in the operation with a boiling heat. Proof-goods contain about a half of the same totally inflammable spirit, and alcohol entirely consists of it.

Malt-low-wines, prepared in the common way, are exceeding nauseous, fulsome, and disagreeable. They have however a natural vinosity, or pungent acidity, that would render the spirit agreeable, were it not for the gross oil of the Malt, abounding therein. When this oil by suitable contrivances, as mentioned above, is kept from running in among the low-wines, they prove considerably sweeter, both to the smell and taste; and less thick and milky to the eye.

When distilled over gently, in order to their rectification into proof-spirit, they leave a considerable quantity of this gross fœtid oil behind, with the phlegm, in the still. But, if the fire be made fierce, this oil is again thrown over, mixed with the spirit; and, being now broke somewhat fine, impregnates it rather in a more nauseous manner than at first. And this is the usual fault commited not only by the Malt-stiller, but even the rectifier; who, instead of separating and keeping back the foul parts, according to the design of the operation, really brings them over in greater vigour. Whence it is not unusual, after repeated rectifications, as they call them, both simple and compound, to find the spirit much more nauseous and disagreeable than it came from the hands of the Malt-stiller. The remedy is, plainly, either gentle and soft working in the common engine, or the prudent use of the balneum mariæ.

Malt-low-wine, when brought into proof-spirit, appears bright and clear, without the least cloud or milkiness; no more oil being contained in the mixture than is perfectly dissolved by the alcohol, weakened with its own quantity of phlegm. Its taste also is much cleaner for the same reason; viz. because no gross parts of the oil can, in their own form, hang upon the tongue, but now pass readily and slightly over it: which is not the case in low-wines and faints, where the oil remains distinct and undissolved.

When proof Malt-spirit is distilled over again, in order for alcohol, if the fire be raised when the faints begin to come off, a very considerable quantity of oil will be brought over, and run in the visible form of oil, from the nose of the worm. Though this is not peculiar to Malt-spirit, but others also, and even French brandies do the same; so that sometimes half an ounce or more of this oil may be collected from a single piece of brandy.

Malt-spirit, more than almost any other, requires to be brought into the form of alcohol, before it can be used internally; especially, as it is now commonly made up, with as much fulsome oil in it as will give it the strongest proof. On which account it is, that in all compound waters, not excepting those of the apothecary, an indifferent judge will easily find the predominant flavour of this fulsome spirit, through that of all their ingredients. For this reason, it ought at least to be rectified, in balneo mariæ, to a perfect alcohol, before it is used in the finer compositions.

And, when once brought, with a due care and art, to a perfect alcohol indeed, it is then preferable to the French brandies for all curious internal uses; as being a much more uniform, hungry, tasteless, and impregnable spirit than those usually are.

This alcohol ought to be kept in close earthen vases or jars; not only to prevent its evaporation, but also its colouring itself with the resinous parts of the oak, which it dissolves powerfully, when preserved in casks.

The quantity of pure alcohol obtainable from a certain quantity of Malt differs according to the goodness of the subject, the manner of the operation, the season of the year, and skilfulness of the workman: according to which variations, a quarter of Malt may afford from eight or nine, to thirteen or fourteen gallons of alcohol; which should encourage the Malt-stiller to be careful and intelligent in this business. As, after each operation in the common way, there is always a remainder of faints, which never ought in their foul state to be mixed among the cleaner spirit; they should either be converted to other uses, or treated in a particular manner, so as to make a pure alcohol: the uses they are otherwise fit for being principally external, or, when redistilled to a proper height, burning in lamps: for which purpose they may have their disagreeable odour corrected by proper aromatics, or other ingredients, used in distillation.

But to make them into pure and perfect alcohol is a work of greater difficulty; yet practicable, though not perhaps to advantage. One way of effecting it is by slowly rectifying them from water into water; by which operation several times repeated, a pure alcohol may be obtained from the foulest and most oleaginous faints. But of this method, and others for the like purpose; see RECTIFICATION.

The œconomical use of the still-bottoms of the Malt-wash is sufficiently understood by the Malt-stiller; and, being so profitable an article, may, perhaps, render him less sollicitous about the improvement of the other branches of the business.

But these bottoms might have some farther, if not more advantageous uses than feeding of animals. Thus, in particular, they might, in a chemical way, afford a large proportion of an acid spirit, an oil, a fewel, and a fixed salt; and, with some address and good management, a vinegar or a tartar. Besides this, one uncommon use thereof has been already touched upon, where the refuse wash is observed to be very advantageously employed, instead of water, in the next brewing: as more readily disposing the subject to ferment; giving the spirit a vinosity, and somewhat increasing its quantity. But the proportion for this purpose should not exceed that of a fifth or sixth of the whole liquor employed.

The liquor left behind in the still, upon rectifying the low-wines, is little more than mere phlegm or water, impregnated with a few acid and some oily parts, not worth separating, unless for curiosity. And the same is to be understood of the liquor left behind upon distilling proof-spirit into it.

Explanation of *plate* XXIX, being a section of part of a Malt still-house.

a, A worm-tub, or refrigeratory belonging to the still *f*, *g*.
b, A man pumping water into the still *f*.
c, A common pump.
d, A pipe which conveys the water from the pump into the still *f*.
e, A cock to the pipe *d*.
f, The body of a still.
g, The head of the still *f*.
h, The nose or beak of the still-head, by which the vapour arising by distillation is conveyed into the worm, where it is condensed into a fluid.
k, An iron door, which confines the fire under the still.

l, A

l, A tackle for lifting off the ſtill-head *g*,
m, The head of another ſtill.
n, A machine for ſtirring the liquor, or, as the brewers call it, waſh, in the ſtill.
o, A man turning the machine.
p, A tackle for lifting off the ſtill-head *m*.
q, The beak or noſe of the ſtill *m*.
r, The door to the fire-place belonging to the ſtill *m*.
s, A copper for brewing the waſh for diſtillation.
t, A maſh tun, which receives the liquor from the copper *s*.
u, A cock, by which the liquor is let out of the copper *s* into the maſh-tun *t*.
w, A man maſhing, or ſtirring the Malt in the maſh-tun.

MALT-*duſt*.—This is accounted a great enricher of barren ground: it contains in it a natural heat and ſweetneſs, which gives the earth whereon it is laid a proper fermentation, as thoſe who live in malting countries have found by experience. Some are of opinion, that there is not a greater ſweetener than Malt-duſt, where the grounds are natural clay, and have contracted a ſourneſs and auſterity, whether by reaſon of its having lain long untilled, and unexpoſed to the air, or by reaſon of water having ſtood long thereon.

MA'LVA, *mallows*. See MALLOWS, in the Dictionary.

MALVA *marina*, *the ſea mallow*, in botany, a name not very judiciouſly given by ſome writers to a ſpecies of ſubmarine plant, ſuppoſed, in ſome degree, to reſemble the common mallow. It is very common in the places where they fiſh for coral, and grows to the rocks without any regular roots; it is found at different depths, but moſt uſually far from the ſurface, and its height is uſually about two inches. It is of a duſky greeniſh colour, with an admixture of a faint yellow; it is compoſed of ſeveral leaves of about half an inch broad, and a little more than that in length. Each of theſe is faſtened to a pedicle of about an inch and a half long; the leaves are of a fine thin membranaceous ſubſtance, but their ſtalks or pedicles are thick and tough like horn. When examined by the microſcope, many glandules diſcover themſelves upon the ſurfaces of the leaves, but the ſtalks or pedicles are entirely covered with glandules in form of ſmall protuberances, which make it as rough in thoſe parts as the common chagrine. The ſtalks, when cut tranſverſly, ſhew an infinite number of pipes or veſſels running up to every part of the leaves. Count Marſigli has given an elegant figure of this, both as it appears to the naked eye, and by the microſcope. *Marſigli, Hiſt. de la Mer.*

MA'LVA *roſea*, *roſe mallow*, *or hollyhock*; the characters are:
It hath a large and more expanded flower than the mallow, which cloſely adheres to the ſtalk; and in many ſpecies, the flowers are double, where the petals occupy the place of the ſtyle: it is in every reſpect larger than the common mallow: the leaves are rougher, and the plant grows almoſt ſhrubby.
Theſe plants are propagated from ſeeds, which ſhould be ſown upon a bed of freſh earth in April: and when the plants are come up pretty ſtrong, they muſt be tranſplanted out into nurſery-beds at about eight inches diſtance from each other, obſerving to water them until they have taken root; after which they will require no farther care until the Michaelmas following, but only to keep them clear from weeds; at which time they ſhould be tranſplanted into rows two feet aſunder, and a foot diſtance in the rows; in which place they may continue until they flower, when you ſhould mark all thoſe with double flowers, which have good colours, with ſticks, that they may be tranſplanted into the borders of large gardens at Michaelmas, where they will remain four or five years, and produce their flowers very ſtrong: but when the roots are much older, they begin to decay, and do not produce their ſtems ſo ſtrong, nor are their flowers ſo large; wherefore there ſhould always be a ſupply of young plants raiſed from ſeeds every third or fourth year, in order to have the flowers in perfection: but it is the better way to change the ſeeds every three or four years, with ſome perſon of integrity who lives at a conſiderable diſtance, and is exact to ſave ſeeds from none but double flowers, and ſuch as are well coloured, by which means you may preſerve the ſorts well from degenerating: but if you conſtantly ſave the ſeeds in the ſame place, they will in a few years become of little worth.

MA'LUS, *the apple*. See APPLE.

MA'MEI, *the mammee-tree*; a genus of plants, whoſe characters are:
It hath a roſaceous flower, which conſiſts of ſeveral leaves placed in a circular order; from whoſe cup ariſes the pointal, which afterwards becomes an almoſt ſpherical fleſhy fruit, containing two or three ſeeds incloſed in hard rough ſhells.

MA'MMOTH'*s Teeth*, or MAMMOUT *Bones*, in natural hiſtory, a name given by travellers and other writers to certain foſſil teeth, and other bones, found in Ruſſia and ſome other parts of the world, and that uſually at great depths in the earth. The Ruſſians and other people give them this name, ſuppoſing them to have belonged to an animal which they deſcribe as being of a monſtrous ſize, and living in caverns under ground. But the true account of them is, that they are in reality the teeth and other bones of elephants, there being no ſuch beaſt as theſe people deſcribe.

MA'NDARINES (*Dict.*)—There are in China nine orders of Mandarines, or nine degrees of nobility, which have as many different animals for their characteriſtics. The firſt is diſtinguiſhed by a crane, the ſecond by a lion, &c. There are in all 32 or 33,000 Mandarines in China. There are Mandarines of arms, and Mandarines of letters, who are judges; they both paſs ſeveral examinations. They are ſo much reſpected, that no body ſpeaks to them but on the knee. They are diſtinguiſhed from each other by different ſorts of precious ſtones in their caps and girdles; and there are great lords who are ſuperior to theſe Mandarines, who are alſo known by round jewels in their girdles, and a ſapphire in the middle.
The Chineſe alſo call the learned language of the country the Mandarine tongue; this is, in China, what the Latin is in Europe, and is common to all the learned men in the empire. Their public officers, as notaries, lawyers, judges, &c. write and ſpeak the Mandarine.

MANDRA'GORA, *mandrake*, in botany, a genus of plants, whoſe characters are:
The flower is monopetalous, bell-ſhaped, and multifid; the fruit is ſoft, globular, and contains ſeeds, which are for the moſt part kidney-ſhaped.
The mandrake has a large browniſh root, ſometimes ſingle, and ſometimes divided into two or three parts, growing deep in the earth, from which ſpring ſeveral large dark green leaves, a foot and more in length, and four or five inches broad, ſharp-pointed at the ends, of a fœtid ſmell; from among theſe ſpring the flowers, each on a ſeparate foot-ſtalk, about the height and bigneſs of a primroſe, of a whitiſh colour, of one bell-faſhioned leaf, cut into five ſegments, ſtanding in a large five-cornered calyx; and are ſucceeded by ſmooth round fruit, about as big as a ſmall apple, of a deep yellow colour when ripe, and of a very ſtrong ſmell. It grows wild in Spain, Italy, and Turkey, but in cold countries only in gardens. The leaves and roots are uſed.
This plant is rarely uſed inwardly, many eſteeming it to be a narcotic, and of a poiſonous nature; though others deny it and ſay, that the fruit may be eaten without any ill effects. Outwardly, it is uſeful in all kinds of inflammations, hot tumors, and ſcrophulous ſwellings: the juice, dropped in the eyes, is good to take away their heat and redneſs. It is ſeldom to be met with; and, though an ingredient in the unguentum populeon, its place is generally either ſupplied by henbane, or Engliſh tobacco. *Miller's Bot. Off.*
The mandrake is commonly reckoned among narcotics and hypnotics; whether this be true of the bark of the root, which is the part uſed in the ſhops, I am not certain; but the fruit is without doubt unjuſtly ſuſpected. Caſpar Hoffman confeſſes himſelf unable to determine, whether the apple, either with or without the rind, may be eaten with ſafety or not. Aetius ſeems to aſcribe all the malignity to the ſeeds, as if the pulp, without them, was harmleſs, unleſs eaten in an exceſſive quantity. That the pulp, however, may be eaten together with the ſeeds, without injury, appears from the example of I. Faber Lynceus, profeſſor of botany at Rome, who, as we are aſſured by J. Torrentius, in his Notes on Hernandez de Plantis Mexicanis, before his auditors, eat up a large mandrake apple, ſeed and all, in the morning faſting, without any conſequent ſleeping, or any the leaſt ill ſymptom. And that the experiment might be the ſurer, he continued, he ſays, without taking any thing elſe till dinner-time, which was ſome hours. J. Torrentius ſays, he has very often tried the ſame experiment.

MA'NGANESE, *magneſia*, in natural hiſtory, a very poor kind of iron ore.
It is a denſe, ponderous, and heavy ſubſtance, in its pureſt pieces, approaching greatly to the texture of the lapis hæmatites, being compoſed of regular parallel ſtriæ, diverging from a center to the circumference. This kind, however, is rare; beſides this, there is another ſomewhat of a leſs pure kind, of an iron grey colour, and irregularly ſtreaked like the ſteel-grained lead ores. But the common Manganeſe is of a perfectly irregular ſtructure. It is very heavy, moderately hard, and of a deep duſky grey, approaching to black, though ſometimes of a ferrugineous brown. It is found in large maſſes of no determinate ſhape, and of a rude, rugged, and unequal ſurface. Manganeſe gives fire but difficultly with ſteel, and makes no effervеſcence with aqua-fortis. It is found in many parts of England and Germany.
This ſubſtance is of vaſt uſe in the glaſs trade, but neither the induſtrious Neri, nor any others who have written of the art, can ever deliver the true proportions in which it is to be mixed with the glaſs metal on the ſeveral occaſions. The ſame thing is alſo to be obſerved in regard to zaffer, another ſubſtance in continual uſe among them. And the reaſon of this is, that there is vaſt difference in the quality of theſe bodies, ſome which are ſold being very pure and rich, others good for almoſt nothing, and much of middle degrees of purity between theſe. For this reaſon there is no determining how much of each is to be added to the glaſs, but the conciator adds them at ſeveral times, and in ſmall quantities, and takes frequent proofs by his eye, till he knows that they are properly proportioned. *Merret's Notes on Neri.*

MA'NGO *Tree*, in botany, the name of a vast tree, forty feet in height, and eighteen in thickness, and spreads its numerous branches all around at a great distance, being always green, and bearing fruit once or twice a year, from six or seven years old to an hundred. It is propagated by insition, or sowing the seed, in Malabar, Goa, Bengall, Pegu, and many other countries in the East-Indies.

The fruit is of a round oblong figure, flat, slightly sinuated, or hollowed at the sides, and shaped much like a kidney, bigger than a goose egg, smooth, shining, first green speckled with white, then inclining to yellow, and at last of a gold-colour: it has a yellowish and succulent pulp, not unlike that of a peach; or rather a plum, first acid, then acido-dulcid, and pleasant to the taste. Within the pulp is contained an oblong, compressed, and lanuginous stone, thin, yet very hard and tenacious, and including a callous oblong kernel, very like an oblong almond, and of the same bigness, and of a bitterish, though not unpleasant taste.

There are various sorts of this fruit, as there are of our apples and pears, which are very different, according to the countries where they grow: that species, which is without a stone, and is very grateful to the palate, seems to us only a variety, or a degenerate fruit The fruit is cut into slices, and eaten either without wine, or macerated in wine; it is also candied, in order to its preservation. Sometimes they open it with a knife, and fill up the middle with fresh ginger, garlic, mustard, and salt, with oil or vinegar, that they may eat it with rice, or after the manner of pickled olives.

As to its temperament, this fruit is cold and moist, though the Indian physicians affirm the contrary. We make use of pickled Mangoes, which are imported to us, as we do of pickled cucumbers, for sauce to roasted meat. The stones roasted are said to cure a looseness, which Garcias found to be true. The wood of the tree, with cinders, is used for burning the carcases of the pagans, as being consecrated to this rite; whence it serves also for coffins, in which they reposit their dead; but it is but of a soft substance, and of short duration.

The stalks supply the place of arequa or caunga, in the chewing of betel; the same, calcined and reduced to powder, take away warts. Of the tender leaves, with the bark of the avanacoe, that is, the ricinus, the seed of cummin and parpadogam, is made a decoction, which is highly beneficial in the cough, asthma, and other affections of the thorax. The bark of the tree pulverised, and taken in chicken-broth, is an excellent dissolvent of extravasated and coagulated blood, occasioned by a fall, in any part of the body. The juice of the bark, with the white of an egg, and a very little opium, taken inwardly, is a present remedy against the diarrhœa, dysentery, and tenesmus. Of the gum of the tree, and the flowers of rice, with the addition of a small quantity of opium and pepper, are prepared pills, which also cure all sorts of fluxes of the belly. Of the flower of the dried kernels the natives have the art of preparing various kinds of food.

MANIFE'STO (*Dict.*)—Manifesto's were substituted in the room of that august and solemn ceremony, by which the ancients introduced the divine Majesty in declarations of war, as witness and avenger of the injustice of those who undertook war without reason and necessity. Motives of policy have, besides, rendered these Manifesto's necessary, in the situation of the princes of Europe with regard to each other, united by blood, alliances, and leagues. Prudence requires the prince who declares war against his enemy, to avoid drawing upon him the arms of all the allies of the power he attacks. It is to prevent these inconveniences that Manifesto's are published.

MANU'RING.—Sea sand is often made use of by way of manure, in some parts of Cornwall, near the sea shore. When the sand is notably shelly, that is, much mixed with the broken pieces of sea shells, it is reckoned best. It is spread upon such land as is intended for wheat, or usually in the first crop of four, whatever be the grain; for, after four crops, it is the custom, in Cornwall, to leave the land six or seven years for pasture before it is tilled again, and the grass will be so good the first year, where this manure is used, as to be fit for mowing: this is called mowing of gratten by the people there. The Cornish acre is eight score yards, at eighteen feet to the yard. In one of these acres, the farmers bestow, according to the distance from the sea shore, from three hundred sacks to one hundred, each sack containing thirteen gallons, which is called a horse-load, the roads in many parts of this country being so bad, that they are forced to carry the sand on horse-back from the water-side to the land, though eight or ten miles distant. In this case the sand costs them in the whole about eight pence per load. Where the land lies very distant from the shore, and from all water carriage, they bestow very little of this manure, but they do not care to be any where wholly without it. In some of these places they lay twenty loads on an acre, and find a proportionable advantage from it. Where much sand is used, the corn is large and plentiful, and the straw little. Hence has grown the old Cornish phrase of a bushel of corn to a peck of straw; which is not miraculous in a place where the ears of barley are frequently found as long or longer than the stalks they grow on.

Where little of this sand is used, there is generally a great deal of straw, and but little and hungry ears of small grain. After the corn is taken off, the grass that naturally comes up is a white clover; and, where the land is any thing deep, a red kind comes up among it. This is usually but short the first year, but it grows thick, and affords good feeding for the cattle; and they are found to thrive better, and give better milk, than when they are fed on the high grass, which generally succeeds where there has been less sand used.

Another great advantage of the lands where much sand is used, is, that no snow lies upon them; there is a continual winter spring, and an early harvest, usually six weeks before the neighbouring lands that do not use it in proper quantities; so that all the expence of procuring it in quantities is many ways amply repaid to the farmers.

We have, about Erith, and many other places, the same sort of sand in great abundance in the Thames, that is used with this great advantage in Cornwall; and, if it should be found on trial to answer as well, probably there would be found few places where this river would not afford it at some depth, or in some part of its bed. The coral sand of Falmouth is dredged up from under a stratum of ouze of about a foot in thickness; and perhaps in the Thames, where the bottom seems of another nature, the same sand, or some of equal efficacy, may be found underneath. The sand taken up out of the Thames at Erith is used by the brick-makers, and they observe that the grass always grows particularly fresh and strong about the edges of their heaps of it, and that clover naturally grows there among the other grass. *Phil. Transf.* N°. 113.

MA'PLE *tree*, *acer*, in botany, the name of a tree common in most parts of England.

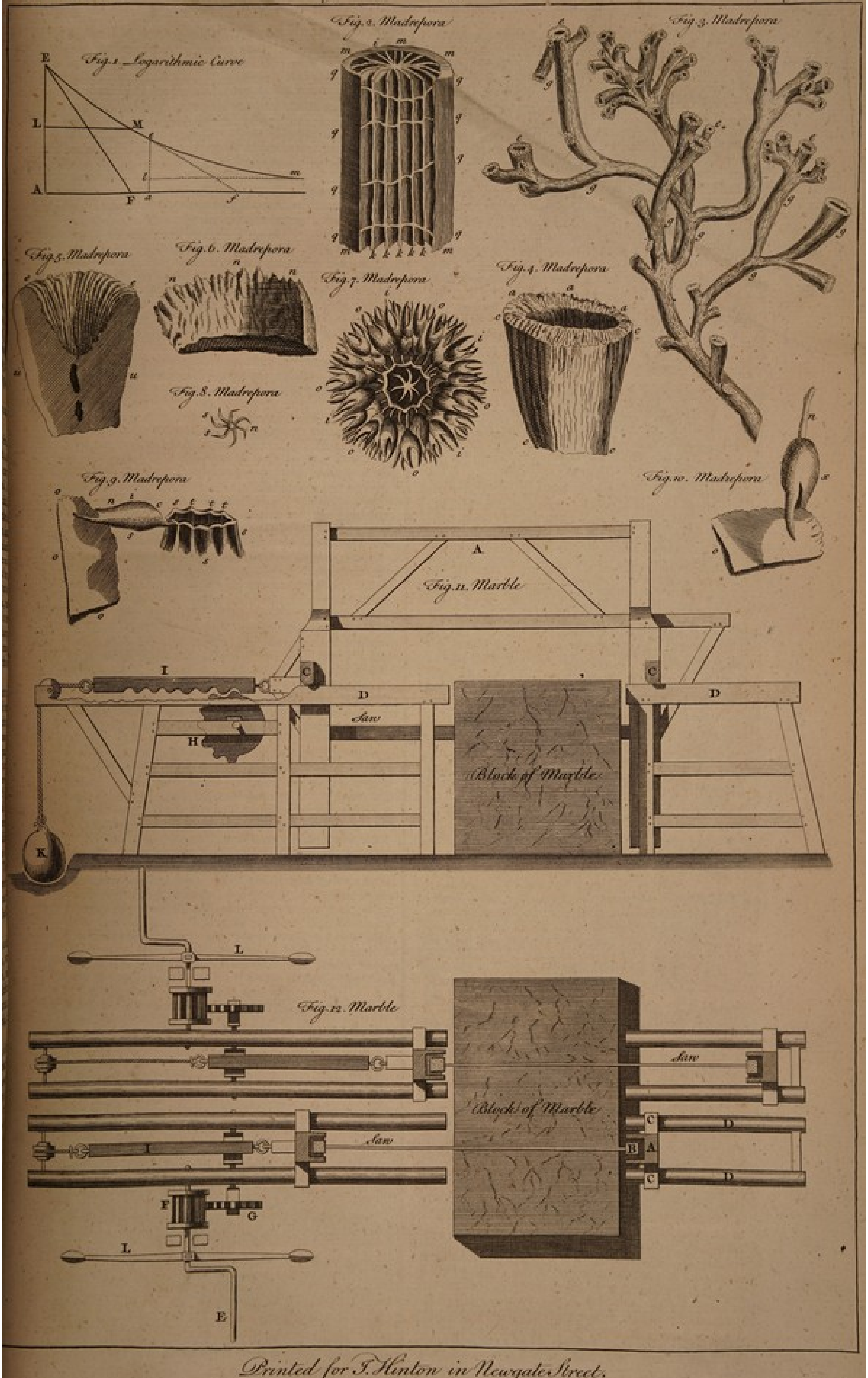
These trees are easily propagated by sowing the seeds, soon after they are ripe, in an open bed of common earth, covering them about half an inch thick, with sandy light earth: the spring following they will appear above ground, and, if kept clear from weeds, will grow above a foot high the first summer: the Michaelmas following, if they are thick in the seed-bed, you may take out a part of them, and transplant into a nursery, in rows at three feet distance, and two feet asunder in the rows; in which place they may remain three or four years, when, they will be large enough to plant out for good. The timber of the common Maple is far superior to the beech for all uses of the turner, particularly dishes, cups, trenchers, and bowls; and when it abounds with knots, as it very often doth, it is highly esteemed by the joiners for inlayings, &c. and also, for the lightness of the wood, is often employed by those that make musical instruments; and, for the whiteness of the wood, is in great request for tables.

Egyptian MA'RBLE, a name given by our artificers to a very beautiful green and white Marble, greatly in use among us, and brought in great quantities from Egypt and other places. It was also in frequent use, and in great esteem among the Romans, who received it also from Egypt, and distinguished too lightly two kinds of it, from the different disposition and order of its variegations, and honoured them with the names of two of their emperors, in whose reigns they were first brought into use. These were the marmor Augusteum and Tiberianum. Those pieces, in which the variegations were waved and thrown into arches and circular figures, they called the Augustan; and those, which were marked with more diffused and scattered veins, they called the Tiberian. These were the whole differences between the two; and, if we were to acknowledge different species from such differences as these, we must allow almost as many different species as we see blocks of Marble. *Hill's Hist. of Foss.*

Colouring of MARBLE.—The colouring of Marble is a nice art, and in order to succeed in it, the pieces of Marble, on which the experiments are tried, must be well polished, and clear from the least spot or vein. The harder the Marble is, the better it will bear the heat necessary in the operation; therefore, alabaster, and the common soft white Marble, are very improper to perform these operations upon.

Heat is always necessary for the opening the pores of the Marble, so as to render it fit to receive the colours; but the Marble must never be made red-hot, for then, the texture of the Marble itself is injured, and the colours are burnt, and lose their beauty. Too small a degree of heat is as bad as too great; for, in this case, though the Marble receive the colour, it will not be fixed in it, nor strike deep enough. Some colours will strike even cold, but they are never so well sunk in as when a just degree of heat is used. The proper degree is that which, without making the Marble red, will make the liquor boil upon its surface. The menstruums, used to strike in the colours, must be varied according to the nature of the colour to be used. A lixivium made with horse's or dog's urine, with four parts quick-lime, and one part pot-ashes, is excellent for some colours; common ley of wood-ashes does very well for others: for some, spirit of wine is best; and, finally, for others, oily liquors, or common white-wine.

The colours which have been found to succeed best with the peculiar menstruums, are these: stone-blue dissolved in six times the quantity of spirit of wine, or of the urinous lixivium; and that colour which the painters call litmouse, dissolved in common ley of wood-ashes. An extract of saffron, and that colour made of buckthorn berries, and called by the painters sap



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sap green, both succeed well dissolved in urine and quick-lime, and tolerably well in spirit of wine. Vermilion, and a fine powder of cochineal, succeed also very well in the same liquors. Dragon's blood succeeds very well in spirit of wine, as does also a tincture of logwood, in the same spirit. Alkanet root gives a fine colour, but the only menstruum to be used for this is oil of turpentine; for neither spirit of wine, nor any lixivium, will do with it. There is another kind of fanguis draconis, called dragon's blood in tears, which, mixed with urine alone, gives a very elegant colour. *Philos. Transact.* N°. 268.

Besides these mixtures of colours and menstruums, there are some colours which are to be laid on dry and unmixed. These are dragon's blood, of the purest kind, for a red; gamboge for a yellow, green-wax for a green, common brimstone, pitch, and turpentine for a brown colour. The Marble, for these experiments, must be made considerably hot, and then the colours are to be rubbed on dry in the lump. Some of these colours, when once given, remain immutable; others are easily changed or destroyed. Thus the red colour given by dragon's blood, or by a decoction of logwood, will be wholly taken away by oil or tartar, and the polish of the Marble not hurt by it.

A fine gold colour is given in the following manner: take crude sal armoniac, vitriol, and verdigrease, of each equal quantities; white vitriol succeeds best, and all must be thoroughly mixed in fine powder.

The staining of Marble to all the degrees of red or yellow, by solutions of dragon's blood or gamboge, may be done by reducing these gums to powder, and grinding them, with the spirit of wine, in a glass mortar; but, for smaller attempts, no method is so good as the mixing a little of either of these powders with spirit of wine, in a silver spoon, and holding it over burning charcoal. By this means a fine tincture will be extracted, and, with a pencil dipped in this, the finest traces may be made on the Marble, while cold, which, on the heating it afterwards, either on sand, or in a baker's oven, will all sink very deep, and will remain perfectly distinct in the stone. It is very easy to make the ground colour red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteness is to remain, with some white paint, or even with two or three doubles only of paper, either of which will prevent the colour from penetrating in that part. All the degrees of red are to be given to Marble by means of this gum alone; a slight tincture of it, without the assistance of heat to the Marble, gives only a pale flesh colour, but the stronger tinctures give it yet deeper; to this the assistance of heat adds yet greatly; and, finally, the addition of a little pitch to the tincture gives it a tendency to blackness, or any degree of deep red that is desired.

A blue colour may be given also to Marble by dissolving turnsol in a lixivium of lime and urine, or in the volatile spirit of urine; but this has always a tendency to purple, whether made by the one or the other of these ways. A better blue, and used in an easier manner, is furnished by the canary turnsol, a substance well known among the dyers: this needs only to be dissolved in water, and drawn on the place with a pencil; this penetrates very deep into the Marble, and the colour may be increased by drawing the pencil, wetted afresh, several times over the same lines. This colour is subject to spread and diffuse itself irregularly; but it may be kept in regular bounds, by circumscribing its lines with beds of wax, or any other such substance. It is to be observed, that this colour should be always laid on cold, and no heat given even afterwards to the Marble; and one great advantage of this colour is, that it is therefore easily added to Marble already stained with any other colours, and it is a very beautiful tinge, and lasts a long time. *Mem. Acad. Par.* 1732.

A description of a machine for sawing MARBLE, from a draught of M. Morel's. See *Plate* XXX. *fig.* 11, 12.

Few are ignorant of the common manner of sawing blocks of Marble; they make use of a smooth saw without teeth, which sometimes employs two men one on each side, who cast fine sand into the track of the saw frequently, to wear the Marble, and let water trickle into it to prevent the saw from heating. The frame of the saw is represented by the letter A. The arms of the saw are hollow in the form of cullices, about five feet in height, to answer to the biggest blocks of Marble; and as the saw cannot act upon the Marble, but by the efforts it makes to penetrate it, the extremities are both loaded with a cube of lead, the weight of which must be sufficient to make the saw descend. Besides the parts which compose it, this machine is also fortified with two ears C C to strengthen it and make it slide on the tressels D D placed in a right-line, and at such a distance, that the frame of the saw may easily pass between them.

Though several saws may be made to work at the same time, I shall only speak of one of the two in the plan: the power must be applied to the handle E, whose crank is twelve inches, which continues to the trundle-head F eight inches in diameter, which communicates with the cog-wheel G sixteen inches diameter; at the axis of the wheel G is another wheel H which can be seen only in the eleventh figure, being hid in the plan under the piece I. This wheel which is twenty inches radius to the extremity of the cogs, has cogs only on the half of its circumference, which indent with the notches in the piece I, fixed at one of its extremities to the frame of the saw; at the other is a cord, which, after having passed on a pulley, is fastened to the weight K.

When the power turns the handle, the teeth of the wheel H, meeting those of the piece I, force it, notwithstanding the weight K, to move 30 inches from the left to the right, and the saw is impelled in the same manner, so that, when the wheel H has made an half-turn, as it presents no more cogs to catch in the notches of the piece I, the saw is retracted from the right to the left by the action of the weight K; the handle therefore must be turned twice round to carry the saw once backwards and forwards, and in one of these turns it has plainly no resistance but what proceeds from the friction of the parts.

The diameter of the trundle-head F being only half the diameter of the wheel G, the saw moving thirty inches at every half-turn of the wheel H, for which the handle is obliged to make a turn, the velocity of the acting power will be to that of the saw, in winding up, nearly as seventy-five to thirty, or as five to two; wherefore the resistance of the saw will be in the same proportion as five to two, to the power applied to the handle.

As two men are generally wanted to move the saw, whose joint effort I suppose equal to fifty pounds, we may reckon, subtracting the weight K, the power applied to the handle ought to be twenty pounds; but as an equal power is required to bring the saw back again, as that which carried it forward, and the two cubes of lead with which it is loaded act with equal gravity, the weight K must be at least fifty pounds: but this weight which renders the acting power of no effect, in one of the two turns of the crank, becomes contrary to it in the other, as it re-unites itself to the resistance of the saw, which will be in winding up equal to 100 pounds, taking two-fifths of which for the power applied to the handle, there will remain forty pounds, for which two men are required; so that, hitherto, this machine seems of no advantage, because two men must be employed at the machine as well as in the common method; unless you reckon the intervals when the weight K operates alone a benefit.

But this defect may be remedied by working two saws together instead of one, as may be seen in *fig.* 12, where are two handles on a common axis, but their cranks bent opposite. One saw may be made to go backward as the other goes forward, and, setting a man to each handle, they will divide between them the power necessary to impel one of the saws, while the weight K retracts the other; the resistance will not exceed 40 pounds at most, which will be equally divided between them, because, the two wheels H having their cogs disposed contrarywise, as soon as one leaves its piece I, the other catches in his: thus two men may perform the work of four, by applying the machine to saw two blocks at once; it may be said this machine is rather curious than useful, but we chose to exhibit it, because the principles of its construction may be applied to several uses.

Coralloide MARBLE, in natural history, the name given by authors to such Marbles as have specimens of the marine corals or bodies of that kind immersed in them, as the sea-shells are buried in, and make a part of the body of others.

MARBLE *colour*.—To give this variegated colour to glass is a very easy operation: there needs no more than to put crystal frit into a pot in the furnace, and to work it before it has stood the usual time to purify in the fire. *Neri's Art of Glass.*

MA'RBLED *China ware*, a name given by many to a species of porcelain or China ware, which seems to be full of cemented flaws. It is called by the Chinese, who are very fond of it, tsou tchi.

It is generally plain white, sometimes blue, and has exactly the appearance of a piece of china which had been first broken, and then had all the pieces cemented in their places again, and covered with the original varnish. The manner of preparing it is easy, and might be imitated with us. Instead of the common varnish of the China ware, which is made of what they call oil of stone and oil of fern mixed together, they cover this with a simple thing made only of a sort of coarse agates, calcined to a white powder, and separated from the grosser parts by means of water, after long grinding in mortars. When the powder has been thus prepared, it is left moist, or in form of a sort of cream, with the last water that is suffered to remain in it; and this is used as the varnish. Our crystal would serve fully as well as these coarse agates, and the method of preparation is perfectly easy. *Obs. sur les Cout. de l' Asie.*

MARLE (*Dict.*)—It is a very material circumstance in the marling of land, to find out how much the land requires of this manure; and, till experience has thoroughly shewn this, it is better to err in laying on too little, than too much; because the latter is a fault not to be remedied. It is to be observed also, that Marle never makes so great an improvement on land the first year, as it does afterwards.

In Staffordshire they lay two hundred loads of Marle upon an acre of land of the common kind; but, where the soil is black,

loose,

loose, and sandy, or full of worms, they will lay on three or four hundred loads to an acre; it being a rule with them, that this sort of soil cannot be marled too much. If the mould be thin, the less Marle does; if deep, it must have the more.

It is best sowing of marled lands under furrow; because, if these lands are well husbanded, they will be very mellow and hollow, which will occasion the earth's sinking from the roots of the corn, if it stand too high. If Marle fattens land, or makes it stiff or binding, it must be well dunged, and laid down for grass. In Staffordshire, after their land is marled, their way is to take the crops following. After the first crop of wheat is off, they plow in the wheat stubble in December, and, if the weather proves frosty, to mellow it, they do not plow it again till April. They then sow it with barley, allowing three bushels of seed to an acre. The common produce of this is thirty bushels. After this they sow pease, for which they plow once in the February following, allowing only three bushels of seed to an acre, as in the barley. Next after this, if they intend six crops, they sow wheat again upon the pease-crop; the fifth crop is barley again; and the sixth year's is red oats. Some sow two or three crops more, when the ground has been well marled, but that is much better let alone.

In digging for the Marle, they use in manuring their lands, in Ireland, they meet with fossil horns, and other curious fossils. The Marle always lies in the bottom of low bogs. It is never met with in any other places, and is found by boring with augres made for that purpose. It usually lies at five, seven, or nine feet depth. The obtaining it in many places is attended with very considerable expences, in draining off the water. The manner of digging it is this: they employ six able labourers and a supernumerary; and these cut up a hole of twelve feet square; which is supposed a pit that this number of men can manage in a day. Two men dig, two throw it up, and two throw it by, and the supernumerary supplies defects on all occasions. For the first three feet they dig through a fuzzy earth, fit for making a turf for fuel. Under this lies a stratum of gravel, of about half a foot. Under this often, for three feet more, there is a more kindly moss, which would make better fuel. This lower stratum of turf is always full of fossil wood, which is usually so soft, that the spade cuts as easily through it, as through the earth it lies in. Under this, for about three inches, is found a series of leaves, principally of the oak; these appear very fair to the eye, but fall to pieces on touching; and this stratum is sometimes interrupted with vast heaps of seed, which seem to be of the broom or furz. In some places there appear berries of different kinds; and in others, several species of sea plants, all lying in the same confused manner as the oak leaves. Under this vegetable stratum, there lies one of blue clay, half a foot thick, and usually full of sea shells. This blue clay is not so tough as the common sort, but is thrown carefully up, and used as Marle in some places. Under this always appear the right Marle; the stratum of this is usually from two to four feet thick, and sometimes much more. *Philosophical Transactions.* N°. 394.

Dice MARLE, in husbandry, a name given by the people of Staffordshire to a reddish Marle, that breaks into small square pieces like dice, or else into thin flakes, in the manner of lead ore, and looks smooth on the surface.

MARI'NE *Remains*, a term used by many authors to express the shells of sea fishes, and parts of crustaceous and other sea animals, found in digging of great depths in the earth, or on the tops of high mountains. Their being lodged in these places is an evident and unquestionable part of the sea's having once been there, since it must have covered those places where it has left its productions.

It has been a favourite system with many, and particularly with the late Dr. Woodward, that all these Marine bodies were brought, to the places where they now lie, by the waters of the universal deluge; which, as we are informed by holy writ, covered the whole surface of the globe, and even the highest mountains. But, though this is a very ready expedient to account for many of the natural phænomena, yet there are evident proofs that it cannot have been the cause of all that is attributed to it, and there must necessarily have been some other cause of many of these remains having been placed where we now find them. Neither does the opinion of some particular authors, that partial inundations of different places have left these Marine bodies behind them at the recess of the waters, seem sufficient to account for the multitudes of these remains, many of which we find thrown upon places inaccessible to such floods. *Moro de Crustaceis in Montib. deprehens.*

Signior Moro has attempted to account for these phænomena on a new plan of reasoning. He observes, that it is the best basis of argument to begin from facts, and that, if we can certainly find how some part of these animal remains come to be deposited at such great distances from their natural residence, we may very rationally conclude, that by the same means, be they what they will, all the rest were also brought thither. He adds, that the earth, once the bottom of the sea, or the level surface of a plain, may be, and frequently has been, in the memory of man, raised up into a mountain by subterranean fires, earthquakes, and volcano's. He mentions the famous instances of the new island raised out of the sea near Santorini, in the year 1707, which became of circumference not less than six miles, and of the new mountain raised near Pozzuoli, in 1538.

These, and many other like facts, prove that the origin of mountains and islands may have been such, and that the matter they consist of may have been the same with what was once the bottom of the sea; and that the Marine bodies, found in these mountains, were such as were living, or remaining of living fish, at the time when the islands or mountains were so raised above the surface of the water which before covered it.

This is no new opinion; but this author has set it in a new and much stronger light than it ever had appeared in before, by the instances and examples he has brought in proof of it. Some have been fond of believing that the bodies we call Marine remains, were never indeed any parts of living animals, but that they are mere lusus naturæ, formed in the places where they are found; but Fabius Columna proved this to be an error, shewing that the shark's teeth, or glossopetræ, of the island of Malta, when calcined by a strong fire, yielded ashes, the same as those from animal bodies, and by no means of the same nature with those produced from calcined stones.

MARMO'TTE, *marmotta*, the mountain rat, a creature very common in many parts of Europe, and frequently carried about as a shew by the poor Savoyards. It is of the size of a leveret, or between that of the hare and the rabbit; and is larger-bodied than the cat, but much shorter-legged. Its whole figure and appearance are like the common rat, whence it has its name.

They will play with one another in the manner of kittens, and make a soft and not disagreeable noise on those occasions; but when they are provoked, or when they are affected, as they always are by change of weather, they make a very shrill and disagreeable squeaking. They feed on vegetables, and are very fond of the roots of several plants; they are very fond also of milk, butter, and cheese. They sit on their buttocks to eat, and use their fore-feet as hands to reach their food to their mouths, in the manner of the squirrel. They lie hid in the winter in holes which they dig in the earth, and sleep away a great part of that season. They make their holes in a very nice and artful manner, and make themselves a bed of straw, and other soft matters, that they may lie the softer and the warmer. It is a creature easily bred up tame, and will be perfectly good-humoured and familiar, but it hates dogs.

MARRU'BIUM, *white hore-hound*, in botany, a genus of plants, whose characters are:

The leaves are wrinkled; the calyx is long, and generally furnished with five aculeated appendicula; the galea is erect, with two horns; the beard tripartite, with oblong slender fauces.

Horehound has square, white, hoary stalks, about a foot high, having two leaves at a joint, which are rugged, white, and downy, roundish and blunt-pointed, and serrated about the edges, standing on pretty broad foot-stalks: among these grow very thick whorles, of white, labiated, and galeated flowers, standing in stiff hoary calyces, which end in nine or ten hard, and almost prickly, spinulæ; each calyx contains four small longish seeds; the root is woody, hard, and full of fibres: it grows by the sides of roads, and in lanes; and flowers in June.

The leaves and tops are used.

They are hot and dry, pectoral, and good to free the lungs from hot viscid phlegm, and thereby to help old coughs, especially in cold moist constitutions; the juice being made into a syrup, with sugar or honey, they open obstructions of the liver and spleen, and are very serviceable against the dropsy, jaundice, green-sickness, and obstructions of the catamenia, and suppression of the lochia, and other distempers of the female sex; for which few herbs go beyond it. *Miller's Bot. Off.*

The leaves of the white horehound give no tincture of red to the blue paper; they are very bitter, and have a penetrating smell. It is probable, that in Flanders this smell may approach to that of musk, for Dodonæus affirms it does so. The bitter natural salt of the earth, composed of marine salt, sal ammoniac, and nitre, seem to be united in this plant, with a considerable quantity of sulphur, phlegm, and terrestrial parts.

This plant, by the chemical analysis, yields a great deal of acid phlegm, oil, and earth; a little urinous spirit; some concreted, volatile, and fixed salt; a little lixivial.

Thus it is no wonder, if the white horehound should be a great dissolver, and a good aperitive, and excellent for those who have the asthma or jaundice. The juice of this plant is given to drink, from two ounces to six, for rheums and stubborn coughs: one glass-full of the infusion in white-wine, and several glass-fulls of ptisan, two pugils of the tops of white horehound, are sufficient for one decoction: but the fat must first be taken off, by straining it through a wet cloth, and dissolving it in half a drachm of chalybeated soluble tartar, or twenty grains of the chalybeated flowers of sal ammoniac; one or two ounces of the syrup of horehound, two drachms of the tincture of steel, and two ounces of orange-flower-water may be prescribed for the suppression of the menses. *Martyn's Tournefort.*

MA'RSHY *Countries*.—It is to be observed, that neither canals, nor even large inundations, where the water is deep, are nearly so dangerous in regard to people's health, or exhale so much noxious vapours, as Marshy grounds, or meadows that have

have been once floated, and but lately drained; and that fields, though dry in appearance, may neverthelefs be moift, by the tranfpiration of fubterraneous water.

By this exhalation, as well as by that of ditches and canals, in all which innumerable plants and infects die and rot, the atmofphere is filled, efpecially during the latter part of the fummer and autumn, with moift, putrid, and infalutary vapours. Add to this, that, Marfhy countries being low, and without hills to receive the winds, or direct them in ftreams upon the lower grounds, the air is apt to ftagnate and corrupt. The common water too, being either collected from rains, and preferved in cifterns, or drawn from fhallow wells, is, in hot and dry feafons, foon corrupted; fo that every thing confpires, in fummer, not only to relax the folids, but to difpofe the humours to putrefaction.

In Marfhy countries, rainy and moift feafons differ greatly; fince intenfe and continued heats occafion the greateft moifture in the atmofphere, by the immenfe exhalations they raife; whereas frequent fhowers, during the hot feafon, cool the air, check the excefs of vapours, dilute and refrefh the corrupted ftagnating water, and precipitate all putrid and noxious effluvia. But, if heavy rains, in the beginning of fummer, are fucceeded by great and uninterrupted heats, thofe rains, by overflowing the meadows, ferve only for matter of more exhalation, and to make the feafon more fickly, and the diftempers more fatal.

The epidemic of the hot feafon, and the great endemic of Marfhy countries, is a fever of an intermitting nature, commonly of a tertian fhape, but of a bad kind; which in the damper places, and worft feafons, appears in the form of a double tertian, remittent, continued putrid, or even an ardent fever. Marfhy countries are likewife fubject, more than any others, to the cholera morbus, dyfentery, and a kind of fcurvy, peculiar to a moift and corrupted air; the fymptoms of which laft agree fo much with the fea-fcurvy, that they may be accounted the fame difeafe; the exhalations of the canals and Marfhes, in hot weather, acting like the vapours which rife from the bildge-water of a fhip.

As to the diet neceffary in moift places, it may be obferved in general, that thofe who can afford to live above the common rate, keep freeft from the difeafes of the Marfhes. For fuch climates require dry houfes, the apartments raifed from the ground, proper exercife, without labour in the fun, or in the evening damps; a juft quantity of vinous liquors, and victuals of good nourifhment. Without fuch helps, not only ftrangers, but the natives themfelves, are extremely fickly after hot and clofe fummers. *Pringle's Obfervations on the Difeafes of the Army.*

MARSHY *lands*, a name given by our farmers to a fort of pafture land, or grazing ground, which lies near the fea, rivers, or fens.

As to lands lying near rivers, the great improvement of them is their being overflowed, which brings the foil of the uplands upon them, fo that they need no other mending, though kept conftantly mowed. The great inconveniency of thefe lands is their being fubject to floods, which high hills near the fides of rivers, and the long courfe of them, befpeak to be frequent: and, though the richeft land generally lies near fuch rivers, yet there is the greateft danger of the crops being fpoiled, efpecially, when they are not inclofed, and therefore cannot be fed with cattle. This, when feeding bears any thing of a price, would be the very beft way of managing thefe uncertain lands; and inclofing them would be highly beneficial, on this account. *Mortimer's Hufbandry.*

The Marfh-lands in Lincolnfhire, and many other parts of England, produce a fort of grafs, which feed fheep in a better manner than that of almoft any other land, in regard to their fize, and the quantity of wool. The fheep about Grimfby, and fome other places in this county, produce fuch lufty wool, or, as they call it, wool of fo large a ftaple, that three or four fleeces ufually make a tod of twenty-eight pounds weight. Several hundred loads of this wool are yearly carried from thefe places to Norfolk, Suffolk, and other parts of the kingdom, for the cloth manufacturers. They fend this in large packs, which they call pockets, each containing about five and twenty hundred weight. *Philof. Tranf.* N°. 223.

When Marfh lands lie flat, it is neceffary for the owner to keep all the water he can from them. The fea water, in particular, is to be kept from them as much as poffible; and this is ufually done at a very great expence, by high banks and walls.

Two things greatly wanting in thefe lands, in general, are good fhelter for the cattle, and frefh water. The careful farmer may, however, in a great meafure, obviate thefe, by digging, in proper places, large ponds to receive the rain water, and by planting trees and hedges in certain places towards the fea, where they may not only afford fhelter for the cattle, but keep off the fea breezes, which often will cut off the tops of all the grafs in thefe places, and make it look as if mowed.

Thefe lands fatten cattle the fooneft of any, and they preferve fheep from the rot. It would be of great advantage to them, if there were raifed, in the middle of every large Marfh, banks of earth in a crofs, or in the form of two femi-circles, and thefe planted with trees; thefe would ferve as a fhelter for cattle, let the wind blow from what quarter it would, and would foon repay the expence of making.

There are, in different parts of England, very large quantities of land upon the fea-coafts that would be worth taking in, tho' no one has yet thought of doing it. The coafts about Bofton, Spalding, and many other parts of Lincolnfhire, give frequent inftances of this, where the fea falls from the land, fo that on the outfide of the fea walls, on the owfe, where every tide the falt water comes, there grows a great deal of good grafs, and the owfe is firm to ride upon when the water is upon it.

This owfe, when taken in, hardly finks any thing at all, and they dig the walls from the outfide of it, all the earth they are made of being taken from thence, and the fea, in a few tides, filling it up again: and, though the fea, at high-water, comes only to the foot of the bank, yet, once in a year or two, fome extraordinary tides go over the banks, though they are ten feet high. Thefe banks are fifty feet broad at the bottom, and three feet at the top; and the common price of making them is three fhillings a pole, the earth being all carried in wheelbarrows, and face towards the fea, where the greateft flope is, being turfed. *Mortimer's Hufbandry.*

MARTEA'U, the name given by French naturalifts to a peculiar fpecies of oyfters, called alfo malleum by others. It is one of the moft curious fhells in the world. Its figure is that of a hammer, with a very long head, or rather of a pick-ax. It has a body of a moderate thicknefs, and two long arms. It is of a brownifh colour, with a beautiful tinge, of a violet blue. Notwithftanding the ftrange fhape of thefe fhells, they clofe very exactly.

MA'RTES, *the martin, or martlet*, in the Hiftory of Quadrupeds, the name of a creature of the weafel kind, called alfo by fome fogua. There are two fpecies of this creature, the one called the Martes abietum; or fir martin, the other the Martes fagorum, or beech martin. The beech martin is diftinguifhed from the other by having a larger and blacker tail, and being all over of a darker colour, and being white on the throat, whereas the others are yellow; but the fpecies are fcarce kept up diftinct, the creatures mixing with one another in the breed. When diftinct, the beech martin is found to be a much tamer creature than the other, and may be kept about houfes like a cat; and often lives of its own accord about houfes, and among old walls. Their fkins make a valuable fur; and that of the fir martin, or yellow kind, is much the moft valuable. *Ray's Syn. Quad.*

MA'RTLET (*Dict.*) — Some heraldifts fay that this mark of diftinction is more peculiarly applied to the fourth brother or family. See *plate* XXI. *fig.* 37. in the Dictionary.

MA'RVEL *of Peru*, a name given to the plant more ufually called jalap. See the article JALAP.

MA'RUM *Syriacum, Syrian maftich*, in botany, a genus of plants, whofe characters are:

It is a plant with a lip-flower, confifting of one leaf; but has no galea (or creft) the ftamina fupplying the place of it; but the under lip is divided into five large fegments, the middlemoft of which is hollow like a fpoon: thefe flowers are produced fingle from the wings of the leaves: to which may be added, it has the appearance of a fhrub, and an hot volatile fmell.

This plant is propagated by planting cuttings, in any of the fummer-months, upon a bed of frefh light earth, obferving to water and fhade them, until they have taken root; after which they may be tranfplanted either into pots or borders of the fame frefh light rich earth: but the greateft difficulty is, to preferve it from the cats; which will from a great diftance tear this plant in pieces, and from which there is fcarcely any guarding it, efpecially near towns and cities, where there are many of thefe animals, unlefs by planting large quantities of it: for it is obfervable, that, where there are but few of them, the cats will not leave them until they have quite demolifhed them; whereas, when a large quantity of the plants are fet in the fame place, they will not come near them.

Thofe plants which are put into pots, fhould be fheltered in winter; but thofe in the full ground will abide the cold of our ordinary winters very well, provided they are planted on a warm dry foil; and may be clipped into pyramids or balls; in which figures I have feen fome plants of this kind near three feet high, which have endured the open air feveral years without any covering.

The common herb maftich is a cephalic, and is of fervice in all diforders of the nerves. It has alfo an aftringency, by means of which it is of fervice in hæmorrhages, of all kinds, particularly in profluvia of the menfes.

MA'RYGOLD, *caltha*, in botany, the name of a genus of plants, the characters of which are thefe: the flower is of the radiated kind; its difk is compofed of feveral flofcules, and its outer circle of femi-flofcules; thefe are all placed upon the embryo feeds, and contained in a common cup. The embryo's finally become flat, crooked, and marginated capfules, containing a long-fhaped feed.

The flowers of the common marygold are cordial and alexipharmic; they promote fweat, and are good to throw out the fmall-small-pox, or any other eruption. They also promote the menses, and are so far aperient, that they are found of service in the jaundice, and indurations of the spleen. The midwives burn them under women whose labour does not come on properly, and suppose they are of great virtue in promoting the pains. They also distil a water from them, as a remedy for sore eyes; but these last virtues are not so well warranted.

MA'SONS, the name of a mechanic trade, called also stone Masons, or stone-cutters, whose business is the stone-work in buildings, tombs, broad pavements, &c. a most curious art, taken in all its parts, and not hard work; (for they have labourers under them, who saw and do the drudging part) and a lad, to be properly qualified for learning this trade, ought to have an insight in geometry and architecture.

They take with an apprentice ten pounds, whose working hours are from six to six; a journey-man's wages fifteen or eighteen shillings a week; and to set up a master two hundred pounds will be sufficient, though some employ a good deal more.

They are a society so long as the year 1410, in the reign of king Henry the IVth, and with whom the marblers, or statuaries, joined; but not incorporated into a company till 1677, by king Charles the IId. livery-fine five pounds.

Their hall is in Mason's-alley, in Basinghall-street; and their court-day on the first Thursday after quarter-day.

They have also a stand in St. Paul's church-yard, in which they sit, to attend the lord mayor, on the day of his installation.

Arms. Azure, on a chevron argent, between three castles argent, a pair of compasses, somewhat extended, of the first. Motto. In the Lord is all our trust.

MA'TCHING, in the wine trade, the preparing vessels to preserve wines and other liquors, without their growing sour or vapid.

The method of doing it is this: melt brimstone in an iron ladle, and, when thoroughly melted, dip into it slips of coarse linen cloth; take these out, and let them cool. This is what the wine coopers call match. Take one of these matches, set one end of it on fire, and put it into the bunghole of a cask; stop it loosly, and thus suffer the match to burn nearly out; then drive in the bung tight, and set the cask aside for an hour or two. At the end of this time examine the cask, and you will find that the sulphur has communicated a violently pungent and suffocating scent to the cask, with a considerable degree of acidity, which is the gas, and acid spirit of sulphur. The cask may, after this, be filled with a small wine, which has scarce done its fermentation, and, bunging it down tight, it will be kept good, and will soon clarify. This is a common and very useful method; for poor wines would scarce be kept potable, even a few months, without it. Nor could stums be prepared in large quantities without this help. *Shaw's Lect.*

MA'STER *Load*, in mining, a term used to express the larger vein of a metal, in places where there are several veins in the same hill. Thus, it often happens, that there are seven, sometimes five, but more usually three veins or loads, parallel to each other, in the same hill. Of these, the middle vein is always greatly the largest. This is called the Master load; and the others which lie there, two, or one, on each side of this, are called the concomitants of the Master load.

The general breadth of the Master loads, in Cornwall, is from three to seven feet. They are seldom larger than this, except in certain peculiar places, as where all the veins meet together, as they sometimes do, and form a knot, from which they separate again, and each takes its peculiar course. The size of such a knot is easily determined, and it is usually very rich in tin, or the other metal of the mine. The several parts, even of the Master load, are not at all regular in breadth, but, from six feet, it will, in some places, dwindle to one, or even to an inch broad, in a very small space; but the miners are not disheartened at this, for they know it will soon grow wider again, unless really worked out. *Phil. Transf.* N°. 69.

The Master load usually lies in a hard rocky or shelfy stratum, made up of metalline matters, spars, mundic, and other unprofitable substances, or weeds, as the miners call them, and is, as it were, all along a continued rock; but has many veins and joints, as they are called. In some places the matter in which the ore lies is softer, and then it is much more easily worked. In Cornwall they usually allow two shovel-men to three beele men or pickers; but, where the load runs in a softer substance, there must be a greater proportion of shovellers or carriers away.

There is generally water found about the loads of the metal. In most places it is met with at some feet deep from the loady surface; and it often runs through the heart of the load, not in a direct channel, but windingly, in and out, insensibly, through the veins and joints of the load. When the miners have followed a load to some depth, and the water begins to be troublesome, as it generally soon is, if there be any in the work, they descend to the bottom of the hill, where they have that conveniency, and at the lowest place begin as little adrift, as the convenience of working or driving will permit, scarce half so big as that for a load; they carry this on, on a level, till they come to the work itself. In this the use of the dial is needful, which they term plumming and dialling.

By this means the exact place of the work is known, where to bring the adit, or to sink down to make an air-shaft. Tho' the water is troublesome in the loads, yet there is always some great convenience attending it, which is, that, where there is water, there is never want of air for the respiration of the miners, and the candles always burn well. But it is also to be observed, that, in a soft, loose, quagmire country, the earth sometimes falls in after the workmen, in such a manner as, though it does not choak up the whole shaft, yet it so far stops it, as to render the current of air less free, and the miners find the utmost necessity of opening a shaft for air to respire from the surface. If the soil be so soft as not to be able to support itself in the working, as is sometimes the case in these wet clayey hills, it is necessary to prop it up, as they go on, with boards, posts, and the like. This adds greatly to the expence of mining; but, in working a Master load, it is often worth while. When the miners are out of heart at the trouble of walling and propping, on this occasion, it sometimes happens, that a dipping of the load carries them down into a firmer stratum, and they are at once relieved from all that trouble and danger.

MATRICA'RIA, *feverfew*, in botany, a genus of plants whose characters are:

The root is annual and fibrous; the leaves are cut many ways, and by conjugations; the calyx is hemispherical and squamous; the flowers are collected into bunches, or form umbella's, and are generally marked with white rays.

The leaves of the feverfew are large and winged, divided into several sections, usually about seven, that at the end being the largest; they are deeply cut in, or laciniated, of a pale yellow green colour. The stalks are stiff, round, or striated, two feet high, or more, cloathed with smaller leaves, and pretty much branched towards the top, on which grow large flat umbels of flowers, made of several white petals, broader and shorter than those of the chamomile, set about a yellow thrum. The root is thick at the head, having many fibres under it; the whole plant has a very strong, and, to most, an unpleasant smell. It grows in hedges and lanes, and flowers in June and July. The leaves and flowers are used.

This is a herb particularly appropriated to the female sex, being of great service in all flatulent disorders of the womb, and hysteric affections; procuring the catamenia, and expelling the birth and secundines. The juice to the quantity of two ounces, given an hour before the fit, is good for all kinds of agues. It, likewise, destroys worms, provokes urine, and is good for the dropsy and jaundice. *Miller's Bot. Offic.*

MATTS, on board a ship, a kind of broad, thick clouts, wove out of spun yarn, sinnet, or thrums; and used to preserve the main and fore yards from galling against the masts at the ties, and at the gunnel of the loof. They also serve to keep the clew of the sail from galling there; as also to save the clews of the foresails from doing so at the beak-head and boltsprit.

MAT'TAGESS, in zoology, the English name of the larger species of the lanius or butcher bird.

The word Mattagess is borrowed from the Savoyards, and signifies the murdering pye; and has been given it from its savage disposition, and its resemblance to the magpye, in the shape of its tail.

It is barely of the bigness of a thrush; its beak is moderately long, black, and hooked at the end, but straight all the way to that. Its tongue is bifid and hairy, and there are several black and short bristles at the top of the beak. Its head, back, and rump are grey. Its chin and belly are white, and its throat and breast variegated with dusky streaks. Its feet and legs are black; it is very common in Germany, and is sometimes seen in the northern parts of England, but with us it is not very frequent. It lives among low bushes, and builds in them; its nest is made of moss, wool, and soft herbs, and the tender branches of heath; it has seven young ones at a brood, which are of a greenish colour, and very little resemble their parent; it feeds on thrushes, and smaller birds, and is a very terrible destroyer among them. *Ray's Ornithology.*

MA'VIS, in zoology, the common name of the song thrush, or throstle, called by authors the turdus viscivorus minor, to distinguish it from the larger species, called in English the missel bird; and usually known among us also by the simple name thrush. It is called viscivorus by authors, from its resemblance in colour to the viscivorus, not from its feeding on the misletoe berries, as that does.

It is much smaller than the missel bird, and of a middle size, between the fieldfare and red-wing. Its back is of a greyish brown, somewhat like the colour of the Spanish olives; its belly white, and its breast yellowish, and spotted with brown and blackish spots, and it is spotted round about the eyes; its under small feathers of the wings are of a yellowish or reddish brown, and those under the tail whitish; its legs are brown. It feeds on worms, snails, and small insects, and remains with us the whole year; it builds with moss and stubble, and lines the nest with mud. On this it lays five or six eggs, which are of a bluish green, variegated with a few black spots; it sits on hedges and bushes, and sings very agreeably. *Ray's Ornithology.*

MAU'MY *Soil*, in argiculture, an earth confifting of a white marly clay, chalk, and fand, which caufes it to work very fhort, as the farmers call it, when any thing dry. This fort of land is ufually fowed with wheat, mifcellan, or barley, and requires the fame tillage that the clay land does, and muft be kept dry and warm.

Its moft proper manure is the rotteneft dung: as they frequently fow beans next after wheat in clayey grounds, fo in thefe they chufe to fow peafe, chufing a fair and fettled feafon for their feed time; for, if there happen a fmart fhower foon after their fowing, the earth will bind fo firmly together after it, that moft of the feed will be loft. *Plot's Oxfordfhire.*

MEA'DOW.—There are two forts of Meadows in England, one of which is ftiled water-Meadows, and the other are fimply called Meadows.

Water-Meadows are thofe which lie contiguous to rivers or brooks, from whence the water can be carried to overflow the grafs at pleafure. Of thefe there are large tracts in feveral parts of England; which, if fkilfully managed, would become much more profitable to their owners, than they are at prefent; as hath been already mentioned in another place: for nothing can be more abfurd than the common practice of flowing thefe low grounds all the winter; whereby the roots of all the fweeteft kinds of grafs are deftroyed, and only fuch graffes left, as are natives of marfhes, which are coarfe and four; and, if people were curious to examine the herbage of thefe water-Meadows, they would find the bulk of them compofed of bad weeds, fuch as grow by the fides of rivers, brooks, and ditches; of which the feveral forts of docks make no fmall fhare; and, although many of thefe Meadows produce a great burden of what the country-people call hay, yet this is only fit for cows, cart-horfes, and other animals, which by hard labour and hunger are driven to eat it; for horfes which have been accuftomed to feed on good hay, will ftarve before they will touch it: and after the grafs is mown off thefe Meadows, and cattle turned in to graze upon them, how common is it to fee the land almoft covered with thefe rank weeds, which the cattle never will eat? Which muft always be the condition of fuch Meadows, where the water is let over them in autumn and winter; for, as the fides of rivers and brooks do every-where abound with thefe rank weeds, whofe feeds ripen in autumn, falling into the water, they are carried by the ftream, and depofited on the land, where they grow, and fill the ground in every part: but fo incurious are the generality of farmers in this refpect, that, if the ground is but well covered, they care not what it is; few of them ever taking any pains to weed or clean their paftures.

The method which I propofe for the management of thefe Meadows is, never to flow them till the middle or latter end of March, excepting once or twice in winter, when there may happen floods, which may bring down a great fhare of foil from the upper lands; at which times it will be of great fervice to let water upon the Meadows, that the foil may fettle there; but, the fooner the wet is drained off, when this is lodged, the greater advantage the Meadows will receive by it: but, from the end of March to the middle of May, by frequently letting on of the water, the growth of the grafs will be greatly encouraged; and at this feafon there will be no danger of deftroying the roots of the grafs: and after the hay is carried off the ground, if the feafon fhould prove dry, it will be of great fervice to the grafs, if the Meadows are flowed again; but, when this is practifed, no cattle fhould be turned into the Meadows, till the furface of the ground is become firm enough to bear their weight without poaching the land; for otherwife the grafs will fuffer more from the treading of the cattle, than it will receive benefit by the flowing: but thefe are things which the country people feldom regard, fo that thefe Meadows are generally very unfightly, and rendered lefs profitable.

I would alfo recommend the weeding of thefe Meadows twice a year; the firft time in April, and again in October; at which times, if the roots of docks, and all bad weeds, are cut up with a fpaddle, the Meadows will foon be cleared of this trumpery, and the herbage greatly improved.

Another great improvement of thefe lands might be procured by rolling them with a heavy roller, in fpring and autumn. This will prefs the furface of the ground even, whereby it may be mown much clofer; and it will alfo fweeten the grafs: and this piece of hufbandry is of more fervice to pafture, than moft people are aware of.

As to thofe Meadows which cannot be flowed, there fhould be the fame care taken to weed and roll them, as hath been directed for the water-Meadows: a ralfo never to let heavy cattle graze upon them in winter, when they are wet; for the cattle will then poach them, and greatly injure the grafs: therefore thefe fhould be fed down as clofe as poffible in the autumn, before the heavy rains fall to render the ground foft; and thofe paftures which are drier may be kept to fupply the want of thefe in winter; and, where there are not cattle enough of their own to eat down the grafs in time, they had much better take in fome of their neighbours, than fuffer their fog (as it is called) to remain all the winter. When thefe Meadows are fed in the autumn, the greater variety of animals are turned in, the clofer they will eat the grafs: and I am fully convinced, the clofer it is eaten, the better the grafs will come up the following fpring: therefore if, during the time while the cattle are feeding, the Meadows are well rolled, the animals will eat the grafs much clofer, than they otherwife would.

MEA'SURE, (*Dict.*)—We have lately had fome acute comparifons between fome of the French weights and meafures and thofe of England, the refult of which is, 1. The Paris half toife, as fet off on the ftandard kept by the Royal Society, contains of Englifh inches, by the fame ftandard, 38,355; whence it appears, that the Englifh yard and foot are, to the Paris half toife and foot, nearly as 107 to 114; for, as 107 to 114, fo is 36 to 38. 35514.

2. The Paris two marc, or fixteen ounce weight, weighs Englifh troy grains 7560; whence it appears, that the Englifh troy pound of twelve ounces, or 5760 grains, is to the Paris two marc, or fixteen ounce weight, as 16 to 21; that the Paris ounce weighs Englifh troy grains 472.5; and that confequently the Englifh troy ounce is to the Paris ounce, as 64 is to 63.

3. The Englifh avoirdupoife pound weighs troy grains 7004; whence the avoirdupoife ounce, whereof fixteen make a pound, is found equal 437.75 troy grains. And it follows, that the troy pound is to the avoirdupoife pound, as 88 to 107 nearly; for, as 88 to 107, fo is 5760 to 7003.636; that the troy ounce is to the avoirdupoife ounce, as 80 to 73 nearly; for, as 80 to 73, fo is 480 to 438. And, laftly, that the avoirdupoife pound and ounce are to the Paris two marc weight and ounce, as 63 to 68 nearly; for, as 63 to 68, fo is 7004 to 7559.873.

4. The Paris foot, expreffed in decimals, is equal to 1.0654 of the Englifh foot, or contains 12.785 Englifh inches. *Philof. Tranf.* N°. 465.

MECHA'NICS. (*Dict.*)—The term Mechanics has been formerly, and ftill is ufed in a double fenfe in very different fciences, both with refpect to their objects and principles. For the name Mechanics is applied equally to that fcience which treats of the equilibrium and comparifon of powers, and to that fcience, in which the nature, generation, and alteration of motion are explained. To avoid ambiguity, therefore, it would be proper to give the name ftatics to the fcience of equilibrium and comparifon of powers, and to reftrain the term Mechanics to the fcience of motion.

Thefe two fciences not only differ as to their objects and principles, but alfo with refpect to the times in which they have been cultivated. Some of the principles of ftatics were eftablifhed by Archimedes; but Galileo laid the firft foundation of Mechanics, when he inveftigated the defcent of heavy bodies; and, fince his time, by the affiftance of the new methods of computation, a great progrefs has been made, particularly by Sir Ifaac Newton in his Principia. This admirable work is now rendered more acceffible to beginners by the learned comment of the fathers le Seur and Jacquier, printed, with the text, at Geneva, 1739, 4to, 1742, 4 Vols. 4to. We have alfo the fciences of ftatics and Mechanics treated of, under the name of phoronomia, by the late learned profeffor Herman, Amft. 1716, 4to. Mr. Euler's Mechanica, five de Motus Scientia, is fufficiently recommended by the name of the author, well known as one of the moft eminent mathematicians in Europe. This work, however, did not efcape the cenfure of a late ingenious writer; but, granting the juftnefs of his remarks, it may be faid, that a few inaccurate expreffions, owing to analogies carried too far, and to the ftyle of infinitefimals, are but fmall flaws in fuch a work. As to ftatics, the fubject has been almoft exhaufted by Varignon, in his Mecanique Paris, 1725, 2 Vols. 4to.

ME'DAL. (*Dict.*)—Impreffions of Medals. A very eafy and elegant way of taking impreffions of Medals and coins, not generally known, is this: melt a little ifinglafs glue, made with brandy, and pour it thinly over the Medal, fo as to cover its whole furface; let it remain on for a day or two, till it is thoroughly dry and hardened, and then, taking it off, it will be fine, clear, and hard as a piece of Mufcovy glafs, and will have a very elegant impreffion of the coin. *Shaw's Lect.*

We have an eafy method of procuring the true impreffion or figure of Medals and coins, by Mr. Baker in the Philof. Tranf. N°. 472.

Take a perfect and fharp impreffion, in the fineft black fealing-wax, of the coin or Medal you defire; cut away the wax round the edges of the impreffion; then with a preparation of gum-water, of the colour you would have the picture, fpread the paint upon the wax impreffion with a fmall hair pencil, obferving to work it into all the finking or hollow places, thefe being the rifing parts of the Medal; and the colouring muft be carefully taken from the other parts with a wet finger. Then take a piece of very thin poft paper, a little larger than the Medal, and moiften it quite through. Place it on the wax impreffion, and on the back of the paper lay three or four pieces of thick woollen cloth or flannel, of about the fame fize; the impreffion, with its coverings, fhould be placed between two fmooth iron plates, about two inches fquare, and one tenth of an inch thick. Thefe muft be carefully put into a fmall prefs, made of two plates of iron, about five inches and an half long, one inch and a half wide, and half an inch in thicknefs, having a couple of long male fcrews,

running

running through them, with a turning female ſcrew on each, to force the plates together. Theſe being brought evenly together, by means of the ſcrews, will take off a true and fair picture of the Medal; which, if any deficiencies ſhould appear, may eaſily be repaired with a hair pencil, or pen, dipped in the colour made uſe of.

If a relievo only be deſired, nothing is neceſſary, but to take a piece of card, or white paſte-board, well ſoaked in water; then placing it on the wax mould, without any colouring, and letting it remain in the preſs for a few minutes, a good figure will be obtained.

MELÆNA'CTOS, *the black eagle*, a ſpecies called alſo aquila Valeria by ſome authors. It is a ſmall eagle, of twice the bigneſs of a crow. Its jaws and eye-brows are deſtitute of feathers, and look reddiſh: its head, neck, and breaſt, are black, and in the middle of his back he has a large triangular ſpot, of a pale browniſh red, with ſomething of whiteneſs intermixed. His rump is a reddiſh brown, and his wings variegated with black, white, and grey; his beak is not large, black at the end, the ſkin covering the noſtrils red, and the iris of his eye hazel-coloured. His legs are feathered a little below the knee, and below that red, and the claws very ſharp. *Willughby's Ornithology.*

ME'LANCHOLY (*Dict.*)—The cauſes evidently productive of Melancholy are obſerved to be,

1. All things which fix, exhauſt, or diſturb the nervous fluid of the brain; ſuch as violent and ſudden frights, intenſe thinking upon any object, exceſſive love, watchings, ſolitude, fear, and hyſteric diſorders.

2. Such things as hinder and diſturb the generation, reparation, circulation, and various ſecretions and excretions of the blood, eſpecially in the ſpleen, ſtomach, omentum, pancreas, meſentery, inteſtines, liver, uterus, and hæmorrhoidal veſſels: ſo that, of conſequence, Melancholy may be produced by the hypochondriacal diſorder; by acute diſeaſes ill cured, and eſpecially a phrenitis and burning fever; by an exceſs of all the ſecretions and excretions; by ſuch aliments and drinks as are cold, tenacious, terreſtrial, tart, and aſtringent; by violent heat long protracted and parching the blood; as alſo by a ſtagnant, moiſt, and cloudy air.

3. A naturally black, hairy, dry, ſlender, and robuſt conſtitution of body, a middle age, a quick, penetrating, and diſcerning genus.

If this diſorder continues long, it produces ſtupidity, epilepſies, apoplexies, madneſs, convulſions, blindneſs, ſurpriſing fancies, laughter, weeping, ſinging, ſighs, eructations, flatulences, anxieties; an urine ſometimes copious and limpid like water, and at others highly thick; a retention, accumulation of the excrementitious blood in the veſſels of the abdominal viſcera, and often a ſudden excretion of it; obſtinate coſtiveneſs, frequent ſpitting of a thin matter, and an incredible ability of enduring watchings, hunger, and cold.

This diſorder has often been cured by a ſupervening unſeemly itch, ſometimes reſembling an elephantiaſis; by numerous and large varices; by a copious diſcharge from the turgid hæmorrhoidal veins; and an evacuation of the black bile by vomit and ſtool.

Patients labouring under this diſorder are generally injured by all medicines which impair the ſtrength, and evacuate too forcibly; as alſo by thoſe which throw the humours into too violent commotions, whether cordials, or medicines of whatever other denomination.

Hence the beſt method of curing this diſorder is, after a due obſervation of the firſt cauſes and the variety of patients conſtitutions, to accommodate various medicines to theſe cauſes, and various conſtitutions.

The ſeveral intentions of cure to be purſued, therefore, are,

1. To rouſe, augment, and regulate the fluids of the brain and nerves; which is done, firſt, by diverting the mind from its uſual object to others of an oppoſite nature: ſecondly, by inducing cautiouſly another diſpoſition, or affection of mind, oppoſite to Melancholy: thirdly, by humouring the perverſe and falſe turn of the imagination: or, fourthly, by frequently oppoſing it with great vigour.

2. To remove thoſe obſtructions which are either the cauſe, or the effect, of a perverted imagination, by ſoftening, inciding, and ſtimulating the obſtructing matter, by means of mineral waters, whey, viſceral, hepatic, and antihypochondriac decoctions, waters invigorated with lixivial or compound ſalts, laxative preparations of mercury, emetics, motion, exerciſe, riding, ſailing, uterine medicines, and ſuch as promote the lochia, remedies which procure hæmorrhoidal diſcharges, baths, liniments, and plaiſters.

3. They alleviate the ſymptoms by veneſection, immerſion in cold water, and the uſe of carminatives and opiates.

4. After due evacuations, to exhibit ſuch things as are from experience known to exhilarate the mind, and corroborate all the parts of the body.

From what has been ſaid, it is obvious that the perfect cure of this diſorder, as well as of great many others falſly accounted incurable, conſiſts in the correction of the bilis atra, or melancholic humour.

When Melancholy increaſes ſo far as to bring on an agitation of the fluids of the brain, capable of driving the patient into a raging fury, the diſorder is called madneſs.

This only differs in degree from a dejected Melancholy, is its offspring, ariſes from the ſame cauſes, and is generally to be cured by the ſame medicines.

In madneſs the muſcles are generally ſurpriſingly ſtrong, the patient is afflicted with watchings, incredibly capable of enduring hunger and cold, diſtracted by terrible imaginations, and ſubject to thoſe diſorders called lycanthropia and cynanthropia; which ſee.

It is obſervable, that, upon diſſecting thoſe who have died of madneſs, the brain has been found dry, hard, and friable, with its cortical ſubſtance of a yellow colour, and its veſſels turgid, varicoſe, and diſtended with black and viſcid blood.

It is alſo obſervable, that, during this diſorder, all the excretions have, in like manner, almoſt ceaſed.

Unexpected precipitation into the ſea, and a ſubmerſion in it, continued as long as poſſible, conſtitute the principal remedy for it.

Madneſſes, obſtinate againſt all remedies, have often been removed upon the approach of varices, hæmorrhoidal diſcharges, dyſenteries, dropſies, copious ſpontaneous hemorrhages, tertian and quartan fevers.

Such a ſort of madneſs ſometimes ariſes after the body is, by an autumnal, violent, and long-continued intermittent fever, weakened and exhauſted, both by the force of the diſeaſe, and repeated veneſections and purgings. The madneſs is alſo generally brought on again by theſe very means.

This ſpecies of the diſorder is only to be cured by the uſe of reſtoratives, cardiacs, and corroboratives, long perſiſted in: but, if it is treated with evacuation, it brings on an atrophy, a weakneſs, and an unſurmountable fooliſhneſs.

But a madneſs ariſing in robuſt vigorous perſons in the flower of their age, or of hot and plethoric habits, is to be cured by repeated veneſections, interpoſing a briſk purge between each; and, when the diſorder is alleviated, it is to be treated with opiates and cardiacs. *Boerhaave's Aphoriſms.*

ME'LON, *melo*, in botany, makes a diſtinct genus of plants, the characters of which are theſe:

The flowers conſiſt only of one leaf each, and are wide at the mouth, and divided into ſeveral ſegments, wholly reſembling the flowers of cucumbers. Of theſe alſo ſome are male or ſterile flowers, having no embryo fruit; others are fruitful or female flowers, having an embryo which ripens into a large fruit of an oval figure, ſometimes ſmooth, ſometimes rough, divided into three cells, and containing oblong ſeeds; each of theſe cells ſeems alſo divided into two. See *Plate* XXXII. *fig.* 4. where *a* is the flower, *b* the fruit.

The proper management and culture of Melons is this: the ſeeds ſhould be procured from good Melons, produced in ſome diſtant garden; for, if ſowed on the place where it was raiſed and ripened, it is very apt to degenerate. This ſeed ſhould be kept three years before it is ſowed, and it ſhould be ſowed at two ſeaſons. The firſt for the early crop, to be raiſed under frames, ſhould be ſown in January or the beginning of February; the ſecond, to be raiſed under bell or hand glaſſes, is to be ſowed in March, and this is the ſowing which produces the general crop of Melons, which ripen in July and Auguſt. About a week before the time of ſowing the ſeed, ſome dung ſhould be prepared in a heap with the litter, or ſome coal aſhes, and the ſame methods uſed in the early cucumbers, for the firſt crop; but for the ſecond, which is of more general uſe, the ſowing may be on the upper ſides of the hot-beds that were for the early Melons or cucumbers, or on a freſh moderate hot-bed. When the young plants are come up, they muſt be removed to another hot-bed, and covered with hand glaſſes, and watered and ſhaded till they have taken root; and, after this, they muſt have as much air and ſun as the ſeaſon will permit, and their ſtalks ſhould be earthed up as they grow, which will vaſtly ſtrengthen them.

In the beginning of April the plants will begin to ſhew their rough leaves; a parcel of dung is then to be prepared with litter and coal aſhes. The common quantity is a load to five holes; a trench muſt then be dug, which ſhould be ten inches deep, if the ſoil be dry, but only three, if it be wet. The dung muſt be evenly laid in this, and heaped up to three feet high: then the place intended for the holes muſt be marked out, at each of which muſt be laid a baſket full of light rich earth, thruſting a ſtick of two feet long into the middle. Then cover the dung all over with the earth, which was dug up out of the trench, laying it ſmooth, and about three inches thick; then the glaſſes are to be placed cloſe down over the place where each of the ſticks is, and in two days the earth will be warm enough to receive the ſeedling plants. The ſticks are now to be taken out, and the earth formed in the places into a hollow like a baſon, that it may retain the water which is given to the plants. The plants are then to be taken up, and two ſtrong and thriving ones put into each of theſe holes, which muſt be watered and ſhaded till they have taken root. The plants having taken root, and thruſt out a fourth leaf, the top of each of them ſhould be pulled off, in order to force out ſhoots from the bottom; and, as the weather becomes warmer, the glaſſes muſt be raiſed with ſtones on the ſouth fouth fide, to give them air, and about twice a week they fhould have a little water.

About the middle of May the ftalks of the plants will begin to prefs upon the glaffes on every fide, and the glaffes are then to be raifed up on bricks, to give them room to run out; and they fhould be pegged down with forked fticks, and turned into a proper direction for their running, fo that they may be out of the way of tangling one with another: they fhould now, if the weather be fevere, be fheltered with mats in the night, and watered gently at times. When the ftalks of the plants are grown to the edges of the bed, the earth muft be raifed with old dung buried under it, till it be upon a level with the beds, for two feet wide on each fide. The branches are here to be trained in a proper courfe, and the glaffes are to be left over the roots of the plants; and, after this, what water is given them is to be fprinkled all over the plants. When the fruit begins to appear, the waterings muft be very gentle on the plants; but it will be proper to foak the earth well with large quantities of water about the beds, which will fpread a moifture even to the roots of the plants; from this time the plants fhould be gently watered twice a week, and that always in the evening. When the Melons are grown of the fize of a tennis ball, a piece of tile fhould be laid under each to keep them from the ground. As they afterwards approach to ripenefs, they fhould be turned feveral times, that they may ripen equally every fide; and if, the weather be not very favourable, they fhould be covered with glaffes.

If the Melon is defigned to be eaten as foon as cut, it fhould be fuffered to remain on the plant till it changes pretty yellow, and the ftalk begins to feparate from the fruit; but, if it is to be kept two or three days after cutting, it muft be always cut proportionably earlier.

It is a practice with many to take off the leaves about the fruit, that it may have more fun; but it is wrong, and the fruit is always the worfe tafted for it, and the fkin is hard and tough. *Miller's Gard. Dict.*

When a Melon is perfectly fine, it is full, without any vacuity: this is known by knocking upon it, and, when cut the flefh muft be dry, no water running out, only a little dew, which is to be of a fine red colour. Large Melons are not to be coveted, but firm and well-flavoured ones. Our gardeners, who raife Melons for fale, fow the feeds of the large rather than the good kinds, and they increafe the fize of thefe by much watering the roots, but this fpoils the tafte. Some of the French raife at this time particularly fine Melons, by a method kept as a fecret, but which we find, on a ftrict enquiry, is no other than the ingenious Mr. Quintiny's, of that nation, publifhed near eighty years ago in our Philofophical Tranfactions.

The Melons, particularly proper to be treated in this manner, are thofe which have a thin and fomewhat embroidered fkin, not divided by ribs, and have a red pulp, dry and melting on the tongue, not mealy, and of a high flavour.

Petrified MELONS, a name given by the people who have written books of travels, &c. to certain ftones found on mount Carmel, which refembles Melons.

MELTING *Cone*, in affaying, is a fmall veffel made of copper or brafs, of a conic figure, and of a nicely polifhed furface within. Its ufe is to receive melted metals, and ferve for their precipitation, which is effected, when two bodies melted together, and yet not mixing perfectly with one another in the fufion, feparate in the cooling into two ftrata, on account of their different fpecific gravity. This precipitation might be made in the fame veffel in which the fufion is performed; but then the melting pot or crucible muft be broken every time to get it out, whereas the conic fhape, and polifhed furface of this veffel, makes it eafily got out without violence. The fhape of this veffel is alfo of another ufe in the operation; for, by means of it, the heavy matter, fubfiding to a point, is formed into a perfect and feparate regulus, even where the whole quantity, as is very frequently the cafe, has been but very fmall.

When the quantity of the melted matter is great, it is common to ufe, inftead of this cone, a large brafs or iron mortar, or any other conveniently fhaped brafs or iron veffel. It is neceffary, when the cone is of brafs, to be cautious that it be not made too hot; for the brittlenefs of that metal, when hot, makes it eafily break, on the ftriking with any force on that occafion, to make the melted mafs fall out.

Thefe, and all other moulds for receiving melted metals, muft always be well heated before the mafs is poured into them, left they fhould have contracted a moifture from the air, or have been wetted by accident; in which cafe the melted metal will be thrown out of them with great violence and danger. They ought alfo to be fmeared over with tallow on their infide, that the regulus may be the more eafily taken out of them, and the furface of the mould not corroded by the melted mafs poured in.

If a very large quantity of a metal is, however, to be received into them, and efpecially if any thing fulphureous have place among it, this caution of tallowing the moulds does not prove fufficient; for the large quantity of the mafs makes it continue hot fo long, that this becomes but a flight defence to the furface of the mould. In this cafe the affayer has recourfe to a lute, reduced to a thin pap with water, which, being applied in form of a very thin cruft, all over the infide of the cone or mould, foon dries up indeed, but always preferves the fides of the veffel from the corrofion of the mafs. And this caution is found neceffary, even when pure copper is melted alone, without any mixture of fulphur. See *Plate* XXXI. *fig.* 1. *Cramer's Art of Aff.*

Weaknefs of the MEMORY, in many cafes, is to be confidered as a difeafe, and is looked on in that light by the medical writers, who have prefcribed various remedies for it. The principal caufes of this debility, are a too frequent and conftrained ufe, or rather abufe of it, in the getting by rote numbers of words and fyllables, particularly in the learning different languages; a paralytic affection in the head; violent external injuries in the fame part; violent pains in the head, attended with deliriums, or attending a phrenitis. And to thefe are to be added drunkennefs, and an abufe of venery.

Prognoftics. All debilities of Memory are cured, with great difficulty, by medicines alone; and indeed this complaint is feldom removed, unlefs the whole frame of mind and courfe of life be altered; all paffions avoided, and excefs of every kind left off. But, of all other kinds, that debility of Memory which proceeds from a paralytic diforder of the head, particulary when that diforder affects the tongue, is found to be the moft obftinate and difficult of cure. Much fleep, or exceffive waking, are equally hurtful to the Memory, and frequently bring on an almoft total lofs of it.

Method of treatment. All fuch medicines as are of an agreeable tafte or odour, are generally fuppofed to be of fervice in ftrengthening the Memory; and lignum aloes, ambergreafe, and fome other of the fcented drugs, have been known to do great good. The aromatic, volatile, and fpirituous medicines alfo all help in this cafe, if taken in fmall dofes, and continued for a long time together. The analeptics and nervine medicines are alfo greatly recommended, but they are feldom found of ufe; for, among people afflicted with a debility of Memory, many are thofe of robuft conftitutions and ftrong appetites, who eat already more than nature requires, and have therefore very little ufe for analeptics or nutritive things. Bleedings in fmall quantities frequently repeated, in cafes where there is no contrary indication, frequently prove of great fervice in this cafe; but the primæ viæ are firft to be cleanfed before fuch a courfe is entered upon. Many greatly recommend bags of aromatics to the head, to be conftantly worn in caps; but it is much to be feared thefe can have but very little effect. *Junck. Confp. Med.*

MENSTRUUM (*Dict.*)—*Action of* MENSTRUUMS.—The changes, wrought upon bodies by the diffolving power of Menftruums, feem greatly to depend upon the minute particles of the Menftruum now ftrongly cohering with the particles of the folvend; and can fcarcely be attributed to an effential alteration introduced by the Menftruum into the diffolved particles. Though pure metals, fuch as gold, filver, and mercury, diffolved, feem entirely changed; yet they may be eafily feparated from the Menftruums in the form of a calx, which being fufed in the fire, the metal is recovered unchanged. Hence it appears, that the Menftruums have no other effect, than barely adhering to the furfaces of the metallic particles, while divided: many more inftances of this kind may be given.

But it may be objected, that folution produces new bodies; becaufe, if red lead be diffolved in diftilled vinegar, there arifes fugar of lead, when the acid of the vinegar is attracted into the particles of the lead; and, though this falt of vinegar be diftilled in a retort with a ftrong heat, the fpirit of vinegar is not recovered, but a particular liquor obtained, which will burn in the fire. There are many more inftances of the like kind; but we muft confider, that the adhering parts of the Menftruum cannot always clearly extricate themfelves, but remain united. Hence, fome imagine, that the nature of bodies is deftroyed, while there only happens fuch a fimple conjunction of unchanged particles, under a new appearance.

Thus the blade of a lancet or knife, when naked, has the appearance of the power of cutting; but, when in the fheath, it has not, then, the fame appearance; though, in themfelves, the knife, or lancet, is ftill the fame. The eafier they are to be unfheathed, the fooner the appearance of their cutting power becomes manifeft; but, if the fheath was firmly connected with the blade, we fhould not fcruple to fay, that the blade was changed. So, if a little cylinder of pure filver be gilt, and fo put into aqua-fortis, the filver will be perfectly diffolved, and leave the hollow covering of gold entire, floating like a black film in the Menftruum; whence the acid parts of vinegar may be fo united to certain parts of lead, as not to feparate upon diftillation, but eafily rife together. It would, therefore, be wrong to affert, that the acid of the vinegar was thus converted into a new kind of inflammable liquor by the contact of lead: it is highly probable, that this difference much oftener happens from combination, than from any change of the fubftance; and the like holds, alfo, in feparation. For the fubftance diffolved often confifts of very different parts, fome of which are perfectly taken up by the Menftruum, while others have been rejected, and left feparate: whence, after the Menftruum is abftracted from the folution, there

there remains a different fubftance from what was employed as the folvend. And hence, without caution, one might be ready to infer, that the fubftance thus procured was a new one, produced by the changing power of the folvent; whereas, in reality, it is only produced by a bare feparation.

Hence we may learn, that the action of all known Menftruums depends upon motion: for, if a Menftruum did not change the motion of the parts upon which it acts, thofe parts would remain as they were; in which cafe the Menftruum, contrary to fuppofition, could have no action at all. The origin of this motion we cannot fairly attribute to the common caufes of motion, fuch as impulfe, gravity, elafticity, magnetifm, and the like; but there is a particular caufe, not common to all bodies, exerted between the folvent and folvend. An enquiry fhould be carefully made into this fubject, to which we are the more incited, as fome great philofophers have conceived, that all the actions of bodies muft be accounted for mechanically.

When a folvent divides its folvend by a mere mechanical motion, this motion muft be generated in the particles of the folvent by fome caufe, and this caufe is generally fire. The particles of the Menftruum, thus agitated, muft ftrike againft the furfaces of the united particles of the folvend, communicate to them their motion, and loofen and feparate them from the folid, whether this action be exerted externally, on the furface of the folvend, or internally, by penetrating the folvend.

Though this mechanical manner of acting may have fome effect, it is, perhaps, lefs than is generally imagined: for fluids can produce little alteration in a folid, by means of their quantity, hardnefs, figure, and weight; and the force they receive from the fire is but fmall, and always as capable of acting upon themfelves: the power of folution, therefore, muft depend upon fome other caufe. Thus a wedge could never cleave wood by being barely applied to it, or kept floating about it; but muft firft be fixed into the fubftance, and then driven farther by an external force; an action not to be expected from the particles of a yielding fluid.

Thofe Menftruums alone appear to act mechanically, which, by a bare mechanical motion, arifing from their magnitude, hardnefs, figure, weight, and impulfe, firft attenuate bodies, then directly feparate from them again, according to their fpecific gravities; by which kind of folution no great change can arife. By this mark we may diftinguifh Menftruums which act mechanically from others.

Repulfion, alfo, may caufe bodies to feparate, after having been mixed together by fhaking; as in oil and water, or alcohol and oil of tartar per deliquium; where not only gravity, but, alfo, repulfion occafions a feparation, and fuffers fimilar things to unite with fimilar.

When, after folution, the diffolved particles remain equally mixed with thofe of the folvent, though, at firft, they differed remarkably in their weight, fuch a folution may partly be afcribed to the general mechanical power, which here almoft univerfally occurs; but principally to another action, arifing from the peculiar properties of the folvent and folvend, with refpect to each other: as, by this power, the particles of the one attract the particles of the other; thus both are feparated from their former concretions, and afterwards permix or unite with each other, fo as to form numerous new fpecies of bodies.

To illuftrate this doctrine by an example: if a ball of foft clay be put into water, and fet over the fire to boil, the parts of the water put in motion by the fire will divide the clay into fmall particles, and permix them with the body of the water, while the boiling continues; but when the external force of the fire ceafes, and the water comes to reft, and grows cool, all the clay falls to the bottom: this I would call a mere mechanical folution.

But if a ball of fal-gem be boiled in four times its quantity of water, all the falt immediately diffolves fo perfectly as to remain totally imbibed, fufpended, and uniformly diffufed in the water, even after it grows cold, and is thoroughly at reft; although the gravity of the falt is much greater than that of the water. Whence it appears, that the water has a power, by which it unites to itfelf the particles of the falt, fo that they cannot be feparated from it by their own gravity, but remain fufpended. The clofer or loofer degrees of adhefion of the particles of different Menftruums with the particles of the body diffolved are almoft infinite; and hence arife numerous differences in the corpufcles produced by Menftruums.

Calcined MERCURY, *mercurius calcinatus*, a new and more expreffive name for the preparation of Mercury, commonly called precipitate per fe. It is made by fetting purified quickfilver, for feveral months, in a fand-heat, in a glafs veffel with a broad bottom, and opening it to the air by a fmall hole, till it is reduced to a red powder.

The quickfilver muft have a communication with the external air, as is neceffary to the calcining of all the metals. This opening is beft made, not as in the common bolt-heads, but at the lower end of a ftem, going into the body of the glafs; that, if the quickfilver rife with the heat, it may not, by afcending into the ftem, be removed out of the heat that is to calcine it. *Pemberton's London Difpenfatory.*

Coralline MERCURY, *mercurius corallinus*, the name given, in the London Difpenfatory, to a preparation of Mercury, commonly known by the name of arcanum corallinum. It is prepared in this manner: pour upon the red corrofive Mercury, commonly called red precipitate, thrice its weight of rectified fpirit of wine; digeft them together in a gentle heat for two or three days, often fhaking the phial; then fet fire to the fpirit, and continue ftirring the powder till the fpirit is burnt away. *Pemberton's Lond. Difp.*

This operation proceeds upon the principle of fpirit of wine's dulcifying acid fpirits.

Oil of MERCURY, the name given by the chemifts to a preparation of Mercury in a fluid form, by means of a ftrong acid. The preparation is this: calcine Mercury with oil of vitriol to a dry fnowy calx; fuffer it to cool, then put it into a glafs, and pour upon it an equal quantity of oil of vitriol; let this boil away almoft to a drynefs, carefully avoiding the poifonous fumes; then increafe the fire, and by degrees reduce it to a drynefs again; which is, in this ftate, a very difficult and tedious tafk. When the powder is dry, put the fame quantity of oil of vitriol to it again, and proceed as before: at length it will fcarce dry by means of ever fo long or ftrong a fire, but only ceafe flowing freely, and become fomewhat rigid, like a fixed oil. It is then highly fharp, cauftic, and not to be touched, like the ignis gehennæ of Paracelfus. By this means the Mercury is fo fixed with the oil of vitriol, as not to be evaporated, or fly off, by the action of a very violent fire.

By this procefs we fee the method of impregnating, faturating, and incerating metals by acids to any degree, and alfo of fixing, in a great degree, volatile Mercury by them; but no metal is hence to be expected, for, in whatever manner Mercury is fixed with acids, it is always recoverable again in its priftine ftate, by grinding it with twice its weight of iron filings, and diftilling it in a glafs retort, with the greateft degree of a fand-heat. *Boerh. Chem.*

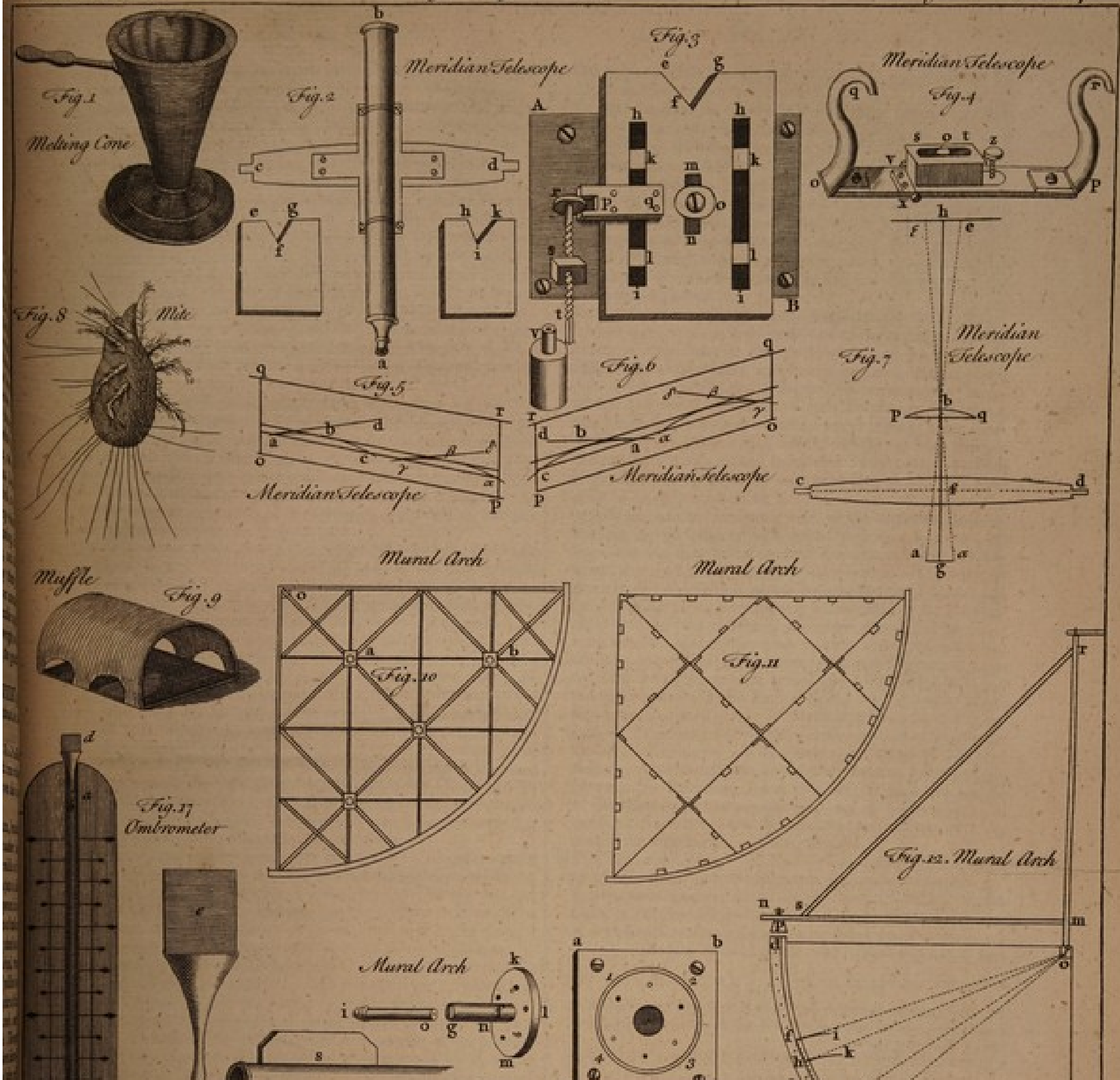
MERIDIAN *Telefcope*, a telefcope, as *a b* (*Plate* XXXI. *fig.* 2.) fixed at right-angles to an axis *c d*, and turned about it in the plane of the Meridian.

The vulgar ufe of it is to correct the motion of a clock or watch, by obferving, day after day, the exact time when the fun or a ftar comes to the Meridian. It ferves alfo for other ufes to be mentioned hereafter.

The axis *c d* confifts of a ftrong brafs plate, broader in the middle than towards the ends, having another long plate placed edgeways and foldered along the middle of the backfide of it from one end to the other. This plate is alfo broader in the middle than towards the ends, to prevent its fpringing. To the ends of thefe plates two folid pieces of brafs are firmly jointed and foldered; and, the whole being placed in a turning lathe, the folid ends are turned truly cylindrical, to an equal thicknefs, and are alfo well fmoothed and polifhed with oil and proper powders. Flat upon the broader plate of the axis, there lies another brafs plate, in the fhape of a crofs; one bar of it being parallel, and firmly fkrewed to the axis. The ends of the other bar, being turned up at right-angles, have femicircular notches filed in them, to receive the cylindrical tube of the telefcope, which is made of brafs, to prevent its warping; and is firmly fixed in thefe notches by two half-collars of brafs, which go over the tube, and are fkrewed to the ends of the femicircular notches, as reprefented in the figure. The cylindrical ends of the tranfverfe axis *c d* are to be placed upon two angular notches *e f g* and *h i k*, filed in two thick brafs plates, and well planed and polifhed, for the axis to turn very fmoothly upon them. In order to bring the axis *c d* exactly perpendicular to the plane of the Meridian, each of the notched plates are contrived to be moveable by a fkrew, one upwards or downwards, and the other fideways, by fliding them upon the furfaces of two other brafs plates immoveably fixed to two pofts or free-ftone pillars.

In order to move the notched plate *e f g*, *fig.* 3, up or down, two long upright flits *h i* are cut through it; in each of which, at *k* and *l*, are two fquare ftuds of brafs firmly riveted to the fixed back-plate A B, being exactly as broad as the flits that flide by them. In the middle between them there is alfo a fhorter parallel flit *m n*, through which a broad-headed fkrew-pin is fkrewed into the back-plate, having a round fpringing plate under the head of it; thus the two plates are preffed together or relaxed, according as the notched plate is to be fixed or moved. To perform this motion gradually, *p q* reprefents a fmall piece of another brafs plate, laid upon the fore-plate and riveted to the middle of one of its upright fides. In the end *p*, which projects over this fide, there is a fmall fquare notch, which receives the circumference of a fmall circular plate *r*, like a fkrew-head, fixed perpendicular to a long fkrew *r s t*, placed parallel to this upright fide of the notched plate. This fkrew works round in a concave fkrew in the middle of a thick brafs ftud at *t*, firmly riveted to the back-plate, and being turned by a hollow key *v*, put upon the fquare end of it, it gradually raifes or depreffes the notched plate *e f g*; which is fixed more firmly, at its proper height, by turning the middle fkrew at *o*, abovementioned.

The angular notch that fupports the other end of the tranfverfe axis is moveable fideways, by the fame contrivance; as will appear



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appear by supposing the notch efg to be cut in the side opposite to the skrew rst, and this side to be turned upwards.

The transverse axis is to be placed horizontal upon the angular notches by a spirit level, consisting of a hollow glass tube st, *fig.* 4, five or six inches long; not quite straight, but as little incurvated as possible; and filled with spirit of wine, or any liquor that will not freeze or grow foul, all but a bubble of air; which, by the laws of hydrostatics, will always move to the highest place in the cavity of the tube. The tube, with its convexity upwards, is placed in a long slender brass box, made fit to receive it, and is fastened in it by very hard cement. This box is laid lengthways upon a long ruler op; and through the bottom plate of the box, a little produced, there passes a fine skrew-pin Z, to be turned by the fingers; whose end, by working against the surfaces of the ruler below, gradually raises or depresses this end of the box, while it turns upon a small axis vx near the bottom of the other end of it.

Upon the ends of the ruler op two brass plates oq, pr, are fixed, whose planes are perpendicular to the length of the ruler; these plates, being equal in length, have their upper parts formed into circular hooks q, r, to be hung upon the cylindrical ends of the transverse axis of the telescope; the interval between the hooks being of a proper length to interpose them between the shoulders of the cylinders at the end of the axis and the brass notches they rest upon.

The frame $poqr$, being thus suspended upon the transverse axis, raise or depress the tube of the level by twisting the knob of the skrew Z, till you bring either end of the air-bubble to rest at any point a, towards the middle of the tube, and observe any mark upon the side of the tube that is opposite to it. Then take off the frame $poqr$, and, turning the ends of it contrary ways, hang it again upon the cylinders. And, if the air-bubble rests exactly at the same mark as before, the transverse axis is truly horizontal: if not, depress that end of the axis which lies on the same side of the mark as the bubble does, or raise the opposite end, till the bubble returns about halfway towards the mark. Then, having made a new mark where it rests, transpose the frame again, and repeat the same practice till the bubble rests exactly at the same point in both positions of the frame. Instead of making marks, over-against one end of the bubble, it is better to have a fine pointer, sliding upon a wire, along the top of the tube.

Let a plane passing through the axis qr, *fig.* 5, 6, and the mark a where the bubble resteth, cut the tube of the level in the curve abc; and let a line ac, drawn parallel to the axis qr, cut off the arch abc, and after the frame of the level has been transposed, the chord ac of the arch abc will still be situated somewhere in the same parallel to qr as before, suppose at $\alpha\gamma$. Now, since the ends of the chords ac, $\alpha\gamma$, are turned contrary ways in the same line, it is plain that the mark a, which was the highest point in the arch acb, being now transposed to α, is become the low point of the same arch in the situation $\alpha\beta\gamma$. Therefore the bubble cannot now remain at the mark α, but will ascend to the highest point of the arch $\alpha\beta\gamma$; which will be γ, if the arch be circular. For then the tangents ad, $\gamma\delta$ to the points a and γ will be parallel to each other; and, ad being horizontal, $\gamma\delta$ will be so too; and consequently γ will be the highest point. Let $b\beta$, drawn parallel to the axis or to $a\gamma$, touch the arch $\alpha\beta\gamma$ in β; and, it is evident, the point β will be lower than γ. Therefore by depressing that end of the axis qr, which lies on the same side of the mark α as the bubble does at γ, the point γ will also be depressed; and so the bubble will recede from γ towards the mark α till it comes to β, when β becomes the highest point; that is, when the tangent $b\beta$ and the axis qr are parallel to the horizon: and then, if the frame $qopr$ be transposed back again, the bubble will rest at the same point β as before.

Now, if the arches abc, $\alpha\beta\gamma$ be circular, b and β are exactly the middle points of the arches. But, if the arches be not circular, the points b and β will not be in the middle, yet, being at the greatest distance from the chords ac, $\alpha\gamma$, they will be the points where the bubble will rest, when the axis is horizontal.

It must be observed of these levels so suspended, that, if you gently turn the frame about the axis of suspension, the air-bubble will frequently change its place, though the supporters of the axis keep fixed; either because the plane of the curvity of the tube is not parallel to the axis, or because the cavity of it is not cylindrical, or upon both accounts. It is therefore necessary to reduce the plane of the frame as near to the same vertical position as possible, which may be done either by a plumbet hanging down by the side of a perpendicular ruler fixed to the horizontal one op, in *fig.* 4, or by another tube of a spirit level, fixed upon the ruler op at right-angles to it. But, if the frame $poqr$ vibrates freely upon the axis, this additional apparatus will be needless.

If the far end of the telescope be just made to preponderate the elevation of it, for observing the appulses of stars to the cross hairs, it may be gradually altered by a string, tied to its near end, and wound about a peg fixed below the telescope. The peg may be made to turn with a proper degree of stiffness between two semicircular notches pressed gently together by a skrew-pin passing through both the pieces. Or the same design may be executed several other ways.

If, after the telescope is turned upside down, and the contrary ends of the transverse axis are placed upon the same notches, you perceive that the same point of the object is covered by the intersection of the hairs in the focus of the telescope; it is certain that the line of sight is perpendicular to the transverse axis. But, if the intersection covers a different point of the object, the hairs must be moved by the key above-mentioned, till they appear to bisect the line that joined those two points of the object as near as you can judge; then, by reverting the telescope to its former position, you will find whether the hairs be exactly adjusted.

For let the line cd, *fig.* 7. be the transverse axis which the telescope turns about a, the intersection of the cross hairs; b the center of refractions in the object-glass, and ab the line of sight. Let ab, produced, meet a remote object in e; and the point e will appear in the telescope to be covered by the intersection a, because the image of it falls upon a. Imagine a line gh drawn through the center b to cut the axis cd at right-angles in f, the hair $a\alpha$ in g, and the object $e\epsilon$ in h; and when the ends of the axis cd are transposed by reverting the telescope, the perpendicular bg will keep its position, or be parallel to it; but ba will be transposed into the position $b\alpha$, equally inclined to the contrary side of the perpendicular bfg. Produce αb till it meets the remote object in ϵ, and the cross hairs at α will now appear to cover the point ϵ. But the perpendicular gbh bisects the interval $e\epsilon$ in h. Therefore by moving the intersection of the cross hairs from α towards g, till you perceive the middle point h is covered by it, it is manifest that the line of sight is now perpendicular to the transverse axis cd; and consequently upon reverting the telescope, the same point h will be covered as before. Hitherto I have supposed the telescope to be turned about an axis cd, lying in the same plane with the line of sight; but, if it turns about any other line parallel to cd, it is easy to understand that the motion of the line gbh will still describe a plane perpendicular to this transverse axis. It is scarce necessary to be observed that the perpendicularity of the line of sight to the transverse axis has no dependence upon its passing through the middle of the aperture of the object-glass, nor of being parallel to the sides of the tube; nor is it required to coincide with the axis of the object-glass. *Smith's Optics.*

MERIDIONAL *parts* (*Dict.*)— To find the Meridional parts to any spheroid, with the same exactness as in a sphere.

Let the semi-diameter of the equator be to the distance of the focus of the generating ellipse from the center, as m to 1. Let A represent the latitude for which the Meridional parts are required, s the sine of this latitude, the radius being unit; find the ark B, whose sine is $\frac{s}{m}$; take the logarithmic tangent of half the complement of B from the common tables; subtract this logarithmic tangent from 10.0000000, or the logarithmic tangent 45°; multiply the remainder by $\frac{7915.7044678978}{m}$ &c. and the product subtracted from the Meridional parts in the sphere, computed in the usual manner from the latitude A, will give the Meridional parts expressed in minutes for the same latitude in the spheroid, provided it be oblate.

Example: if $mm : 1 :: 1000 : 22$, then the greatest difference of the Meridional parts in the sphere and spheroid is 76.0929 minutes: in other cases, it is found by multiplying the remainder abovementioned by 1174.078.

When the spheroid is oblong, the difference of the Meridional parts in the sphere and spheroid, for the same latitude, is then determined by a circular ark. *Phil. Transf.* N°. 461.

MESENTERY (*Dict.*)— The disorders incident to the Mesentery deserve our most attentive consideration, since the superfluous humours of the veins are easily conveyed to it, and lay a foundation for very terrible disorders, such as a cholera, melancholy, fluxes, gripes, cachexies, atrophies, languors, slow and erratic fevers, together with other diseases, whose natures are not to be discovered without great difficulty. When the Mesentery is affected with a tumor without inflammation, the tumor is generally, at first, lax and soft, but, some time after, becomes intirely dry and indurated. This tumor, and the part in which it resides, are insensible of pain; for which reason the internal swelling, which lies pretty deep, is only to be discovered by a rough touch.

In this case, the part affected is distended, which lessens the diameters of the intestines, and, by that means, occasions costiveness; which effect is by no means produced by a tumor of the abdominal muscles, or prominent fat; for neither of these affect the intestines. The fat, also, when laid hold of by the hand, may be distinguished from the abdominal muscles. But, when the tumor is lodged in the abdominal muscles, it is always discoverable by the first touch, and is ever painful when pressed, and sometimes painful without any compression. Besides, a tumor of the abdominal muscles is prominent, when not pressed; perceptible upon the mildest touch, and of an oblong figure, like that of the musculus rectus. *Lommii Medic. Observat.*

Obstructions of the Mesentery proceed from the same causes with

with those of the liver and spleen, but happen more frequently and easily, by reason of the narrowness of the meseraic; and, especially, of the lacteal vessels, which convey the chyle to the organs allotted for the second digestion. And when the chyle, which is so often mixed with crude and gross humours, stagnate, and produce obstructions, in the lacteal veins, the meseraic veins are, also, obstructed by gross humours conveyed from the liver, spleen, and other parts, and lodged there for a considerable time. During the stay of these humours, they become gradually thicker, so, as at last, sometimes, to produce a scirrhous tumor. With these humours are, also, sometimes, mixed gross flatulences, which generally prove the causes of violent symptoms. To the obstruction, also, or rather the contraction, of these vessels, we refer the compression of the glands dispersed through the whole substance of the Mesentery; for these, increasing beyond measure, as happens in strumous persons, compress the meseraic veins, and hinder not only the due distribution of the chyle, but, also, the circulation of the blood.

The diagnostic signs of obstructions of the Mesentery are divided into three classes, which either indicate the species of the disease, the part affected, or the productive causes.

The signs which indicate the species of the disorder, that is, obstructions of the hypochondria, and their causes, are the same with those producing obstructions of the liver and spleen. But the signs which in a peculiar manner indicate, that the Mesentery is affected, are tension and resistance in the middle of the abdomen, under the stomach, and in the umbilical region, where there is, also, a sense of weight, sometimes an obtuse pain, and sometimes one of an highly acute kind, when flatulences are contained in these parts: a pain is, also, sometimes, perceived in the back, to which the Mesentery is affixed; rumblings and noises happen in the belly, eructations are excited, and vapours are raised to the head, by which means various symptoms are produced: in a word, all the symptoms which generally attend melancholy, indicate obstructions of the Mesentery, because that disorder is produced and cherished by obstructions of the same kind.

As for the prognostics: this disorder is not of itself very dangerous, because the Mesentery is capable of bearing great disturbances, without any immediate danger to life. Besides, generous remedies may be used for the cure of this disorder, which, when duly exhibited, generally produce the desired effect, unless the disorder causes hypochondriac melancholy, which, on account of the obstinate nature of the melancholic humour, is generally called the reproach of physicians. But, as the Mesentery is not furnished with an exquisite sensation, and as the obstructions of it are generally not very troublesome to the patient, they are often neglected, and lay a foundation for other highly dangerous disorders.

The cure of this disorder is to be performed in the same manner with that used for removing obstructions of the liver. *Riverius, Prax. Med.*

MI'LIUM, *millet*, the seed of a plant, which by consent of authors, both ancient and modern, is refrigerating and drying; it is of bad juice, difficult of digestion, binds the belly, and generates flatulences; it is, however, well known to be a very grateful food to many nations at present. In former times it served to make bread, under a dearth of better corn, as we are assured by Dioscorides, Pliny, Galen, and others of the ancients. Among the Italians, says C. Bauhine, loaves made of millet, which are yellow, are eaten hot by many, not out of necessity, but for their sweetness; but, when this bread is grown hard, it is quite black. Of the flour of millet and milk the Italians make fine cakes, which must be eaten as soon as dressed, or else they become glutinous, and ungrateful to the taste. In former times they made a sort of white puddings of millet, as Pliny tells us. And among the Cossacks and Tartars, their principal food is millet, the crude meal of which they mix with the milk of mares, or with blood drawn from the crural vein of their horses. A pudding, prepared of millet, boiled in milk, with an addition of butter, and sugar sprinkled over it, is much in request among the Germans at present; and these puddings have been long ago introduced into England, and are still in fashion.

The flower of millet was formerly used in fomentations for the gripes, and for pains of the head and nerves; it was applied externally in bags, because the use of it in cataplasms was difficult, on account of its friability. If the membrane of the brain happens to be wounded, it is excellently conglutinated says Archigenes, by infusing thereon the juice of calaminth, and sprinkling it with the dry flour of millet. A decoction of millet, with figs and raisins, is called by Heurnius a noble sudorific and diuretic. Or, take of a decoction of millet, boiled till it bursts, four ounces; white wine, two ounces. Let the patient take it hot. *Chesneau. Raii Hist. Plant.*

Millet is diuretic and astringent; the seeds are of extraordinary service in diseases of the lungs, and exulcerations of the kidneys; made into a cataplasm, they are anodyne and resolvent. *Hist. Plant. adscript. Boerh.*

Indian MI'LLET.—It delights in a fat and humid soil; for which reason some sow it in their fields to correct their luxuriance; it was brought from India into Spain, Italy, and other warm countries: they sow it in summer, and reap it in autumn.

The seed is like panic both in taste and temperament. The poorest sort of people in Italy, and the peasants in the Paduan, grind the seed, and make it into loaves, which are friable, and afford but little nutriment, being black, difficult of digestion, and binding. It is more usual to make puddings, or white pots, of the flour and milk. In Tuscany they sow it more for the sake of feeding their poultry, than to serve as aliment for men. They, also, give it to their cows, horses, and swine. Of the pith of the stalks is prepared an excellent remedy for the strumæ; the preparation of which see in the Bauhines and Matthiolus; which last author commends, also, the flowers, for uterine fluxes and the dysentery. *Raii Hist. Plant.*

MILLEFO'LIUM, *yarrow*, in botany, a genus of plants, whose characters are:

The leaves are very finely cut; the calyx is squamose, and almost cylindrical; and the flowers are very closely collected into umbella's.

Yarrow has a white creeping root, which spreads much on the surface of the ground. The leaves are long and narrow, having on each side several very finely divided pennæ. The stalk is firm and erect, a foot or two high, somewhat hairy, and beset alternately with smaller, and rather finer leaves. The flowers grow on the top of the branches in flat umbels, each flower being made of five little, white, roundish leaves, set about a thrum of the same colour, growing in a scaly calyx, in which is contained flattish white seed. It grows every-where in the fields, and flowers in June and July. The leaves are used.

Yarrow is cooling, drying, and binding; very serviceable in in all kinds of hæmorrhages, whether spitting or vomiting blood, bleeding at the nose, dysentery, or the too great flux of the menses, or violent flooding, cooling, and tempering its immoderate heat and sharpness. It, also, helps a gonorrhœa, strangury, heat of urine; and, applied outwardly, is of service against ruptures, and to staunch the bleeding in fresh wounds. *Miller's Bot. Off.*

This plant is a little acrid, bitter, aromatic, and gives a considerable tincture of red to blue paper. It seems to me, that the acid part of the natural salt of the earth, disengaging itself of the other principles through the texture of this plant, forms, with the terrestrial parts, an aluminous salt, united with a little essential aromatic oil.

By the chemical analysis are extracted from the yarrow several acid liquors, a great deal of earth, no volatile concrete salt, and a little urinous spirit.

Thus this plant is vulnerary, resolvent, and astringent. It is used in ptisans, and infusions, after the manner of tea. Some boil its leaves in broths, to stop all sorts of hæmorrhages, and especially the irregular flux of the piles and fluor albus. Its juice is prescribed from eight ounces to six; the powder, from a drachm to half an ounce: it is mixed, also, with paste, to make astringent biscuits. Tabernæmontanus says, the water of yarrow is good for the epilepsy; and that the wine of mead, made with this plant, stops all sorts of irregular fluxes. *Martyn's Tournefort.*

MINE (*Dict.*)—*Tracing of* MINES, a term used by our miners, to express the tracing up the mineral appearances on the surface of the earth to their head, or original place, and there discovering a Mine of the metal they contain.

This practice depends on the change wrought on the face of the earth by the deluge, of the effects of which these remains are a very great proof. The superficial, or upper part of veins, is always the poor, the richer ores lying deeper, the poor ones only serving to lead the way. These poor ores, or stones impregnated with the metallic matter of the Mine, and called by our workmen shoad-stones, were probably, at the creation of the earth, brought regularly up to the surface, and shewed the places of the metals below. But, at the time of the covering the earth by the waters of the deluge, they were, with the rest of the surface, washed off, and carried, with the descent of the water, down into the plains, or into the beds of rivers, and there carried many miles down the stream. This being an allowed truth, the art of training a Mine is easy; for, though this carrying the shoad-stones and poor ore was done so many ages ago, yet, all the way that some pieces were carried on, others would be deposited by the way, and, the heaviest and richest falling first, the lightest would always be carried farthest, and there would be always left a stream of this matter all the way from the place where it was first produced, that is, where the Mine now is; for the breaking of the surface of the earth, at this great catastrophe, was not so deep as to reach that; and this stream or train of matter will be found richer and richer as it approaches the Mine, and finally will stop at the place where it is.

Where there is supposed to be a Mine of any metal, the hills and countries all about are diligently searched; the situations, and descent of the lands, and the earth, stones, and other fossil bodies, are examined, particularly the colour and nature of the various sorts of earth and stones which are found on the hills where the Mine is suspected to lie, that they may be readily

dily known again, if any of them are found in the neighbouring valleys. The ftones which denote the loads, and are called fhoad-ftones, are found two, three, four, or even five miles from the hills, where they originally lay; but, if the fame fort of ftones are remembered on the hills, the train is to be made out.

After any great land-flood, in which it is fuppofed there are ufually fome new frets made in the banks of the rivers, thefe are carefully examined, to fee whether any metalline ftones may be found in their fides and bottoms, all being then fo clean, that the fmalleft fhoad-ftone may ufually be feen. If no ftones of this kind are found, it fometimes is of ufe, in order to farther refearches, to examine whether any pieces of earth, of a different colour and nature from that of the reft of the bank, be found; for, this being, if any fuch is found, wafhed alfo from the neighbouring hills, it proves a great direction which fide of the hill to fearch into.

If no fhoad-ftone or grewt of a different nature from the reft be found in thefe frets or newly worn banks, the miners leave the place for the prefent. For though the bed of the river afford many metalline ftones, they never regard them, the continual change of place they receives from the current of the water, rendering them only tokens that there is metal fomewhere in the country; but they confound and perplex rather than inftruct in the fearch after the places where it is.

If there be found indeed ftones of the fhoad-kind, full of protuberances, or having fharp angles, as if newly broken, it may be worth while to fee whether they are not wafhed out of fome part of the neighbouring banks by the late floods; as this fort of appearance is a token of their having been newly taken into the bed of the river. But, if they are rounded and fmooth, it may be concluded that they have been long fubject to the action of the water, and brought, perhaps, many miles from the places where they were originally lodged in the earth, where only they could have been of any ufe to the tracer of the Mine.

When the frets in the fides of rivers have been traced in vain, the fearcher after a Mine goes up to the fides of the hills moft fufpected to have Mines in them, and there feeks for a convenience of bringing a little ftream of water to run down. When this is found, he cuts a trench about two feet over, and as deep as the fhelf. The water is turned into this cut, and after two or three days running in it, all the filth will be wafhed away, and the loofer part of the earth cleared off; and if any fhoad-ftones are lodged within the whole courfe of this cut, they will be found. If any fuch are found, it is an unqueftionable proof that there is ore in the higher parts of the hill; this encourages the work, and there is always found a Mine, or at leaft a fquat, which will, without much danger, repay the expence and trouble. The fquats are flat parcels of the ore, lying in different and diftinct places of the hills, and not communicating with one another.

Sometimes a great deal of this labour is faved, and the fhoad-ftones are found on the furface of the ground, either turned up by the plough, or thrown up in fmall quantities in mole-hills, or raifed by fome other accident; for they are feldom found naturally lying on the very furface of the earth; for the putrid remains of vegetable and animal fubftances, and other adventitious matter, have raifed the furface of the earth in all places, fince the time of the flood, and made indeed a fort of new furface. Thefe ftones were certainly laid bare on the furface of the ground, at the time of their being carried down from the Mines; but this adventitious matter has buried them in this long tract of time, and they are generally found under about a foot of a fort of vegetable mould. If, by any of thefe fearches, a fhoad is found, the miners have nothing to do but to follow it to its head, and there make the opening; but if no fuch direction can be had, nor any fhoad found, and there is yet fufpicion that there is a Mine in the hill, the method is to make an effay-hatch, as it is called; this is funk near the foot or bottom of the hill, and is an opening of about fix feet long, and four feet broad, made in the fearch of a vein as deep as the fhelf; this is a caution that muft be always carefully obferved, for if they are made lefs deep than this, they may mifs of the vein, though there is one. And the finking thus deep is always attended with certainty, for if no fhoad is found on this, it may be concluded there is none there; except that fometimes it is found that the fhoad has been wafhed clean away, within two or three feet from the land: and then the load or vein is two feet farther, or thereabouts, up in the hill. If any fhoad is found in the effay-hatch, there is a certainty of a vein of ore; neither doth it add a little toward the making a conjecture how high up the hill, or how far off the vein ftring, or bonny, is, carefully to mark how deep from the furface of the earth the fhoad lies, for this is held an infallible rule, that the nearer the fhoad lies to the fhelf or faft ground, the nearer the vein itfelf is, and vice verfa.

When there is no fhoad or appearance of a Mine found in the firft effay-hatch, if the conjecture of a Mine being in the hill has any tolerable foundation, the tracing it does not end here; but they go ten or twelve fathoms up the hill, and there open a fecond effay-hatch, and if no ore or fhoad-ftone is found in this, they go as many fathoms on each hand at the fame height with the fecond hatch; and there open a third and a fourth hatch, of the fame depth and dimenfions with the firft; if in neither of thefe there is found any fhoad-ftone, they afcend proportionably with three more hatches, if the fpace of ground requires, at every ten or twelve fathoms, and in this manner open them three abreaft, at twelve fathoms diftance up to the top of the hill. If no fhoad is found in any of thefe, it is concluded then that there is no tracing a Mine there, and the hill is left.

If any fhoad is found in any of thefe hatches or openings, the afcending hatches from this are kept on in a direct line, and, the deeper the fhoad lies, the nearer the vein is. The fhoad grows gradually deeper from the furface, but nigher the fhelf as they approach the Mine: as, fuppofe it be but half a foot from the fhelf and feven feet deep from the furface, the vein is then concluded to be within a fathom or two; and on this the firft proportion of twelve fathoms between every hatch is leffened, to fix, four, two, one, or even lefs than that, as the vein is conjectured to be more and more near.

It often happens, for want of a good guefs in this matter, that the diggers over-fhoot the load; that is, they open their next hatch too high up the hill, or above the load or vein: this is a miftake eafily difcovered and eafily rectified. If a fhoad is found lying near the fhelf in one hatch, and in the hatch above there is no fhoad at all, it is a proof that the hatch is too high, and the remedy is only to fink a hatch at a middle diftance between the laft two, which will probably fall upon the very point of the load, and finifh the work of tracing.

Sometimes it happens that, in continuing the tracing of the firft fhoad, a fecond or new one is found; it is not uncommon for two fhoads to be thus found in one hatch, and this is eafily difcovered without any danger of miftake; for fuppofe in the laft hatch the fhoad which they trace lay at eight feet deep, and in this it lies at ten feet, and, befides this, there is a fhoad found at two feet depth; it is very certain, that the fhoad at ten feet deep is the fame they were before tracing, and this is a new one pointing to another vein or load, which is now firft difcovered fo near the furface of the earth. This has generally gravel or earth mixed with it, and is to be carefully examined; when the higher hatches are opened, this is continually found, as well as the old load; and when the firft is traced to the point of the vein, this fecond is to be continued in the fame manner, by other hatches opened at the fame diftances above: it often happens that in tracing this fecond fhoad, the hatches dug for it difcover another new one or a third fhoad; all thefe are to be traced one over the other by the fame hatches, and will all be found worth the feeking after. The old writers on minerology agree with us in this obfervation, and tell us, it is not uncommon in fome places to find as far as feven loads lying parallel to one another in the fame hill. In thefe cafes, however, there is ufually one mafter-load, or grand vein; the other fix, that is, three on each fide, being the leffer or concomitant veins. Five in the fame manner fometimes lie in this order, the grand load in the middle and two on each fide; but the more common method is three, a large one, and two fmaller.

Every load has a peculiar coloured earth or grewt about it, which is found alfo with the fhoad, and this always in a greater quantity, the nearer the fhoad lies to the load, and becomes leffened by degrees to the diftance of about a quarter of a mile, further than which that peculiar grewt is never found in any quantity with the fhoad; fo that this is a proof that the load or vein is near, when it is found in quantity.

A valley may chance to lie at the foot of three feveral hills, in fuch a manner, as to contain three feveral grewts, or that earth which was moved with the fhoad in the concuffion of the ftrata at the deluge, with as many different fhoads or trains of fhoad-ftones in the midft of each: in this cafe it will be very neceffary to know the caft of the country, and of each hill in refpect to its grewt, for the furer training of them one after another as they lie in order: according to the foregoing rules of effay-hatching, the uppermoft in this cafe always directs which hill to begin with firft.

It fometimes happens that, after having trained the fhoad found in a valley up to the upper parts of a hill, there is only a fquat, or bonny, found inftead of a right vein of ore, for thefe detached parcels of ore have their fhoads as well as the right veins. Thefe are ufually about two or three fathoms long, and a fathom broad; few of them are larger, moft lefs, and they never communicate with any other load or vein, nor ever fend forth any of their own. The extremities of thefe beds of ore terminate without fending out any ftrings, not lying within walls as the loads; but though they are in the fhelf or faft ground, not moved by the flood, their furface is equal every-where with that of the imaginary fhelfy one, and they go down five or fix fathoms deep and there terminate at once. The ore contained in thefe are rich, and they are always wrought out to the confiderable advantage of the owners.

Thefe are the general rules of tracing Mines, and though fomewhat tedious and expenfive, they are certain, and never liable to the error and difappointment the other fhorter ways, as they are called, are liable to. Thefe fhort ways are by the *virgula divinatoria* or the hazel-wand, whofe bending in cer-

 tain

tain places, without any external visible force, is to point out the place where the vein of ore lies: the waters thought to issue from the particular loads are also used by some as a short means of finding the veins; other of these ways are also by mineral steams and effluvia, by the barrenness of the soil, and the pitching of nocturnal lights on the supposed orifices of mines. But these methods are too extravagant or too uncertain to be used in cases of so much consequence. When the mine is found by more certain rules of tracing, the digging it is a matter of less difficulty.

English MI'NERALS.—Dr. Woodward has observed, that the English Minerals are much more valuable and numerous, than has been generally supposed. Fuller's earth, a thing so cheap as to be disregarded by many, he observes, is of almost as much value to our commerce, as any article of foreign production. The property this earth has of imbibing oil and grease, is not confined to the trifling service of taking out accidental stains in cloaths, but it is of so much use in cleansing the wool and the cloth made of it, that we could never have flourished in the cloth trade in the manner we have done, had we not this fossil among us so plentiful and cheap, and at the same time so excellently good. This earth is one instance of the pre-eminence of our soil above others. Another instance we have in our black lead or wadd, a mineral of great use and value in several branches of trade and arts; and which is found no where fine and good, except in England, and in our colonies; and that of the last place, though better than the black lead of other nations, is greatly inferior to our own.

The amber and jet of England are found in considerable quantities, and are equal to those of any other part of the world. Our canal coal comes very near the beauty of jet, and even our common coal for firing is greatly superior, in goodness, to that of any other part of the world, and is no where found in such vast plenty as with us. The English earths and gravel are well known to be superior to those of other countries, in none of which, such grass plats or such gravel walks are to be seen, as in the English gardens. We have stones, slates, flags, and the other necessary fossils for building, in sufficient plenty.

Vitriol and alum are found in greater plenty in England, than in any other country; and are so easily worked or procured from their ores, that we can sell them cheaper than any other people. *Woodw. Cat. Foss.*

Tin is another article, in which England has always had a great pre-eminence; the county of Cornwall alone produces more tin than all the world besides, and the tin of England is well known to excel that of other nations, as well in value as in quantity.

Lead ore is also richer in England than in any other country, and is found in greater quantities here than any where else; besides this, it runs more kindly in the fire, and requires less trouble and expence in the working, than any other lead; and is, when wrought, much finer and more ductile, than any other lead.

This does not arise from any peculiarity in the metal, for lead is the same in all countries, when equally purified; but the spar which lies about, and is mixed with our lead ore, is of such a nature and disposition, that it is easily wrought upon and readily parts from it, leaving the metal more pure than it can be procured by the common large operations in other countries; so that they are forced to send it away much less pure than ours is.

Copper and iron are also found in very great plenty, and several ores of these metals have of late been brought into use, which were not known before the modern improvements in chemistry.

MINERO'LOGY (*Dict.*) — The necessity of cleaving and opening rocks has always been accounted one of the most troublesome articles in the business of mining; they being often composed of such stone as tools can work but very slowly upon in the common ways. Fire and gun-powder have been the two things principally had recourse to on these occasions; and both successfully, but in different ways. The fire calcines stones, and they then easily become shattered to pieces, and give way to tools that would not touch them before; but in this case, besides the expence of wood, the hinderance of the labourers is an article to be considered, for the rocks are made so hot all about the place where the fire has been, that the people cannot get to work again for a day or two, and then the effect of fire reaches but a little way in the rock.

Gun-powder makes its way much farther, and at the same time is much cheaper and does not delay the work, but the labourers may go on immediately afterwards. There have been many ways contrived of using this, but one of the simplest and best seems to be that delivered by Mr. Beaumont, in the Philosophical Transactions. For this there are only three simple instruments required, a borier, a gun, and the quinet or wedge. These are the names the miners on Mendip-hills give the instruments. The borier is an iron instrument, steeled at the end; it is two feet two inches long, and is somewhat thicker at the steeled end than in any other part: the use of this is to make the hole in the rock deep enough to receive the powder. The gun is about six inches long, and an inch and quarter in diameter; and has a hole drilled through it, to receive the priming. The quinet is a wedge of iron of about six inches long, and so shaped, that its flat part on one side joins with a flat part in the gun made to receive it, and by that means the gun is fastened very firmly in its place. *Philos. Trans.* N°. 167.

The manner of using these instruments is this: one man holds the borier on the rock, turning it round, while another forces its point in by blows of a large hammer on the other end. When the hole is made somewhat deeper than the length of the gun, they dry it with a rag, and then put into it two or three ounces of powder; over this they lay a paper, and then they put the gun into the hole, and fasten it in by driving in the quinet or wedge against its flat part. When the powder and gun are thus fixed, they pass down a wire through the hole drilled in the gun, and with this they pierce a hole through the paper that covers the powder; they then prime the gun, and lay a train with a lighted match; but all go out of the mine before the gun-powder takes fire, and, as soon as it has gone off, they go down to work again, finding the rock split, and the instruments unhurt. The paper in this case is put over the powder only, that the tools may be safely employed in driving down the gun and the quinet, because, were not the powder covered, it might do mischief to the workmen by going off by some spark caused by striking either against those instruments, or against the rock itself.

MI'SSEL-*bird*, in zoology, the common English name of the larger species of thrush, called also the shrite, and by authors the turdus viscivorus major. It is much larger than any other of the thrush kind. Its legs and feet are yellow; its head of a brownish lead colour; and its back, tail, and rump, of the same colour, with an admixture of yellow; but, in the summer months, it a little changes its colour, and becomes more grey, or of the colour of unripe pickled olives; its throat, breast, and belly, are all variegated with black spots; the middle of its belly whitish, and the upper part of its breast, and part of its sides, and the under feathers of its tail yellowish. *Ray's Ornithology.*

MIST.—The bluish Mist, which we sometimes see on our fields and pastures in a morning though often innocent, yet has been in some places found to be the actual cause of murrain, and other fatal diseases among the horned cattle.

Dr. Winklar gives, in the Philosophical Transactions, an account of a murrain affecting the cattle in Italy and other places, which was evidently seen to spread itself over the countries in the form of a blue Mist. Wherever this was perceived, the cattle were sure to come home sick; they appeared dull and heavy, and refused their food; and many of them would die in four and twenty hours. Upon dissection there were found large and corrupted spleens, sphacelous and corroded tongues; and in some places those people who were not careful of themselves, in their management of the cattle, were infected and died as fast as themselves. The principal cause of this disease seemed to be the exhalation of some unwholesome steams from the earth; and it was observable, that there had been three earthquakes in Italy the year before it happened. The method of cure which succeeded best, was this: as soon as any beast appeared to be sick, they examined the tongue, and, if aphthæ, or little blisters, were found on it, they scraped it with a silver instrument made with sharp teeth at the sides, till it bled in all those parts where the apthæ were; the blood was then wiped away with a cloth, and the whole tongue washed several times with vinegar and salt. After this the following medicine was given internally: take of soot, brimstone, gun-powder, and salt, of each equal parts; mix these in as much water as will make them thin enough to be swallowed, and let a spoonful be given for a dose three or four times a day. The cattle which were in health had this medicine given them, as well as the sick; and the consequence was, that very few died in Switzerland, while almost all died in other places.

It was very remarkable that the contagion, on this occasion, seemed to travel slowly and regularly on: it came at the rate of about two German miles in twenty-four hours: this it kept regularly to, during the whole time of its raging, and never appeared in very distant places at the same time.

The whole surface of the earth emitting these effluvia, no cattle escaped them in the course of their way, but those which were kept within doors at rack and manger fell ill at the same time, and in the same manner with these in open fields. Dr. Slare was of opinion, that it was owing to certain insects which could not fly faster than at the rate of two German miles a day; and that they travelled regularly, and spread the mischief where they passed; but there wanted some judicious persons, versed in these observations, to have examined both the state of the air, and the beasts, on this occasion. *Philos. Trans.* N°. 145.

MITE, in natural history, the name of a small animal, very well known and found in old cheese, and many other bodies both recent and perishing.

To the naked eye the Mites in cheese appear like moving particles of dust, but the microscope discovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly as creatures that exceed them many times in bulk. See *Plate* XXXI. *fig.* 8.

They are crustaceous animals, and are usually transparent; the principal

principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body, and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quick-ſighted; and, when you have once touched them with a pin, you will eaſily perceive how they avoid a ſecond touch.

They are of different ſorts; for ſome of them have ſix legs, and others have eight. Each leg has ſix joints ſurrounded with hairs, and two little claws at the extremity, with which it very nicely takes hold of any thing. The hinder part of the body is plump and bulky, and in an oval form, from which there iſſue out a few exceeding long hairs. Other parts of the body and head are alſo beſet with thin and long hairs.

The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous as the louſe and ſpider, and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute, and, in their growing to their full ſize, they caſt their ſkins ſeveral times.

Theſe little creatures may be kept alive for many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen in winter, conjoined tail to tail; and this is performed by an incredible ſwift motion. Their eggs, in warm weather, hatch in twelve or fourteen days; but, in winter, they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhews, that ninety millions of them are not ſo large as a common pigeon's egg. *Baker's Microſcope.*

MNE'ME-*cephalicum balſamum*, the name of a famous compound balſam, ſaid to have been purchaſed from a certain Engliſh phyſician by Charles Duke of Burgundy, at the price of ten thouſand florins. Some who have been very laviſh in its praiſes have affirmed, that it has a power of preſerving in the mind the remembrance of all things that are paſt; but this ſeems ſtretching the praiſe of it a little too far. It is prepared in the following manner: take of the juices of the leaves of baum and baſil, of the flowers of tamariſk lilies, primroſes, roſemary, lavender, borrage, and broom, of each two ounces; of lilies of the valley, roſes, and violets, each one ounce; of cubebs, cardamoms, grains of paradiſe, and yellow ſaunders, carpobalſamam, Florentina iris, ſaffron, ſavory, piony flowers, and thyme, of each half an ounce; of liquid ſtorax, ſtorax calamita, opoponax, bdellium, galbanum, gum ivy, and labdanum, of each ſix drachms; roots of long birthwort and piony, and oil of turpentine, ſpikenard, coſtus, juniper, bays, maſtich, ben, and ſpike, of each, five drachms. The dry ingredients are to be beaten to powder, then mixed with the reſt, and, a ſufficient quantity of water being added, the whole is to be diſtilled by an alembic, and the oil carefully ſeparated from the water. The method of uſing it is this: the firſt two months the paſſages of the ears and noſtrils are to be anointed with the bigneſs of a pea of it every day; then, for two months longer, the ſame is to be repeated every third day; after this, it is to be uſed once a week; then, once a fortnight, till a year is expired; and, after this, it is to be uſed once in two months for the ſucceeding years. This is the account of Sennertus. *Sennert. Praſt.*

MNI'UM, in natural hiſtory, the name of a genus of moſſes, the characters of which are theſe: it has heads of two different kinds, the one ſort naked and duſty, having no calyptra or other covering; the others are regular capſules, like thoſe of the hypnum and bryum, containing a fine powder, and covered with a calyptra or hood. This diverſity in the fructification diſtinguiſhes the Mnia from all the other moſſes; but theſe diverſely conſtructed heads are in ſome ſpecies found on the ſame plants; in others, on different ones of the ſame ſpecies, as the male and female flowers are in hemp, mercury, and many others of the larger plants. The ſtalks which ſupport the membranaceous heads are long and naked; thoſe which ſupport the naked heads, are in ſome naked, in others covered with leaves; but they are in all ſhorter than the others. *Dillen. Hiſt. Muſc.*

MI'XTURE, *mixtura ſimplex, ſimple mixture*, in pharmacy, the name of a form of medicine uſed in the preſcriptions of ſome modern phyſicians. It is made by mixing ten ounces of the ſpiritus theriacalis camphoratus of Bates, ſix ounces of ſpirit of tartar, and two ounces of ſpirit of vitriol; theſe are to be ſet in a glaſs hermetically ſealed for three weeks, that they may be perfectly mixed; the doſe is a drachm or thereabouts. Its virtues are, that it reſiſts putrefaction, promotes ſweat, and is of great ſervice in malignant fevers.

MO'AR-*boere*, in huſbandry, a term uſed to expreſs a peculiar diſtemperature of corn, generally comprehended under the common term of a blight. In this caſe the earth ſinks away from the roots of the corn, and leaves the plant ſtanding in great part above ground with naked roots; theſe being too weak to ſupport the ſtalks, the plants fall, and the ears become light. This a diſtemperature peculiar to corn, growing on light and looſe lands. *Tull's Horſehoing Huſbandry.*

The remedy is this: turn a ſhallow furrow againſt the rows, when they are ſtrong enough to bear it, and the mold is fine and dry; the motion of the ſtalks with the wind will draw in this looſe powder, and it will ſpread itſelf equally among all the plants in the row, though it be triple or quadruple. It is eaſy to ſee that this remedy is only practicable in the method of the horſehoeing-huſbandry; for, in the common way of ſowing, there is no means of relief in this caſe. And, in general, the horſehoeing-huſbandry prevents the falling of the wheat, the ſtalks never drooping ſo abſolutely in the drilled wheat, as they do in that ſown the common way.

MOCK-*Bird*, the name of an American bird of the merula kind, and very much approaching the blanvogel or cæruleus. It is of the ſize of the common lark: its beak is ſhort and ſtraight, its tail very long, and its whole body of a very fine deep blue. *Ray's Ornith.*

MOCK-*Lead*, in minerology, a name given by the Engliſh writers to a ſort of foſſil, called alſo blende and galena. It has very much the appearance of an ore of lead, being bright and gloſſy, of a bluiſh black colour, and plated; but, on trial, it is found to yield very little or none of that metal.

MODE (*Dict.*) — Some Modes cannot exiſt without the ſubject, as being only circumſtances thereof; as roundneſs, length, &c. but there are others which are likewiſe ſubſtances, as apparel, hair, nails, &c. which may ſubſiſt without the ſubject.

MODI'LIONS.—*Plate* IV. *fig.* 5, in the Dictionary, repreſents a Modilion of Vignola, and *fig.* 8. a Modilion of Scamozzi.

MO'FFAT-*Waters*, mineral waters of conſiderable efficacy at Moffat, in the county of Annandale. They ariſe from two ſprings on the declivity of a hill, which yield about 1360 gallons of water daily. Theſe waters have a ſulphureous taſte and ſmell, like the waſhings of a gun-barrel; their colour is milky or bluiſh. The ſeaſon for uſing them is between the middle of April and the end of September; but they may be drank all winter, and, if the rains be moderate, the ſtrength of the water is not found to be impaired. The water of the upper ſpring, being too foul for drinking, is made uſe of for bathing, and is, for this purpoſe, made ſomewhat warmer than tepid. The quantities of water, uſually drank, are pretty large, exceeding ſometimes a gallon. It is uſual to join purgatives, and that in great doſes, frequently repeated with the uſe of the waters; but this is thought unjuſtifiable by ſome. The water is alterant and diuretic. Its purging is owing to the large quantities drank, or to ſome ſingularity in the conſtitution, as a weak ſtate of the ſtomach and inteſtines. Few medicines are ſaid to be ſuperior to theſe waters in diſorders of the ſtomach and bowels. It has alſo proved uſeful in nephritic, nervous, and hyſteric cholics, melancholy, barrenneſs, female weakneſſes and diſorders, as alſo in old gleets, either natural, or cauſed by venereal diſorders. In rheumatic and ſcorbutic complaints it is advantageous, and in cutaneous eruptions. It is ſaid ſeldom to fail in ſcrophulous diſorders. This water gives but ſmall marks of a chalybeate nature with galls, nor any of acidity with tincture of roſes, or ſyrup of violets; neither does it produce any effervеſcence with oil of tartar per deliquium, or ſpirit of ſal ammoniac. It ſeems to contain a ſubtile volatile ſulphur, but in a ſmall quantity, ſince it ſoon loſes its remarkable ſmell and taſte, when expoſed to the air, and that acid liquors can neither ſeparate nor precipitate it. Upon evaporation, there is found a dirty ſalt mixed with earth. This ſalt ſeems not to be nitre, nor ſal ammoniac, but common ſalt, and, by a ſlow evaporation of a ſolution of ſea ſalt, cryſtals, not unlike thoſe of the ſalt of Moffat-water, have been obtained. A particular account of theſe waters may be ſeen in the firſt volume of the Edinburgh Eſſays phyſical and literary.

MOIRE, in conchyliology, the mohair ſhell, a name given by the French virtuoſi to a peculiar ſpecies of voluta, which ſeems of a cloſely and finely reticulated texture, and reſembles on the ſurface a piece of mohair, or a very cloſe ſilk-worm's web. See the article VOLUTA.

MO'LA, in zoology, a name of a fiſh commonly called in Engliſh the ſun fiſh. It is of a very ſingular figure. Its body is broad and ſhort, and its hinder extremity is terminated by a circular fin, which ſerves it for a tail; ſo that it looks like the head of a large fiſh ſevered from its body; it is frequently of two feet in length, and ſometimes very much exceeds that ſize, growing even to two hundred weight. It has no ſcales, but is covered with a hard, harſh, and rough ſkin. Its back is black, and its belly white; the ſides are of a middle colour between both. Its back and belly both terminate in a narrow edge. Its mouth is very ſmall for the ſize of the fiſh, and, when open, is round. Its jaws are hard, and edged like a knife within; externally they are rough, as if beſet with ſeveral rows of ſmall teeth. The head does not at all project from the reſt of the body. The eyes are very ſmall. It has only one pair of fins, which are ſituated near the gills, which are only two elliptic holes covered with their proper membranes. Its fleſh is very ſoft, and its bones are all griſly and tender. The ſkin ſticks very firmly to the fleſh, and is not eaſily taken off. It is caught in the Mediterranean, and ſometimes in the Britiſh ſeas. *Willughby's Hiſt. Piſc.*

MOLE-*hills.*—Theſe little hillocks of earth are a very great prejudice to the paſture lands, not only waſting ſo much of the land as they cover, but hindering the ſcythe in mowing. In the weſt of England, they uſe a peculiar inſtrument for the breaking up of theſe; it is a flat board, very thick, and of about eight inches in diameter, into which there is faſtened a perpendicular handle of three or four feet long. It has four broad

and

and sharp iron teeth at the front, which readily cut through the hill, and spread the earth it consists of; and, behind, there is a very large knob, proper for breaking the clods with, if there are any. Some use a spade, or other common instrument, in the place of this, but not so well. There is, however, a much better instrument even than this, for destroying these hills, where they are in very great numbers. This is a kind of horse machine; it has a sharp iron about three feet over, and with a strong back. It is about four or five inches broad, and has two long handles for a horse to be harnessed to, and a cross bar of iron to strengthen it at the bottom of the handles, reaching from one handle to the other. The middle of this cross bar is furnished with one, two, or more, sharp pieces of iron, like small plough-shares, to cut the Mole-hills into two, three, or more parts. The iron behind is of a semi-circular figure. A single horse is harnessed to this machine, and a boy must be employed to drive it, and a man to hold and guide it; the sharp irons or shares are the first thing that meets the hills; they run through it, break its texture, and cut it into several parts, and the circular iron, following immediately behind them, cuts up the whole by the roots, and leaves the land level. This instrument will destroy as many Mole-hills in one day as a common labourer can in eight, and would be of very great advantage to the kingdom, if brought into general use. *Mortimer's Husbandry.*

MOLO'SSES, the dross of sugar, or what remains after the sugar is extracted from the juice of the cane.

Artificial MOLOSSES. There has been found a method of making Molosses from apples, without the addition of sugar. The apple that succeeds best in this operation, is a summer sweeting of a middle size, pleasant to the taste, and so full of juice, that seven bushels will yield a barrel of cyder.

The manner of making it is this: the apples are to be ground and pressed, then the juice is to be boiled in a large copper, till three quarters of it be evaporated: this will be done with a moderate fire in about six hours, with the quantity of juice abovementioned; by this time it will be of the consistence and taste as well as of the colour of Molosses.

This new Molosses serves to all the purposes of the common kind, and is of great use in preserving cyder. Two quarts of it, put into a barrel of racked cyder, will preserve it, and give it an agreeable colour.

The invention of this kind of Molosses was owing to Mr. Chandler of Woodstock, in New England, who, living at a distance from the sea, and where the common Molosses was very dear and scarce, provided this for the supply of his own family, and soon made the practice general among the people of the neighbourhood. It is to be observed, that this sort of apple, the sweeting, is of great use in making cyder, one of the very best kind we know being made of it. The people in New England also feed their hogs with the fallings of their orchards of these apples: and the consequence of this is, that their pork is the finest in the world. *Philos. Trans.* N°. 374.

MOLOSSES *spirits*, a very clean and pure spirit, much used in England, and made from Molosses or common treacle dissolved in water, and fermented in the same manner, as malt for the common malt spirit. If some particular art is not used in the making of this, it will not prove so vinous as the malt spirit, but more flat and less pungent and acid, though otherwise much cleaner tasted, as its essential oil is of a less nauseous flavour. Whence, if good fresh wine-lees, abounding in tartar, be duly fermented in the solution made thin for that purpose, the spirit will by that means become much more vinous and brisk, and approach more to the nature of the foreign spirits.

After the first distilling of Molosses spirits from the wash into low wines, it is to be rectified, and in the succeeding rectifications proper additions are to be made. Alkaline salts, so common in the rectifying malt spirits, must be avoided in this case, as not at all suiting this spirit; and the neutral ones only must be used, such as sandiver, common decrepitated salt, sal enixum Paracelsi, and the like; but, upon the whole, nothing so considerable is to be expected from these salts, as from a careful rectification in balneo mariæ, without any other admixture; by this alone repeated two or three times with fresh water each time, the spirit will at once be made fit for the nicest uses.

Where the Molosses spirit is brought to the common proof strength, if it be found not to have enough of the vinosity, it will be very proper to add to it some good spiritus nitri dulcis; and, if the spirit be clean worked, it may by this addition alone be made to pass on ordinary judgments for French brandy.

When newly distilled, this spirit like all others is colourless, and limpid as water; but our distillers always give it the same sort of yellow tinge, which the foreign spirits are found to obtain from the casks they are sent over in. They have many ways of giving this colour extempore; but the two most in use are, either by an extract of oak-wood, or by burnt sugar.

Molosses spirit coming dearer than that of malt, it is frequently met with, basely adulterated with a mixture of that spirit, and indeed seldom is to be bought without some dash of it. Many have a way of mixing malt in the fermenting liquor; by this the yield of the whole is greatly increased, and the maker may assure the buyer that the spirit is pure as it ran from the worm.

England is the principal place where this spirit is made at this time; it was at one time prepared in great quantities in France, especially in the river Loire; but it is now forbid there, under a severe penalty. In Holland also they have it not, on account of the high duty laid upon treacle in favour of their own sugar-bakers.

We meet with very little of Molosses spirit reduced to the strength of alcohol or spirit of wine, though, when rectified to this state in a proper manner, it is very little inferior to the real alcohol of wine, the name of which is so well known among us, though the thing itself is perhaps never seen here; all that we call spirit of wine being no other than malt spirit reduced to an imperfect alcohol, or a spirit almost totally inflammable.

Great quantities of Molosses spirit are used in the adulterating of brandy, rum, and arrac; and great quantities are used alone in the making cherry brandy, and other drachms, by infusion, in all which many prefer it even to the foreign spirits.

In most of the nice cases in our compound distillery, the Molosses spirit supplies the place of a pure and clean malt spirit, which we have not yet the way of producing in the large way to advantage. Our cinnamon, citron, and other fine cordial waters, are made with it; for the malt spirit would give these a very disagreeable flavour.

There is also another use to which this spirit serves extremely well, and which even a foreign spirit which has any remarkable flower will not do so well in; this is the making the extemporaneous wine, which some people are so fond of. See the article *Extemporaneous* WINE.

It gives a yellow stain to the hands, or other substance dipped into it; and may therefore be of use in dying. It is possible also, that the vinegar-makers may find use for it in their way; but the most advantageous of all its uses is to the distiller himself; a quantity of it added to new treacle intended for fermentation will be of great use in the process, and increase very considerably the quantity of spirit; but the proportion in regard to the new matter must not be too great. *Shaw's Essay on Distillery.*

MOLU'CCA *Balm*, or *baum*, in botany, a genus of plants, whose characters are:

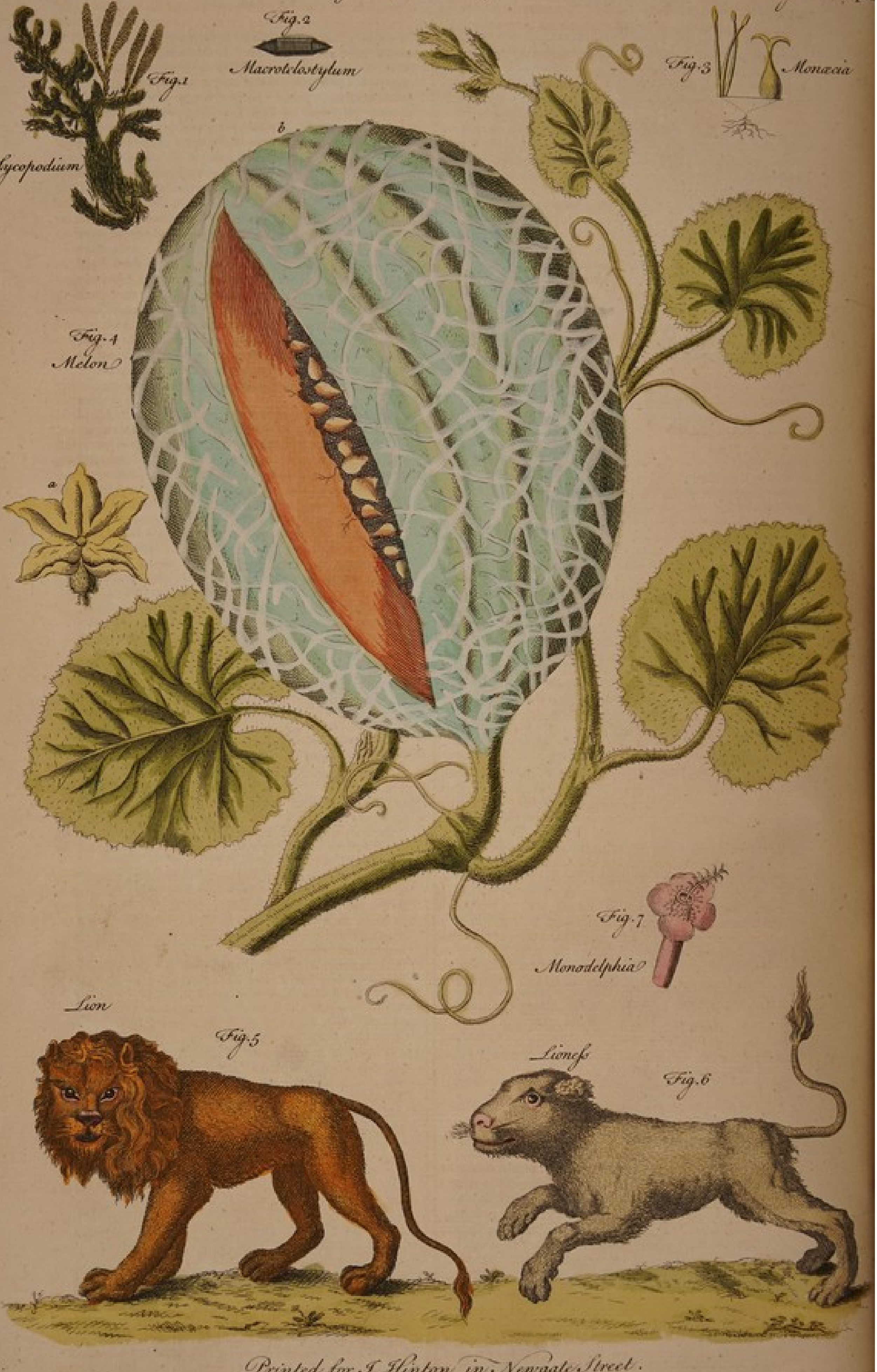
The calyx is expanded, large, bell-shaped, as it were membranaceous, and open. The galea is hollow, the beard tripartite, and the middle segment commonly bifid. The flower is very small, and concealed in the center of the calyx. The seeds are angulous, and hardly covered.

This plant takes its name from the Molucca islands, where it was discovered. It is a vulnerary, and very good in a phthisis, being used as tea. If the disease be attended with spitting of blood, the expressed juice is of service, on account of its astringent quality, which is adapted to an hæmoptoe. No plant is a better lithontriptic, the leaves being infused in wine, or spirit of wine. It has the virtues of baum, but smells somewhat stronger. Here it may be proper to observe, that the perfectly cerulean colour of all plants proceeds from the fatness of the soil in which they grow; this is universally true of them all, and particularly in the instance before us. *Hist. Plant. adscript. Boerhaave.*

MOLUCCA *beans*, a name given by Sir Robert Sibbald, in his Prodromus, and by Mr. Wallace, in his Description of the Orkney-islands, to a sort of fruit frequently cast on shore in the North-west islands of Scotland, especially, on the coasts most exposed to the waves of the occidental ocean.

Some call them Orkney-beans; though they are not the produce of that island, or indeed of any part of Europe, but of America.

How the product of Jamaica, or other parts of America, should be brought to the shores of Scotland and Ireland, seems not easy to determine on any certain foundation. It is easy to conceive that, when they grow by the sides of rivers, they may fall off from the trees into them, and be thence conveyed into the sea. It is likewise easy to see, that, when they are thus floating on the surface of the sea, they may be carried about by the winds and currents, and be carried a great way; but their journey this way must naturally be stopped by the main continent of America, and they must be forced through the gulf of Florida, or the canal of Bahama, going thence constantly east, and into the North American sea. This is easily conceived by a similar fact which happens every day: which is, that a kind of sea lentil, called sargossa, which grows very plentifully on the rocks about Jamaica, is washed off from thence, and carried by the winds and currents, which, for the most part go impetuously the same way, towards the coast of Florida, and thence into the North American ocean; and are there found floating on the surface. Thus far it is easy to trace our fruits from their native soil; but how, after this, they should make the rest of their voyage is a great mystery, and not to be accounted for by us, unless we suppose, that as ships, when they go south, expect a trade easterly wind, and, when they come north, expect, and generally find a westerly wind, for at least two parts in three of the year; so we are to suppose these fruits, being brought north by the current from the gulf of Florida, are put into these westerly winds way, and by them conveyed to the coasts of Scotland and Ireland. *Philosophical Transactions*, N°. 222.



Printed for J. Hinton in Newgate Street.

MOLYNEUX'S *parallactic teleſcope*, a curious teleſcope for finding the parallaxes of the heavenly bodies, invented by that ingenious gentleman.

The curious and uſeful teleſcope was ſuſpended in a vertical poſition, by two poliſhed cylinders, fixed near the top of the tube, ſo that their common axis, if produced through the tube, would paſs at right-angles to its axis, through a point near the center of the object glaſs. When the teleſcope was turned upon theſe cylinders, its axis of viſion moved like a pendulum in the plane of the meridian, and at the ſame time, a fine long wire, whoſe loop was put over one of the cylinders, hung down by the ſide of the tube, being gently ſtretched by a plumbet immerſed in a veſſel of water, deſigned to retard its vibrations. The lower end of this wire played gently againſt the ſmooth ſide of a ſlender braſs plate, fixed tranſverſely to the ſide of the tube, ſo as to point northwards and ſouthwards; and in the middle of this plate was punched a very fine round hole rather broader than the thickneſs of the wire. The teleſcope was gradually moved upon its axis of ſuſpenſion by the preſſure of a long ſkrew, in a parallel direction; the ſkrew worked in a hole of a plate, fixed to the wall of the houſe; and the tube was made to bear againſt the end of the ſkrew by a weight, fixed to the end of a ſtring, paſſing over a pulley, and having its other end tied to a hook, fixed in the ſide of the tube. The oppoſite end of the long ſkrew was fixed, like an axis, in the center of a braſs wheel, whoſe circumference was divided into a convenient number of equal parts, while an index, fixed to the board, pointed to the diviſions of the wheel.

Things being thus prepared, while the wheel was gently turned, the part of the wire, which played againſt the tranſverſe plate, was viewed through a double microſcope, until the little hole in this plate appeared to be biſected by the wire. The teleſcope being thus rectified immediately before the beginning of every obſervation of the tranſit of γ draconis (which paſſes very near the zenith of Kew) and the diviſion of the wheel over-againſt the index being then noted, the wheel was turned again, till the interſection of the wires in the focus was brought to touch the ſtar at the inſtant of its tranſit. Then, by the number of the revolutions of the wheel, and the parts of a revolution that had paſſed by the fixed index, the angular motion of the axis of the teleſcope was eaſily collected, from a proper table of minutes and ſeconds, anſwering to thoſe revolutions. Now, the differences of theſe angles, found at different obſervations, are the differences of the ſtar's declination. And, the inſtrument being rectified every time as above, it is eaſy to underſtand that theſe angular differences could not be altered by any warping, ſhrinking, or ſwelling of the materials of the inſtrument. *Smith's Optics.*

MO'NBIN, *the hog plum-tree*, in botany, a genus of trees, whoſe characters are:

It hath a roſe-ſhaped flower, conſiſting of ſeveral leaves, which are ranged in a circular order; from whoſe cups ariſes the pointal, which afterwards becomes an oval, fleſhy, ſoft fruit, incloſing an hard ſtone, in which are contained four kernels or ſeeds.

This tree is a native of the warmeſt parts of America, where it grows in the ſavanna's, and low marſhy places, in great plenty. It riſes to be forty or fifty feet high, and divides into a great many crooked branches, which are beſet with winged leaves, ſomewhat like thoſe of the aſh-tree. The flowers, which appear in the ſpring, are produced in large pyramidal bunches at the extremity of the branches, which are of a white colour, and are very ſweet. Theſe are ſucceeded by ſeveral yellow oval-ſhaped plums, growing in cluſters. The wood of this tree, being ſoft, is uſed, inſtead of cork to ſtop bottles in America. *Miller's Gard. Dict.*

MONOE'CIA †, in botany, a claſs of plants which have not the male and female parts, that is, the ſtamina and piſtillum in the ſame, but in different flowers; and thoſe on the ſame individual, or on the different ſtalks, growing from the ſame root; thoſe which contain the ſtamina are called the male flowers, thoſe which contain the piſtillum the female ones.

† The word is derived from the Greek μόνος, the ſame, and οἶκος, habitation.

The plants of this claſs are the alder, mulberry, amaranth, &c. See *Plate* XXXII. *fig.* 3.

MONODE'LPHIA †, in botany, a claſs of plants, whoſe ſtamina or male parts, by reaſon of their filaments running in among one another, are all formed into one body.

† The word is formed of the Greek μόνος, ſingle, and ἀδελφή, brotherhood or community; theſe coalitions of the ſtamina in flowers being underſtood in botany by that term.

Of this claſs are the crane's-bill, mallow, &c.

The general characters of this claſs of plants are theſe: there is always a perianthium to the flowers, no ſpecies of the whole claſs being without it. This is always permanent, and ſurrounds the baſe of the ſeed-veſſel, after the flower is fallen. The flower always conſiſts of five petals, which are cordated at the top. The ſtamina are a great number of filaments, which grow together in one body at the baſe, and are looſe at the top. The external ones are ſhorter than the others, and the antheræ are always incumbent. In the piſtils there is found a receptacle of the fructification, which is placed in the center of the flower. The germina are erect, and ſurround in a rotary manner the apex of the receptacle. The ſtyles are all found growing together, at the bottom, into one body, with the receptacle, and in their upper part they are divided into as many filaments as there are germina. The ſtigmata are ſlender and expanded. The fruit is a capſule, divided into as many cells as there were piſtils in the flower. This is of very various figures in the various genera and ſpecies; but the ſeeds in all are uniform, or ſhaped like kidneys. See *Plate* XXXII. *fig.* 7.

MONOPE'TALOUS, in botany, a name applied to the flowers repreſented in *Plate* XXXVI. *fig.* 1.

MONTRO'SE *waters.* Steel ſpaws are very numerous in the country about Montroſe in Scotland: the principal of theſe are at Aberbrothoc, Kincardin, and Peterhead. That of Aberbrothic is in greateſt eſteem.

The water of this Montroſe well is univerſally diuretic; being drank from two to three pints, purges; and half the quantity ſucceeds with ſome. It has been found very uſeful in ſtranguries and ſtoppage of urine, ſcorbutic diſorders, flatulences, ſpaſmodic cholic, and ſpitting of blood. In rheums and ſtrains it has been of good uſe by way of cold pump, where perſons could not bear ſuch uſe of ordinary cold water. *Med. Eſſ.*

MOON (*Dict.*)— We have obſervations and tables concerning the Moon's motion, by Mr. Richard Dunthorn, in the Philoſophical Tranſactions, N°. 482, where he gives an hundred obſerved longitudes of the Moon compared with the tables, viz. 25 eclipſes of the Moon, taken, except the firſt, from Flamſteed's Hiſtoria Cœleſtis, the Philoſophical Tranſactions, and the Memoirs of the Royal Academy of Sciences; the two great eclipſes of the ſun in 1706 and 1715; 25 ſelect places of the Moon, from Flamſteed's Hiſtoria Cœleſtis; and 48 of thoſe longitudes of the Moon, computed from Flamſteed's Obſervations by Dr. Halley, and printed in the firſt edition of of the Hiſtoria Cœleſtis.

In the Philoſophical Tranſactions, N°. 473, we have a new method of computing the appulſes of the Moon to the fixed ſtars and planets; as alſo of the eclipſes of the earth, commonly called eclipſes of the ſun, by Mr. Gerſten, profeſſor of the mathematics at Gieſſen.

The full Moon appears to the naked eye broader than a circular object, ſubtending an equal angle, ſeen by perfect viſion. In a Moon of three or four days old the illuminated part appears too broad, in proportion to the obſcure part, and likewiſe ſeems to extend more outwards, or to have a greater diameter than the obſcure part. Alſo, in an eclipſe of the ſun or Moon, the bright part appears too broad in proportion to the dark part, and the eclipſe appears leſs than it really is.

This obſervation was made by Horrox, and is accounted for by Dr. Jurin, in his Eſſay upon Diſtinct and Indiſtinct Viſion.

MOOR-*cock*, an Engliſh name for the red game, or our lagopus, more commonly called the gor-cock. It is a very delicate bird, larger than a partridge, and common on the hills in Derbyſhire and Yorkſhire. *Ray's Ornithol.* See the article GOR-*cock.*

MOOR-*hen*, *gallinula*, in zoology, the name of a genus of water birds, the characters of which are theſe: the head is ſmall, the body compreſſed, the beak ſhort and moderately crooked, the wings ſmall, and hollowed like thoſe of the common cock and hen kind; the tail very ſhort, the legs long, and the toes remarkably ſo.

The common Moor-hen, called gallinula chloropus by authors, is a very well known bird, ſomewhat like the coot in ſhape, but ſmaller, and very much flatted in the body. Its feet are greeniſh, and its breaſt a lead-coloured blue; its belly greyiſh. It is common about our rivers, and is a very well taſted bird. *Ray's Ornithol.*

MOOR-*land*, or MOORY *land*, in agriculture, is a black, light, and ſoft earth, very looſe, and without any admixture of ſtones, and with very little clay or ſand.

The uppermoſt ſtratum of the fen lands is uſually of this earth, and it uſually conſtitutes a moderately thick or deep bed. Intermixed with water, it cannot eaſily be worked up into a paſte; and, when with labour worked into ſomewhat of a firm maſs, its ſurface appears ſpongy and porous; and, as ſoon as dry, it eaſily moulders away to powder.

It is uſually ſoft to the touch, unleſs it be worked very cloſely between the fingers; then it ſhews a mixture of a ſmall quantity of ſand, both to the touch and to the eye.

It ſeems indeed to conſiſt almoſt intirely of pure vegetable matter, and this, lying in ſuch plenty on the ſurface of the fenlands, is the cauſe of their being ſo very fertile.

The great diſadvantage of the places which have this ſoil, is their being liable to be glutted with wet; and, to remedy the inconveniencies ariſing from thence, the farmers who rent theſe lands have a cuſtom of burning the ſoil at proper ſeaſons. It burns very freely and eaſily, the ſurface readily catching flame; and a ſubſtance ſomewhat bituminous, uſually contained among the ſoil, helps the burning. *Moreton's Northampt.*

MOOR-*ſtone*, the name of a very remarkable ſtone found in Cornwall,

Cornwall, and some other parts of England, and used in the coarser works of the present builders.

This is truly a white granate, and is a very valuable stone. It is a very coarse and rude, but beautiful congeries of variously constructed and differently figured particles, not diffused among, or running into one another, but each pure and distinct, though firmly cohering with whatever it comes in contact with. Its colours are principally black and white; the white are of a sort of marble texture, and opake, formed into large congeries, and emulating a sort of tabulated structure; among these, there are many of a pure crystalline splendor and transparence, and among these are lodged in different directions many small flaky masses of pure talcs of several colours; some are wholly pellucid, others of an opake white, others of the colour of brown crystal, and a vast number perfectly black. *Hill's Hist. of Foss.*

The people of Cornwall who have this stone in great plenty, use it in the tin works, and particularly in their tin kiln, on the good effect of which a great deal depends. This kiln is four-square, and at its top is placed a large block of Moorstone; the usual size of this block is six feet in length and four in breadth; in the middle of this block there is made a hole of about six inches in diameter. This stone serves as a head to cover another like stone placed beneath it; but this under one is not so long as the upper by six inches. The reason of this is, that it must not reach the innermost or back part of the wall, which is the open place through which the flame ascends from another place below that, where a very strong fire of furz is constantly kept up; and there is another little hole also on the outside. The forepart is like a common oven, and has such a sort of chimney.

The tin ore is roasted in this kiln, to burn away the mundic, in this manner: the ore is brought in powder, and poured out in heaps on the surface of the top stone; a man stands there, and thrusts it down through the hole in this stone into the kiln, that is, to the surface of the under stone; a person who stands below, spreads this as it falls with an iron rake, and gives notice to the person above, when there is enough down, that is, when the surface of the lower stone is covered three or four inches thick. When this is done, the hole at the top is covered with green turfs, that the flame may reverberate the stronger, and the heat that the Moor-stone acquires helps to roast the ore; while the flame that comes up from the ore is blue, there yet remains mundic among it; but when this is burnt off, the flame is yellow. *Phil. Transf.* N°. 69.

The miners in some parts of Cornwall use the name Moorstone for a sort of coarse free-stone, which lies very often over the tin ore; this is of a greyish colour, and is somewhat softer than that usually employed in building.

MOOSE *Deer*, a very large and beautiful species of deer, common in North America.

The stag or male of this kind has a palmed horn, not like that of our common or fallow deer, but the palm is much longer and more like to that of the German elk; but it differs from that in having a branched brow-antler between the burr and the palm, which the German elk hath not.

The large horns found fossile in Ireland, have, from their vast dimensions, been supposed to have originally belonged to the black Moose deer; but they, as likewise most other of the large horns found in this part of the world, appear to be the horns of the German elk, having no brow-antlers.

Mr. Ray mentions, in his Synopsis of animals, a pair of extremely large fossile horns, which he saw in a museum in Sussex; but he mentions no brow-antlers in these, and therefore probably they, as well as most others preserved in museums, were the horns of the German elk.

It is not agreed by authors what number of young the Moose brings forth at a time; Mr. Dudley says but two; but Josselyn, and from him Neal, say three; and these authors add, that they do not go so long with young as our does, by two months.

There is, beside the Moose, another animal of the deer-kind, very common in Virginia, and other of the Northern provinces of America. This creature has round horns, not spreading out as in the stag or red-deer, but meeting nearer together at the tips, and bending forwards over the creature's head; and the brow-antlers are not crooked and standing forward, but straight and upright. The skin of this deer is of a sandy colour, with some black hairs, and is spotted all over while young with white spots, as some of our fallow deer are, and it is about the bigness of our fallow deer when full grown.

The Dama Virginiana of Mr. Ray was different from this, if the description be exact, and the horns of the palmated kind. This Dama of Mr. Ray seems to be what Josselyn, in his Voyages, calls the Maurouse; but his description is too short to form any regular judgment from, he only says that the maurouse is like the Moose, but that its horns are small, and the creature about the bigness of a stag. *Phil. Transf.* N°. 444.

Josselyn mentions also the buck, the stag, and the rain-deer; but it is very much to be doubted whether they are the same with the Moose deer.

MO'RTAR (*Dict.*)—*Plate* XXXV. *fig.* 15, in the Dictionary, is a large Mortar; and *fig.* 22. represents the curve described by a bomb, shot from a Mortar.

MORTAR, among bricklayers, a kind of cement, composed of lime, sand, hair, &c. in which they lay the bricks, &c. in building.

The glass-makers in France are said to use a sort of Mortar, for plaistering over the inside of their furnaces, which is made of a sort of fuller's earth, which is procured at Beliere, near Forges, which is the only earth in France that has the property of not melting in this excessive heat; and also the pots which hold the melted metal, are made of this sort of earth, and will last a long time.

Mortar for sun-dials on walls, may be made of lime or sand tempered with linseed-oil, and, for want of linseed-oil, may be made of scummed milk; but oil is better: this spread upon the wall will harden to the hardness of a stone, and not decay in many years, and will endure the weather six times as long as the ordinary plaister, made of lime and hair with water.

MO'RUS, *the mulberry.*— The fruit of this tree, while unripe, is very astringent, but, when thoroughly ripe, it is of a contrary quality, rather purgative, cooling, very pleasant, and quenching thirst. Its syrup, which is very pleasant, is the only use made of it in the shops.

The more general cultivating mulberry-trees in England might be of greater use than is at present supposed in many respects. In Devonshire they have a way of mixing mulberry-juice with their cyder in the making, and thus make the very best of all English vinous liquors. And as to the great article of breeding silk-worms, though a recommendation from the crown could not bring about the planting these trees in sufficient number for it in James the First's time, yet the trees have been found to flourish every-where with us, when properly planted, and the worms feed very kindly and work very well with us. When this manufacture was first attempted, the people of many parts of England, nay, and in some parts of the dampest places in Ireland, tried it, and always with success. The only thing that stopped the progress of so valuable a thing, at that time, was the want of a sufficient quantity of mulberry-trees, and the scheme has been neglected ever since. *Phil. Transf.* N°. 133.

The tree was always esteemed by the ancients for its delicious fruit, before the use of its leaves was ever found out. The Romans, in the height of their luxury, preferred it before all the foreign fruits; and Columella and the other ancients are very express in the method of propagating it.

The common mulberry-tree is to be propagated either by sowing the seeds, or by laying down the tender branches, which in two years will be well rooted, and may be cut off from the tree, and transplanted into the places where they are to remain. But those plants which are propagated from seeds, are usually the most vigorous, and grow the most regularly, and with the straighter stems; but then there is a great disadvantage attending this propagation, which is, that the trees are frequently altogether male, producing only catkins, and no fruit; so that it is better to do it by layers from a tree, which is known to produce plenty of good fruit; the straightest shoots should be always chosen for layers; and, when they are transplanted, they should be tied up to stakes to keep them straight. This tree should not be often pruned, but only such branches are to be cut off, as cross and bruise one another.

The mulberry-tree thrives best in a light soil, which should not be too wet, nor over dry; and it should always have an open exposure; for, if planted too near trees or buildings, so as to be shaded thereby, the fruit seldom ripens well; though it will be to great advantage to have them defended from the west and south-west winds, by trees or buildings at a distance.

The soil under the mulberry-tree should always be well dug up every year, and manured, which proves of very great service to the fruit.

The white mulberry is cultivated in France and Italy for the sake of its leaves, as there is an opinion, that the silk-worms should be fed only with these; but it is affirmed by persons who seem to know best, that the Persians feed their worms only with the leaves of the black kind.

The trees, intended for feeding silk-worms, should not be suffered to grow tall, but kept in a sort of hedge; and instead of pulling off the leaves singly, they should be cut off with sheers, together with the young branches; this is not only much sooner and more easily done, but it is less injurious to the trees. The white sort is propagated either by seeds or layers, as the black, and is equally hardy. *Miller's Gard. Dict.*

MOSS.— These small plants, though neglected for many ages, have, by the industry and application of later botanists, been found a very numerous and very beautiful class of plants; and not without their use in medicine and mechanics, and to various purposes of human life. Dr. Dillenius, who has studied them with an uncommon care, and given a very valuable history of them, has described more than six hundred species; the greater part of which are found in our own country, though some peculiar to others; and, doubtless, there yet remain vast numbers unheeded and unknown in many countries. See *Plate* XXXVI. *fig.* 2.

Uses of MOSSES.— Were there no other use in these minute and beautiful objects than the admiring the wonderful works of the Creator,

Creator, this were enough to make the ſtudy of them worthy of attention; the almoſt endleſs variety of the figure and ſtructure of their leaves, the ſlenderneſs of the ſtalks that ſupport them, and regularity and nice order in which they are arranged; the minuteneſs of their roots, and the ſlenderneſs of the pedicles which bear the heads, each of which is often ſmaller than the fineſt hair; and the extreme exility of the veſſels through which juices are conveyed along theſe for the nouriſhment of the plant and ſeeds, can never enough be admired; and the various ſtructure of the heads or ſeed-veſſels with their coverings, by means of which the tender ſeeds and farinæ are defended, afford to the microſcopic obſerver an endleſs fund of admiration.

But theſe are not all the uſes they were intended for, many may yet remain unknown; but we at preſent well know that ſeveral of the uſnea's are great and valuable medicines, uſed as deſiccatives and aſtringents; that the common cup Moſs is one of the greateſt remedies in the convulſive coughs of children, called the chin-cough, is known to every one; and Dr. Mead has ennobled the grey ground lichen, by publiſhing its virtues in one of the moſt terrible of all diſeaſes, the bite of a mad dog. The common green liverworts are known medicines in diſorders of the breaſt, as are alſo all the ſpecies of polytricha. The ſeeds of our lycopodium are given with ſucceſs in nephritic caſes; and the Indians give one of their ſpecies in many diſtempers, and, as they ſay, with great benefit. The common white ground coralloides ſerves the rain deer of Lapland for food, when all other herbage is loſt; and the confervæ ſerve for food to many of the fiſhes both of the ſea and rivers, and to ſeveral water-fowl. And theſe, as well as the land Moſſes, afford ſhelter and habitation to many inſects, and their young. Many of the ſpecies of coralloides and lichenoides are found of great uſe in that profitable branch of commerce, the art of dying; and, doubtleſs, many others have alſo the ſame qualities, though not yet diſcovered; and we may be guided, in ſearches of this kind, by obſerving that many of them tinge the papers, between which they are dried, to very beautiful and laſting colours. The Moſſes which cover the trunks of trees, as they always are freſheſt and moſt vigorous on the ſide which points to the north, if not only produced on that, ſerve to preſerve the trunk of the tree from the ſeverity of the north winds, and direct the traveller in his way, by always plainly pointing out that part of the compaſs.

The ſoft marſh and bog Moſſes ſerve the poor in many places for ſtuffing their beds, and in the buſineſs of tranſporting plants from other countries, nothing is of ſo great uſe as the ſtalks and leaves of theſe little vegetables: the ſucculent plants coming over in great beauty and vigour, when rolled up in dry Moſs; and trees and ſhrubs, by having their roots covered with ſuch as is ſomewhat moiſt.

The great quality of the Moſſes, which makes them ſo ſerviceable in this caſe, is, that they do not heat and ferment on being moiſtened, as hay and ſtraw would.

Moss *on trees*, in gardening. The growth of large quantities of Moſs on any kind of tree is a diſtemper of very bad conſequence to its increaſe, and much damages the fruit of the trees of our orchards.

The preſent remedy is the ſcraping it off from the body and large branches, by means of a kind of wooden knife, that will not hurt the bark; or with a piece of rough hair-cloth, which does very well after a ſoaking rain. But the moſt effectual cure is, the taking away the cauſe. This is to be done by draining off all the ſuperfluous moiſture from about the roots of the trees, and may be greatly guarded againſt in the firſt planting of the trees, by not ſetting them too deep.

If trees ſtand too thick in a cold ground, they will always be covered with Moſs; and the beſt way to remedy the fault, is to thin them. When the young branches of trees are covered with a long and ſhaggy Moſs, it will utterly ruin them; and there is no way to prevent it, but to cut off the branches near the trunk, and even to take off the head of the tree, if neceſſary, for it will ſprout again; and if the cauſe be in the mean time removed by thinning the plantation, or draining the land, the young ſhoots will continue clear after this.

If the trees are covered with Moſs, in conſequence of the ground's being too dry, as this will happen from either extreme in the ſoil, then the proper remedy is, the laying mud from the bottom of a pond or river, pretty thick about the root, opening the ground to ſome diſtance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of Moſs, but it will alſo prevent the other great miſchief which fruit-trees are liable to in dry grounds, which is, the falling off of the fruit too early. *Mortimer's Husbandry.*

Silk Moss, in botany, a name given by Count Marſigli to a ſpecies of ſea Moſs, of a very remarkable fineneſs and ſoftneſs, much more reſembling ſilk than any other vegetable productions. It is wholly compoſed of a ſort of tuft or fine hairs or filaments, and is of a bluiſh green colour, and almoſt tranſparent. It grows on rocks, ſtones, ſhells, or any thing elſe that lies in its way, and is found, uſually, at ſmall depths; it is not ſo tough and flexible as many others of the ſea plants, but is eaſily rubbed to powder between the fingers. When examined by the microſcope, the ſingle filaments do not appear of the ſame equable ſurface and uniform texture; but they are ſeen to be jointed and made up as it were of a great number of pieces faſtened end by end to one another, in the manner of the beads of a lady's necklace. It is of a fine bluiſh green, and perfectly tranſparent before the microſcope, and reſembles a ſtring of gems, ſuch as the aqua marina, or ſome other like ſtone. *Marſigli, Hiſt. de la Mer.*

Moss is alſo a name given by ſome to the boggy ground in many parts of England, more uſually a fen and bog.

MOTHER-*wort*, *cardiaca*, in medicine, is only uſed in the ſhops as an ingredient in ſome of the compound waters, intended againſt hyſteric complaints; and the country people frequently make an infuſion of it in the manner of tea, for the ſame purpoſe. It is alſo ſaid to be good in flatulencies and cholics, to give great relief in epileptic caſes, and to deſtroy worms. It promotes urine and the menſes, but its power this way is greatly inferior to that of penny-royal.

MOUNTAIN (*Dict.*)—The difficulty of breathing at the tops of high mountains is a thing ſo plainly felt, that none who has ever been in the way of making the experiment, but is well convinced of the certainty of the fact. Acoſta deſcribes what he felt on the tops of the high Mountains of Pariacaca very judiciouſly.

The Mountains of Armenia, and particularly that on which Noah's ark is ſuppoſed to have reſted, have been alſo made famous by the like accounts; though the ſnows that lie on the tops of their Mountains make it impracticable to aſcend their tops, the people who climb as they can, always find that they breathe with more difficulty, and are compelled to fetch their breath oftener, than when on the plains; and, on travellers complaining of this, their guides always tell them, that it is a known thing, and is what every body ſuffers there.

The Mountains in Languedoc and the Pyreneans have the ſame effect. People of curioſity have ſometimes remained hours on the ſummit of theſe Mountains, and always found the ſame ſort of difficulty in breathing; but it is poſſible that this may be owing to the exhalations of certain ſteams from the earth in theſe places, leſs loaded with a weight of air than below; and this appears the more probable, as in going up the Mountain Teneriffe, if many people are in company, and aſcend different ways, ſome uſually bear it better than others; and the very complexions of ſome are turned yellow by the exhalations which are very plainly perceived by their ſmell and ſharpneſs, while others who aſcend to the ſame height by different tracts, eſcape.

The moſt remarkable Mountain in the world, in ſhape, is that called the needle Mountain, or the inacceſſible Mountain, in Dauphiny.

This is a vaſt hill, placed as it were bottom upwards, or ſet on its ſummit on the earth with its broad baſe elevated in the air; it is but about a thouſand paces in circumference at the bottom, and is above two thouſand at the top. On the center of the plain at the top there ſtands another ſmall and very narrow, but very high hill.

It obtained the name of the needle, as it got the other, by its being ſuppoſed impracticable to the aſcent of any one, by reaſon of its projecting ſo greatly outwards. Some hardy perſons, however, once ventured to climb it, and found at the top a number of the chamoiſe, animals by no means qualified for climbing, and which doubtleſs had never either aſcended or deſcended the Mountain, and which muſt be ſuppoſed to have bred there for many ages, though it be very difficult to account for their firſt getting to the place. *Hiſt. Acad. Par.*

MUFFLE, in metallurgy, is an arched cover, reſiſting the ſtrongeſt fire, and made to be placed over coppels and teſts in the operations of aſſaying, to preſerve them from the falling of coals or aſhes into them; though at the ſame time of ſuch a form, as not to hinder the action of the air and fire on the metal, nor prevent the inſpection of the aſſayer.

The Muffles may be made of any form, ſo they have theſe conditions; but thoſe uſed with coppels are commonly made ſemi-cylindrical, or, when greater veſſels are employed, in form of a hollow hemiſphere.

The Muffle muſt have apertures, that the aſſayer may look in; and the fore-part of it muſt be always quite open, that the air may act better in conjunction with the fire, and be inceſſantly renewed; for, without this, ſcarce any fumes are to be produced; and, without theſe, the vitrification of lead is ſcarce practicable; for, when the air is once filled with a certain quantity of vapours, it ſcarce admits any more afterwards; and for this reaſon a conſtant ſucceſſion of freſh air is neceſſary. The apertures in the Muffle ſerve alſo for the regimen of the fire; for the cold air ruſhing into the larger opening before, cools the bodies in the veſſel; but if ſome coals are put in it, and its aperture before be then ſhut with a door fitted to it, the fire will be increaſed to the higheſt degree, much more quickly than it can be by the breathing-holes of the furnace. Another uſe of theſe apertures is alſo, that the arſenical vapours of lead and antimony, paſſing through the holes in the back part of the Muffle, may not be offenſive to the aſſayer, who ſtands before it.

As to the height, length, and depth of the Muffles, theſe muſt be proportioned to the ſize and number of the veſſels they are intended to cover; and care muſt be taken in this, that all parts of the inner surface of those vessels must be in the reach of the assayer's eye. The most frequent size of the Muffle, however, is four inches high, six or eight inches long, and four or six inches broad. The segments cut off at the bases, for the lesser holes, must be of such a proportioned height, that the least vessels, put under it, may not be in the way of coals or ashes falling into them; for that always hinders the vitrification of lead, and the destruction of the other metals and semi-metals, and will sometimes intirely reduce them again, when already destroyed; and the scoriæ, softened by ashes, soften and retard the operation.

Wooden moulds, of a proper shape, are most convenient for the making these Muffles in, and the matter for making them is the same with that of the German clay tests; that is, either a pure native clay, of a condition to bear the fire, which will be known upon the trial; or such clay, hardened by a mixture of the powder of stones: and, in order to the forming of these, the mass must be made tolerably soft and pliant. Knead a sufficient quantity of this mass with your hands upon a flat stone; spread it out evenly into a thin cake or plate, somewhat longer and broader than you intend the Muffle to be made; and so thick, that two or more thin plates or laminæ, of about two lines thick each, may be cut off from it. This is easily done by rolling the mass on the stone with a rolling-pin, strewed over lightly with ashes, or powder of chalk.

When the cake is thus rolled out, with a thin, fine, and perfectly straight brass wire, cut off, from the cake, one thin plate; this must be done with great caution, lest it should break; take this up, and, rubbing it over with oil or fat, lay it over the mould; then cut out a semicircular piece from the mass, of the same thickness with the former, and with this cover the back plane, or farther end of the mould, joining the edges of this plate to those of the former, closely and perfectly, by wetting them well with water.

Next, cut off from the cake another thin plate, to be the bottom of the Muffle; this may be either left loose for the Muffle to be placed on it occasionally, or the bottom edges of the already formed Muffle may be joined to it all round, by means of water, as the back was before joined to the arched part of the Muffle. But, whether it be intended that the bottom shall be thus fixed on, or left loose, it must be half an inch broader every way than the bottom of the Muffle, that this may stand the more firm and sure upon its basis.

When the Muffle is thus made, wet your hands, and rub it carefully all over, that the small and perhaps invisible cracks, and the chinks in the plates, may be closely joined, and the whole matter of it applied perfectly close to the surface of the mould.

When the Muffle has been some time exposed to the air, and is somewhat dried and hardened on the mould, cut out two or three hemispherical pieces on each side, to make the holes before described, at the basis and back; and then draw away the mould from within it; for if the Muffle is suffered to dry perfectly on the mould, it always cracks. When the whole is perfectly dry, let it be baked in a potter's kiln, or in the assayer's oven; but, without great care in the latter method, and lighting the fire at top first, it is apt to crack, so that the potter's kiln, where at hand, is much the better way of baking it. *Plate* XXXI. *fig.* 9.

If there be adapted to the formerly described convex mould another concave one nearly fitting it, only leaving room for the thickness of the Muffle between, and the clay be placed between them, and formed by this means into its exact shape, by a strong and every way equal pressure, this will make Muffles not only with much less trouble, but they will be much stronger, less apt to crack, and more capable of resisting the fire, than those made by the hand in the other way.

The only caution, necessary for the making them, is, that the clay be a little drier than when it is to be worked by the hand; that the sides, both of the inner or convex mould, and of the outer concave one, be thoroughly oiled or greased, and the pressure on the surface of the outer or concave mould be as strong and as equal as may be. There is no clay better for the making these Muffles than the Windsor loam, an earth well known among the chemists and glass-men, and always to be sold in London; and the rubbing the insides of the mould with black, in fine powder, very well supplies the place of greasing them, to prevent the matter from sticking to them.

These are the Muffles ordinarily used in assaying; but, when very large tests are to be covered, they use large spheroidal Muffles, made of cast iron, or sometimes of the same clay, and wrought in the same manner, only made upon proportionably larger moulds. The clay is usually, for these large ones only, laid in a lump on the top of the mould, and with wet hands spread all over it to the bottom, and by this means a Muffle is made with little trouble. *Cramer's Art of Assay.*

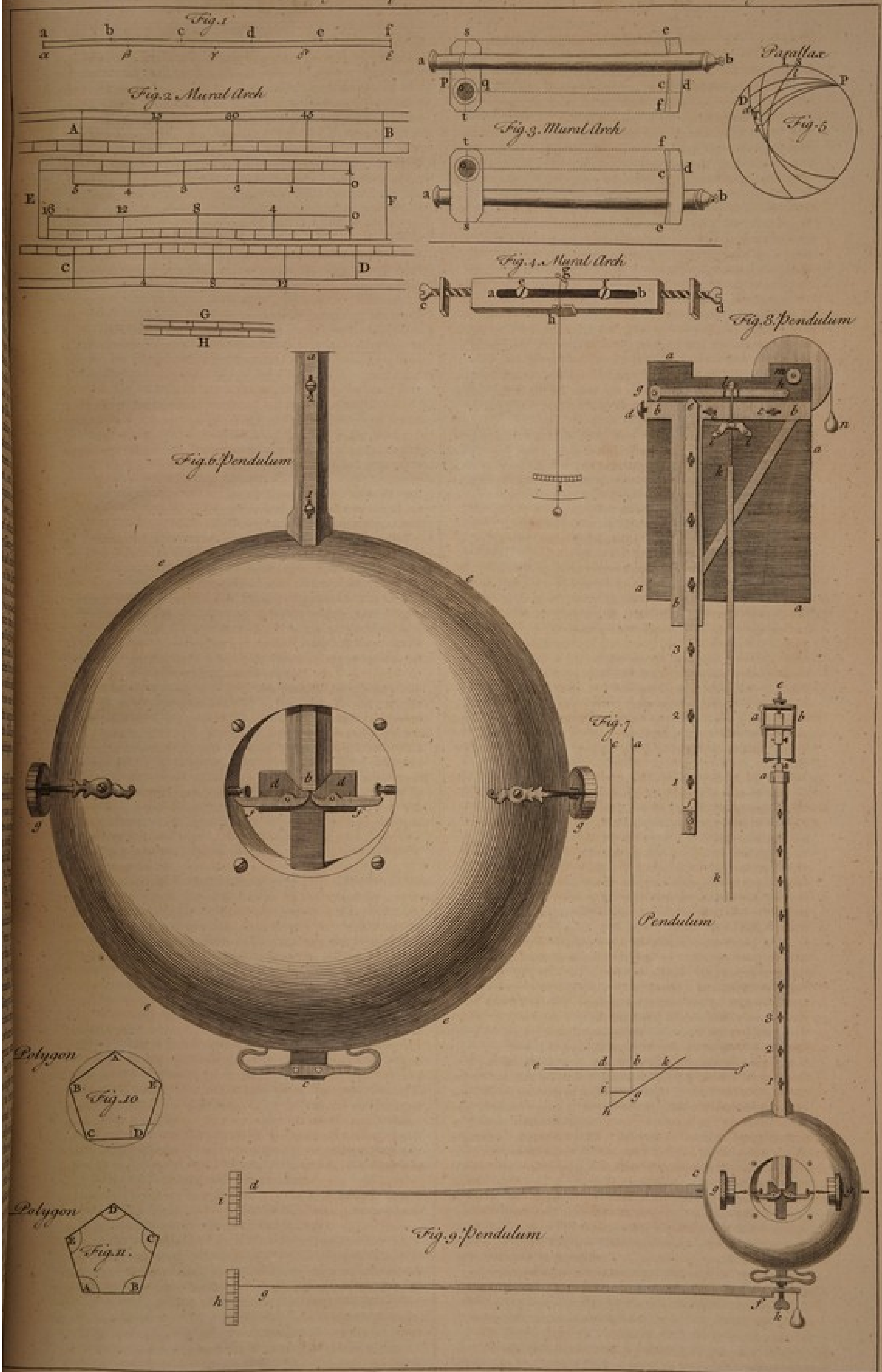
MU'MMY, among the gardeners, is the term used for a sort of waxy composition used in grafting. It is made of one pound of common black pitch, and a quarter of a pound of turpentine, put into an earthen pot with a cover fitted to it; this is to be set in the open air, and the cover being taken off, the matter is to be set on fire, and when it has burned a little while, it is to be quenched, by putting on the cover. This is to be repeated till the mixture is of a proper consistence, which is known by pouring a little of it on a pewter plate, on which, when it is enough, it will coagulate immediately. When it is of this consistence, it is to be poured into another pot, and a little yellow wax is to be added to it, and then, melting the whole together, is to be kept for use. *Miller's Gard. Dict.*

MU'RAL *Arch* (*Dict.*)—The following is a description of the Mural arch in the Royal Observatory at Greenwich.

Since the measure of time by pendulum-clocks, and consequently of the apparent diurnal motion of the heavens, has of late been brought to the utmost perfection, astronomers are agreed that a large quadrant, with a telescopic sight, fixed in the plane of the meridian to a free-stone wall, and thence called a Mural arch, is by far the most accurate, expeditious, and commodious instrument of all others for the chief purposes in astronomy. For, by observing the times by the clock of the appulses of any objects in the heavens to the plane of the meridian, we have their right ascensions; and, by their meridian altitudes observed at the same times, the latitude of the place being once determined, we have also their declinations, and, by consequence, their places in the heavens. Thus, by a good instrument of this kind, a catalogue of the places of the fixed stars may be made in less than a tenth part of the time, and with much greater certainty and exactness than by the best moveable quadrant or sextant, as might easily be shewn; not to mention the saving an immense labour in trigonometrical calculations. I think the noble Tycho Brahe was the first astronomer that used a Mural arch, for taking meridian altitudes; but he could not determine right ascensions so accurately as now, for want of the late improvements in pendulum-clocks. After him, Hevelius, Flamsteed, and others, made use of the like instruments, whose descriptions may be seen in their printed works; but I pass them all over, as being far inferior to this at Greenwich: the expence of which was defrayed by the bounty of his late Majesty King George the First; and the particular accuracy, whereby it excels all others, is owing to the extraordinary skill and contrivance of the late Mr. George Graham; who, besides the direction of the whole design, and inspection of the inferior workmen, was pleased to perform the divisions of the arch, and all the nicer parts of the work, with his own hands; and to him I am highly obliged for informing me in the methods he took to perform it. How far the tables of the moon's motion are corrected by an incredible number of observations made with this noble instrument by our royal astronomer Dr. Halley, and how near they are brought to sufficient exactness for finding the longitude at sea, are related under their proper articles in the Dictionary and Supplement At present I proceed to a description of the instrument.

Excepting the circular limb, the quadrant is chiefly composed of straight iron bars, joined together, as represented in *Plate* XXXI. *fig.* 10, 11. The breadth of every bar is two inches and nine-tenths, and its thickness, one-tenth and three-fourths, nearly. In speaking of the disposition of these bars, those, whose planes compose the plane of the quadrant, I shall call flat bars; and those, whose planes are perpendicular to the former, I shall call perpendicular bars. The lines in *fig.* 10, represent the disposition of all the flat bars, and those in *fig.* 11. represent the disposition of all the perpendicular bars, placed behind the flat ones; and are only to be seen on the back-side of the quadrant. The chief design, in this disposition of both sorts of bars, is to secure the figure and plane of the quadrant from any alterations that may be caused, either by the weight of the materials, or by their swelling or shrinking by the weather, or by the motion of the telescope about the center of the quadrant, or by any accident whatever: the whole fabric is farther strengthened by a great number of short iron plates or pieces of the like bars bent to a right-angle, and placed behind the quadrant in the angles made by the flat and perpendicular bars, and riveted to them both. Their number and places where they are riveted are represented in *fig.* 11. by the small parallelograms adjoining to the lines: and, to make more room for the rivets, the edge of each perpendicular bar does not divide the breadth of the flat bar in the middle, but in the ratio of 2 to 1; and the little plates are riveted on the broader side. The black thickenings of the lines at their intersections in the eleventh figure represent little plates of iron bent in right-angles, and riveted in the angles made by the intersections of the perpendicular bars. At the circumference of the quadrant there is also a perpendicular bar, bent circular, and fastened all along the middle of the breadth of the limb or flat arch of the quadrant, by a sufficient number of the little plates we have been speaking of.

The limb of the quadrant is composed of two quadrantal arches, of the same length, breadth, and thickness; one of iron, the other of brass laid over it. The breadth of each is three inches and four-tenths, and the common part of their breadths, where they lie doubled one over the other, and are riveted together, is two inches and two-tenths, the brass limb being remoter from the center than the iron one by an inch and two-tenths. The limb was reduced to a true plane, as follows: *a b d e*, *fig.* 12, represents the quadrant, placed very firm upon a level plane, with its brass limb lying upwards: and *l m* represents an axis made of iron, placed perpendicular to



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to the plane of the quadrant, and pointing to its center *e*; *m n* is an arm of iron, equal in length to the radius of the quadrant, and fixed at right angles to the bottom of the axis *l m*; to the end of this arm an iron ſcraper *n p* was fixed directly over the braſs limb; and, being firmly ſupported by the arm and its braces, was turned about the axis *l m*, till, by ſcraping the braſs, it reduced its ſurface to a perfect plane; care being taken that the edge of the ſcraper was exactly perpendicular to the axis of its motion.

There are two arches ſtruck upon the braſs limb; one with a radius of 8 feet, or more exactly of 96, 85 inches; and the other, with a radius of 95, 8 inches. This inner arch is divided into degrees, and 12th parts of a degree; and the outward arch into 96 equal parts, which are ſeverally ſubdivided into 16 equal parts. The beam of the compaſs which ſtruck theſe arches, was ſecured from bending by ſeveral braces faſtened to it; and, when an arch was ſtruck, 60 degrees of it were determined by placing one point of the compaſs at *a*, and by making a ſtroke at the other at *b*. This arch *a b* was biſected in *c* by drawing two ſmall arches upon the centers *a* and *b*, with ſuch a radius as to croſs the arch *a c b*, in two points as near together as poſſible without touching each other; then the ſmall interval between them was biſected at *c*, by eſtimation of the eye, aſſiſted by a magnifying glaſs. After this, the interval between the points *a* and *c*, or *c* and *b*, was taken with the beam compaſs, and was transferred from *b* to *d*, which determined the length of the quadrantal arch *a c b d*. Every one of the three arches being biſected in the ſame manner, the quadrant became divided into 6 equal parts, containing 15 degrees a-piece; and every one of theſe was divided into three equal parts as follows. To avoid making any falſe or ſuperfluous points in the quadrantal arch, with its radius unaltered, but upon any other center, there was ſtruck another faint arch, upon which the chord of 15 degrees, already found, was transferred from the quadrantal arch; and the third part of 15 degrees, being determined by trials upon the faint arch, was transferred back again upon the quadrantal arch; which then was divided into 18 equal parts, containing 5 degrees a-piece; and the 5th part of theſe was found by trials, as before, in dividing a ſeparate arch, drawn upon a new center for this purpoſe only. The ſubdiviſions of the degrees into 12 equal parts were made by biſections and triſections as before. Thus was the whole quadrant divided without any falſe or ſuperfluous points.

The outward quadrantal arch was divided into 96 equal parts, by no other method than that of biſection, till 60 degrees or two thirds of the quadrant became divided into 64, and the remaining third into 32, equal parts; which make 96 in the whole. And every one of theſe were alſo divided into 16 equal parts, by continual biſections. Theſe two ſorts of diviſions are a check upon each other, being in effect two different quadrants; and, the diviſions in one being reduced into the diviſions of the other, by a table made for that purpoſe, they are never found to differ above five or ſix ſeconds in any place of the limb: and, when they do, the preference ought to be given to the biſected diviſions, as being determined by a ſimple operation.

The diviſions hitherto mentioned being only very fine points in a fine arch *a b d*, ſcarce diſcernible by the naked eye; it was neceſſary, as uſual, to ſtrike lines perpendicular to the arch, through every one of them. But, ſince it is very difficult, and tedious too, to draw lines exactly through every point by the edge of a ruler, the following method was judged more accurate and expeditious. It was propoſed then to divide any other concentric arch, *f h t* (*fig.* 12.) by croſs ſtrokes, into a ſimilar parts to thoſe in the given arch *a e g e d b*. Take a ſmall beam compaſs, and, having once fixed its points at any convenient interval, upon the centers *e*, *g*, &c. being the given points of the divided arch, ſtrike the ſmall arches *f i*, *h k*, &c. cutting the undivided arch in *f*, *h*, &c. then will the intercepted arches, as *f h*, &c. be ſimilar to the arches *e g*, &c. that is, they will ſubtend the ſame angles at their common center *o*. For joining *e f*, *g h*, and alſo *o f*, *o h*, *o e*, *o g*, the triangles *e o f*, *g o h*, will be ſimilar and equal to each other; every ſide in one being reſpectively equal to every ſide in the other. Therefore by taking away the common angle *e o h*, from the equal angles, *e o f*, *g o h*, the angles *e o g*, *f o h*, that remain, will alſo be equal.

If the triangles *e f o*, *g h o*, &c. be right-angled at *f* and *h*; the dividing ſtroke *f i*, *h k*, &c. will cut the quadrantal arch *f h t*, at right angles alſo, at *f* and *h*, &c.

In the thirteenth figure *a b c d* repreſents a ſquare piece of braſs (with ſeveral ſteady pins in it) ſkrewed to the flat bars, at the center of the quadrant, the ſkrew-holes being ſo large as not to touch the ſkrews; and *k l m n* repreſents a thick circular plate of braſs, with a hollow pipe *f g* fixed perpendicular to the middle of it; this plate was turned exactly circular in a lathe, upon a braſs arbor *o i*, turned tapering and a little hollow in the middle, ſo as to fit the cavity of the pipe *f g*, and to bear againſt it chiefly at both ends. When the hollow pipe *f g* is put through the hole (exactly fit for it) in the middle of the ſquare *a b c d*, the braſs circle *k l m n* is fixed to the plane of the ſquare *a b c d*, with ſkrews and ſteady pins. The point *o*, in the pole of the arbor *o i*, is not only the center of the circular neck *k l m n*, about which the teleſcope muſt turn, but alſo the very center upon which the divided arches were ſtruck upon the limb of the quadrant. The end of the teleſcope that holds the object glaſs, lies croſs one end of an oblong plate of braſs *s t*, at right angles to its ſides, and is held to the plate, by a brace that may be widened and ſtreightened by a ſkrew. Towards the other end of the plate *s t*, there is a round hole, lined with a ſteel collar *p q r*, to be put over the braſs neck *k l m n*, and to turn round upon it. The ſection of this collar, made perpendicular to the plane of it, is repreſented at *z*; the broader of the two rings being under the plate *s t*, and contiguous to the ſquare plate *a b c d*. Over this neck and collar there is fixed a braſs ſpring repreſented at *v*, and ſkrewed to the neck *k l m n*, to keep the collar from ſlipping from it; and over all theſe is ſkrewed a cap repreſented at *x*, to cover the center work, and to keep off the duſt; which is alſo prevented from coming between the plates *a b c d* and *s t*, to the neck and collar, by means of a braſs hoop ſurrounding the broad rim or baſe of the collar *p r*, and ſkrewed to the back-ſide of the plate *s t*; which hoop is received into a circular grove 1, 2, 3, 4, made in the ſquare plate *a b c d*, without touching any part of it.

The chief excellency of the preſent center work conſiſts in preſerving the place of the central point of the quadrantal arch in the pole of the arbor *o i*. For, whenever the neck plate *k l m n* ſhall be worn ſo much as to cauſe an unſteady motion of the teleſcope about the center of the quadrant, a new neck plate and pipe may be caſt, well hammered and turned upon the poles of the ſame arbor *o i*, to fit the hole and collar; and then it will carry the teleſcope about the center of the limb, as exactly as when all was new.

The fourteenth figure gives a view of the quadrant fixed to the eaſtern ſide of a free-ſtone wall, built for that purpoſe in the plane of the meridian. The whole weight of the quadrant is ſupported by two ſtrong iron pins fixed to the wall (as hereafter deſcribed) and projecting through two holes made in two ſquare plates of iron riveted to the quadrant at *a* and *b*, in the tenth figure. The pin at *a*, which bears the greateſt part of the weight, is immoveably fixed in the wall; but the pin at *b* is moveable up or down by a ſtrong ſkrew, in order to bring one ſide of the quadrant to an horizontal, and the other to a vertical poſition.

The contrivance for the motion of the pin *b* is this: in the fifteenth figure *l m n o* repreſents an oblong plate of iron, let into the free-ſtone wall, and faſtened to it by bolts of iron, which paſs through the wall and through another plate let into the oppoſite ſide of it; the bottom of each plate being bent ſquare and bedded in the ſtone. And *e*, *f*, *g*, *h*, are the heads of 4 iron ſkrews, whoſe ſhanks going through 4 long ſlits, made in another iron plate, repreſented by the ſmaller parallellogram, are ſkrewed into the fixed plate *l m n o*. The moveable pin *b c* is fixed to this leſſer plate, which is raiſed, or depreſſed, by means of a long ſkrew *k i*, working againſt the bottom of the pin *b c* at *d*; being turned round in a ſtrong concave ſkrew, fixed to the bottom of the larger plate at *p q*. The key for turning the long ſkrew *k i* is a ſector of a circular plate repreſented at *r s t*; the ſquare hole in its center *t* being put upon the ſhank *k*. The radius of the key is juſt ſo big as to move in the ſpace between the wall and the bars of the quadrant; and a chiſſel *s* is inſerted into the teeth upon the arch of the key, to give power to the hand that moves it.

The weight of the quadrant being thus ſupported by the pins *a*, *b*, (*fig.* 14.) the plane of it is fixed to the wall and adjuſted in any poſition, by much the ſame number of hold-faſts as there are little ſquares round about the quadrant in the ſeventh figure. Each hold-faſt conſiſts of two ſeparate parts; one of them is fixed to the wall, and the other to the quadrant.

In *fig.* 15. *a b* repreſents the wall ſeen end-ways, and *c*, *c*, ſeveral hold-faſts fixed into it. Between the chaps of each hold-faſt, repreſented at *d*, *e*, there paſſes one end of a ſmall plate of braſs, whoſe plane is parallel to the plane of the quadrant, the other end being bent to a right angle and riveted to the perpendicular bars of the quadrant; and each plate is pinched by two oppoſite ſkrews *r*, *s*, that work through the chaps *d*, *e*, which are made pretty wide for adjuſting the poſition of the plane of the quadrant. The intent of the ſkrews in the chaps of the hold-faſt was alſo that, if the wall or quadrant ſhould ſwell or ſhrink, ſo as to alter their proportions, the braſs plates might ſlide without diſtending the inſtrument. The hold-faſts are not faſtened in the wall with lead, which is apt to yield, but with a compoſition made of ſtone-duſt, pitch, and brimſtone, or roſin; ſuch as ſtone-cutters uſe for cementing broken ſtones.

The continuance of the exactneſs of the quadrant depends, in a great meaſure, upon a free and eaſy motion of the teleſcope round the center of it; which will be obtained by counterpoiſing the weight of the teleſcope, and by eaſing the center of the quadrant of as much of thoſe weights as poſſible. For this purpoſe in *fig.* 14. *a b* repreſents an iron axis laid croſs the top of the wall; having two braſs plates fixed perpendicular to the ends of it, with notches or holes cut in them for this axis to turn in, which points to the center of the quadrant at right angles to its plane. To that end of this axis next the quadrant, an iron arm *c d* is fixed, having

having two brass plates *c e*, *d f*, almost perpendicular to it; to them are riveted two slender slips of fir, whose other ends meet at *g*, near the eye glass; being held together in a brass cap or socket. Through a small plate fixed to one side of a collar, embracing this lower end of the telescope, there passes a screw pin at *g* parallel to the telescope; which pin, being skrewed into the cap at the end of the slips, holds up the telescope tight against the center work. The slips are strengthened by 5 or 6 cross braces of the same wood, as represented in the figure. To the other end of the axis *a b* another arm *h i* is fixed parallel to the telescope, and in a contrary direction, carrying a weight *i* to counterpoise the weight of the telescope, and make it rest in any position. And, for the greater ease and freedom of its motion, two small brass rollers are fixed to each side of it, at *k* and *l*, which are held tight to the plane of the limb by a plate springing against its backside, which plate has also a roller at each end of it.

When the telescope is pretty nearly directed to an object whose altitude is to be taken, a plate *m n*, which is carried by the telescope along the limb, and lies cross it, may be fixed to it by a screw, not here represented. Then by twisting the head *o* of a long skrew *o p*, which is parallel to the limb, and which works through a female skrew, annexed to the plate *m n*, and whose neck at *p* turns round in a collar annexed to the telescope; a very gradual motion is given to the telescope for bringing the cross hairs exactly to cover the object.

To avoid the trouble of subdividing the quadrantal arch into smaller parts, the telescope carries a small brass plate, which slides upon the limb, and is called a nonius, from the name of its inventor. To understand the reason and use of this plate, it is convenient to premise the following theorem: If a line *a f*, (*plate* XXXIII. *fig.* 1.) be divided into any number of equal parts, *a b*, *b c*, *c d*, *d e*; and an equal line *α ε* be divided into other equal parts, *α β*, *β γ*, *γ δ*, *δ ε*, whose number is one less than the number of parts in *a f*; I say that *α β*, *α γ*, *α δ*, *α ε*, will exceed *a b*, *a c*, *a d*, *a e*, respectively, by one, two, three, or four parts of *a b*; whose denominator is the number of parts in *a e*, or in *α ε*. For let the lines *a f*, *α ε*, be coincident at both ends, and, since any equimultiples of two quantities *a b*, *α β*, are in the same ratio as the quantities themselves, it will be as *a b* : *α β* :: *a c* : *α γ* :: *a d* : *α δ* :: *a e* : *α ε*, or *a f*, and disjointly as *a b* : *b β* :: *a c* : *c γ* :: *a d* : *d δ* :: *a e* : *e ε*, or *e f*. The consequents, *b β*, *c γ*, *d δ*, *e ε*, are therefore in the same arithmetical progression as the antecedents *a b*, *a c*, *a d*, *a e*; and the first of the consequents *b β* is the same part of its antecedent *a b*, as the last consequent *e f* is of its antecedent *a e*, or as *α β* is of *α ε*, the number of parts in *a e* and *α ε* being equal by the first supposition: and it is manifest that any two equal and coincident arches of a circle have the same property.

The upper arch A B (*fig.* 2.) represents a degree divided into 12 equal parts, containing 5 minutes in each; and the end arch C D a 96th part of the quadrant, divided into 16 equal parts; and E F the nonius, or subdividing plate fixed to the telescope, and sliding with it in the space between the arches A B, C D. The degrees and minutes, and also those 96 parts of the quadrant, are numbered from the left hand to the right, beginning from the intersections of the vertical radius, in order to measure the distances of objects from the zenith; but the parts upon the nonius are numbered the contrary way, beginning from the line *o o*, called the index; which is drawn perpendicular to the sides of the nonius, at the end next the right-hand; and the line of sight through the telescope is so adjusted by the cross hairs in its focus, as to be parallel to the index *o o* produced through the center of the quadrant. In the scheme the nonius E F is so situated, that the upper end of the index *o o* is not opposite to any one stroke upon the adjoining arch, but to some unknown point of a 12th part of a degree, intercepted between 50 and 55 minutes. To find the overplus above 50, I observe by looking back from the index, that a stroke of the nonius, which lies between the numbers 3 and 4, is directly opposite to a stroke upon the adjoining arch, which shews that 3 minutes and a half are to be added to the 50 minutes aforesaid.

For since a degree is divided into 12 equal parts, containing 5 minutes in each, and since the length of the nonius is made equal to 11 of those parts, and is divided into 10 equal parts; it appears by the theorem, in counting back again from the coincident strokes to the index, that the first part of the nonius exceeds the first upon the limb by $\frac{1}{10}$ of this latter part, that is, by $\frac{1}{10}$ of 5 minutes, which is half a minute; and by consequence that 7 parts of the nonius, from the coincident strokes to the index, exceed the 7 corresponding parts of the arch, by 7 half minutes, or 3′ 30″.

When it happens that no one stroke upon the limb is directly opposite to a stroke upon the nonius, then look for that single part of the limb, which is so opposed to a single part upon the nonius, as to be exceeded by it at both ends, as represented in the parts G and H. Then, if by estimation of the eye, this part of the nonius exceeds the part of the limb equally at each end, allow 15″ more than if they had coincided at their ends next the index; and, as according as the excess next the index is judged to be one third, one half, double or treble of the other excess, allow 7½″, 10″, 20″, 22½″, respectively. For since the sum of the two excesses is always the same, and answers to 30″, (as is plain, when one of them is diminished to nothing;) the number of seconds to be added will always be to 30″, as the excess next the index is to the sum of the two excesses.

The lower arch of the nonius is divided into 16 equal parts, and is equal in length to 17 equal parts upon the opposite arch, and consequently will determine 16 parts of any one of them, by the theorem and method abovementioned. In the present scheme the opposite strokes of the nonius and the lower arch are supposed to coincide at the end off the 9th part upon the nonius, which shews that the index cuts off 9 sixteenths of the opposite part of the arch. And so the length of the arch, from the beginning of a 96th part of the quadrant, is thus denoted, 15, 9, the lower pointer being past the 15th stroke.

This way of subdividing by a nonius is preferable to the common method of drawing diagonals; both because the trouble of drawing so many diagonals is intirely avoided, and also because they cannot be drawn so exactly by the edge of a ruler, as the lines upon the nonius; and lastly because the intersection of these diagonals with the index or fiducial edge (as they call it) by reason of their great obliquity to each other, cannot be determined so exactly by the eye, as the coincidence of two strokes in the nonius and the arch, which stand directly opposite to one another.

The object glass being firmly and immutably fixed in the telescope, the nonius plate *c d* (*fig.* 3.) and the collar plate *s t*, were both skrewed fast to the telescope, when taken off from the quadrant; and the line of sight was brought to be parallel to the line *c o*, drawn through *o*, the center of the collar *p q*, to *c* the beginning of the divisions on the nonius, in this manner: the lines *s o t* and *e c f* being drawn upon these plates both perpendicular to *o c*, any distances *o t* and *c f* were taken equal to each other on one side of *o c*; and any other distances *o s* and *c e* (long enough to go beyond the telescope) were also taken equal to each other on the opposite side of *o c*. Through the four points *e*, *s*, *t*, *f*, the ends of the two plates were filled exactly parallel to *o c*. Then placing the points *t*, *f*, upon two points *m*, *n*, of an horizontal line drawn upon a firm plane, a point of a remote object covered by the cross hairs was marked. And the telescope being turned half round its axis *a b*, and the opposite points *e*, *s*, of the plates being placed upon the same points *m*, *n*, another point of a remote object now covered by the cross hairs was also marked; and, the telescope remaining fixed, the cross hairs were moved in its focus, till, after several repetitions of this practice, the same point of the object was covered by them in both positions of the telescope; and then the line of sight was exactly parallel to the line *o c*, supposing the object was very remote. But, because smaller marks upon a nearer object are better discerned, the hairs were so adjusted till in each position of the telescope they covered a separate mark, the interval of the marks being taken equal to the difference of the heights of the axis of the telescope, above the fixed line *m n*, as near as could be measured.

The object glass being well centered (*see the article* CENTERING) the line of sight was first of all made parallel to the plane of the quadrant, as near as it need be, by the measures of the brass work annexed to the telescope; and then the plane described by the line of sight, turned about the center of the quadrant, was brought into the plane of the meridian, by observing whether the fixed stars passed over the cross hairs at the same instant of time, as they passed over a meridian telescope, placed so near the quadrant, that the two observers could hear each other calling out at the times of the transits. And, by the coincidence of these observations upon stars at various altitudes, it appeared that the plane of the quadrant was wrought very true. For it is certain that the meridian plane described by the meridian telescope, as turning upon a transverse axis, must be truer than that described by the quadrantal telescope, as guided by the rollers upon the limb.

When the quadrant was thus reduced into the plane of the meridian by the hold-fast above described, that radius of it, which terminates 90 degrees, was placed exactly vertical (by the movement abovementioned) with a plumb line of very fine silver wire; playing exactly over the middle of the central point *a* (*plate* XXXI. *fig.* 13, 14.) (in the pole of the arbor *a i*) and also over the stroke at 90 degrees upon the limb below. This position of the quadrant being once found, another plumb line was suspended by the side of the quadrant, quite clear of the center work, so as to play exactly over the middle of a fine point made in the limb below, in order to examine afterwards whether the quadrant has kept its place. For this purpose, an oblong piece of brass *a b*, (*plate* XXXIII. *fig.* 4.) laid flat upon the square plate at the center of the quadrant, was gradually moved to the right or left, by two skrews *c*, *d*, working against the ends of it: a slit *a k* being cut lengthways through the plate to slide along two other skrew-pins *e*, *f*, fixed in the back plate. The wire of the plumbet was hung by a loop upon a pin *g*, and lay in a very fine angular nick, filed in the edges of a little plate *h*, which

projected

projected a little farther than the loop, for the wire to bear upon it. This plate *b*, and the pin *g*, were both fixed to the oblong plate *a b*; by whose gradual motions above described, the wire *b i* was brought to play exactly over the middle of the hole *i* in the limb; and then the plate *a b* was pressed to the quadrant by the screws *e, f*. *Smith's Optics*.

MU'REX, in natural history, the name of a genus of shell-fish, the characters of which are these:

It is an univalve shell, bent with sharp spines and tubercles, with a rough clavicle exerted near the summit in most species, but in some depressed. The mouth is always expanded, and sometimes as liquor, sometimes not; the lip is sometimes digitated, sometimes elated or folded, or jagged; and the columella is sometimes rough, sometimes smooth. See *Plate* XXXVI. *fig.* 3.

The antients were furnished with their finest purple dye, from a fish of the Murex kind, and therefore expressed the purple colour by the word Murex. We find, in Virgil,

——Tyrio ardebat murice lana.

Plumier tells us, that, in America, the Murex is called pisseur, from its readily ejecting the liquor, which gives the purple colour, when it is taken from the rocks. And Fabius Columna distinguishes the Murex from the purpura and buccinum, but in a very injudicious manner. He says the purpura affords the fine purple colour: the Murex is covered with spines and turbercles, and the buccinum is known by its smooth and long wreath. But he should have known that the affording the purple dye is common to the Murex and purpura, and even to some of the buccinum kind; and that there are Murexes with very few spines or tubercles, and buccina which are not smooth. The knowledge of the insufficiency of these characters would have engaged him in seeking others more essential; and a person of his great abilities would then perhaps have prevented half the confusion that has happened since in the world, on occasion of errors of this kind propagated from his writings, and those of two or three others of his time. See the article PURPLE.

MU'SA, *the plantain-tree*, in botany, a genus of plants, whose characters are:

The root sends forth shoots, while the stalk, after producing its fruit, decays. The stalk is like a reed, without branches, but running into very large leaves, which are first involved, as in the cannacorus, and afterwards expanded in the form of a circle at the top of the stalk. The flowers and fruit are disposed in clusters, and inclosed in sheaths, as in the palma, or date-tree; the flower is polypetalous, anomalous, and grows on the apex of the ovary. The ovary is like that of a cucumber, soft, tricapsular, esculent, full of seeds, and furnished with a long tube, which has a globular apex.

Musa is the Arabic name for this plant, which by Pliny, as we suppose, is called pala, from the word bala, which is the name by which it is known to the Malabarians at this day. Though all botanists reckon it among trees, it hardly deserves the name of a shrub, much less of a tree, since it has an annual stalk. By Oviedus, and others, it is called platanus; whence comes our English name, the plantain tree; unless we should rather think it was so called from its resemblance to plantain, in its ribbed and fibrous leaves.

The fruit is esteemed delicious food; and, they say, was never known to create any disorder, though eaten ever so freely. Linschooten says, that it has a sweet taste like flour and butter mixed together, and, therefore, may supply the place of bread and milk-meals, with a simple kind of diet, by which the human body may be supported without any other food.

As to its virtues, Alpinus speaks thus: the fruit is of a soft, viscid, fat, and sweet substance, extremely grateful to those who use to eat it, and very nourishing, but burthensome to the stomach, difficult of digestion, and generates a thick and viscid juice, which causes obstructions of the viscera, and especially of the liver; it is, however, beneficial in a cough, and an asthma proceeding from heat. The Egyptians use the decoction with good success in a cough, excited by a distillation of hot humours, and for inflammations of the pleura, lungs, and kidneys, and for a dysury; it is, also, said to stimulate to venery, eaten raw or boiled.

The authors of the Hortus Malabaricus tell us, that the root bruised, and taken in milk, cures the vertigo; that the water of it, mixed with sugar, is drank with good success, for a burning heat of the kidneys, and for pains excited by the urine; and relieves those whose bodies have been infected with quick-silver. The pith of the tree, or the whitish medullary substance, which bears the fruit, being bruised, and taken inwardly with honey, is good for the affections of the eyes, as is also butter, in which slices of the fruit have been fried.

It grows in all parts of the East and West-Indies, and also in Africa. The ficus Indica of Linschooten I take to be only a variety, not a species, of the Musa; for it appears to be the same with that described by the authors of the Hortus Malabaricus, both from the synonyma, and the place where it grows; for the Malabarians, he says, call it palan, and those of Bengal, quelli, which are names much like the bala of the Hortus Malabaricus and Keli. Among the species, also, or varieties, I find one, both in the Hortus Malabaricus, and in Linschooten, called cadalin.

The leaves, which are an ell long, and three spans broad, or, according to Lerius, six feet long and two broad, equal in dimensions to those of the lapathum aquaticum, supply the Indians at Goa, with much useful furniture for their houses, and the Turks make use of them instead of paper; a shoot is often loaded with a hundred plantains, clustered together like grapes; and the branches, from whence they hang, often grow to such a bigness, that, when lopped off with the fruit, they can hardly be carried upon a pole between two porters. The plant bears fruit all the year, and supplies the Indians with provision every day. *Raii, Hist. Plant.*

MUS'CLE (*Dict.*)—The learned Dr. Morton, in his Inquiry into the cause of voluntary muscular motion, proposes and solves the following problem:

A Muscle being given in its natural state, in a living animal body, it is asked how, or by what mechanical means, that Muscle contracts, and is again relaxed, at the command of the will?

Every Muscle of an animal body is observed to be an instrument composed of fibres or lesser muscles, which are joined together, every-where, by one common membrane or substance, called, from its appearance, cellular. This substance, when it arrives at the surface of the muscle, becomes uniform, and makes one intire sheath for the whole Muscle, or bundle of fibres, and renders it distinct from others.

The constituent fibres in many Muscles are observed to be partly fleshy, and partly tendinous; the one changing, or being continued, into the other, for the conveniency of insertion and motion. But the observation is universal, that the fleshy fibres alone contract in muscular motion, and that this contraction is always wave-like, or in alternate curls, from one extremity to the other of a given fibre.

We constantly observe, in every Muscle, numerous arteries, veins, and nerves. These are generally distributed together, or in the same course, by means of the connecting cellular substance, into every point of the fleshy fibres. Injections, and the knife of the anatomist, have followed them a great way, and reason completes the distribution, since you can nowhere wound the flesh of a Muscle, but it shall bleed, and witness a sense of pain.

Therefore there is a circulation of blood, throughout the whole fleshy substance of a Muscle, and further the Muscle feels in every part.

In a living animal, if you tie the artery and vein, which principally belong to a given Muscle, that Muscle is disabled from acting, at the command of the will. Steno, a Danish anatomist of the last century, performed this experiment upon the descending aorta, and thereby took away the use of all the lower limbs *(vide Bgererum, p.* 296) at once, and restored them at pleasure. Late anatomists have it tried upon lesser vessels, with the same constant success. (*Vide Albini Histor. Muscul. p.* 19.)

In a living animal, if you tie the nerve that supplies a given Muscle, that Muscle is disabled from acting at the command of the will. This experiment is distinctly mentioned by Galen in his treatise on the Muscles, and is approved by the trials of later anatomists. (*Alb. p.* 19.)

From these two experiments it is clear, and generally agreed upon, that, in order to the performance of voluntary muscular motion, besides the particular structure, there is required an absolute freedom of the blood-vessels and the nerves.

Muscular motion is observed to be voluntary and involuntary. Of the first kind are all the Muscles of an animal body; of the latter, the only complete instance is the heart. The first seems more complex than the latter, since, besides the motion, it implies an additional act of the will. Effects, that are less compounded, ought naturally to precede effects that are more; these receiving light from the former, where both are homogeneous. For this reason, I have placed here two lemma's relating to automatic, or involuntary motion.

Lemma I. The heart, in its natural state, in a living animal body, being given, its contraction proceeds solely from, or is mechanically caused by, the warm blood, flowing into and filling its fleshy substance in every part.

If this be denied, let the body of an animal be taken quickly after death, and let a warm mild fluid of any kind be injected gently into the heart, so as to fill it. When this is done, we shall see the heart quicken and contract, as in the life of the animal. This experiment was first distinctly mentioned by Peyer, a Switzer, (see a small treatise of his, printed anno 1682, at Amsterdam, and intitled, Miraculum anatomicum in cordibus suscitatis) and is now known to every anatomist. But, if this effect is thus constantly produced soon after death, how much more, when the animal is alive? And if, by the introduction of any common fluid, with the bare addition of a warmth cognisable by our senses, how much more by the introduction of the living blood, an inimitable and wonderful fluid, and the immediate subject of the vital warmth?

If therefore it is granted, that we ought not to admit more causes of natural things than are real (and present for the occasion) and sufficient for explaining the appearances, and we must grant a rule, whose use is so obvious in the Newtonian, which

which is the philosophy of nature; we shall, I say, also grant, that the contraction of the heart, in its natural state, in a living animal body, proceeds solely from, or is mechanically caused by, the warm blood, flowing into, and filling, its fleshy substance in every part. Which was to be proved.

Corollary. The subsequent relaxation admits no difficulty: for, if the blood is the immediate mechanical cause of the contraction, when the blood is removed, the effect ceases.

Lemma II. A Muscle of voluntary motion, in its natural state, in a living animal body, being given, it will contract, by the introduction of a warm mild fluid, into its fleshy substance in every part.

If this be denied, let the body of an animal be taken quickly after death, and the crural artery be pierced, and a warm mild fluid be injected into it: we shall then see the Muscles, to which the artery belongs, quicken and contract, as if the living animal moved them. This experiment was known to Mr. Cowper, and is confirmed by Albinus (see *Hist. Musc.*) But, if this effect is constantly produced soon after death, how much more when the animal is alive?

Therefore a Muscle of voluntary motion, in its natural state, in a living animal body, will contract, by the introduction of a warm mild fluid, into its fleshy substance, in every part: which was to be proved.

But here it may be objected, with some appearance of reason, that there is a warm fluid, the living blood, in every part of the fleshy substance of all the Muscles, during the life of the animals; and yet it is a fact, that no Muscle of voluntary motion contracts, but at the command of the will, morbid cases excepted. This objection comes close to the original question, and, however reasonable it may seem, will quickly vanish before some common observations concerning the objects of sense in general, and their manner of operating upon the different organs, so far as it universally agrees.

We must first beg leave to make an easy postulatum, viz. that the nerves are the immediate instruments of sensation, though they are differently organised for the different senses.

It is a certain fact, that, in the several senses, the proper objects being supposed present, the sensation is intirely relative; or, in other words, that the presence of a powerful object always obliterates the present sensation of a weak object; and that the constant habitual presence of any one object, in the same given degree, produces no sensation at all.

Thus we observe, that the light of the sun extinguishes the light of the stars; a stronger taste covers a weaker; the sound of a drum drowns an ordinary human voice; itching is banished by smart and pain; a weak scent, by one that is strong; cold, or a less degree of warmth, by heat, or a greater degree of warmth; and, universally, our daily experience demonstrates to us, that every organ of sense, made familiar to a given degree of its object, affords no manner of sensation of the object in the given degree.

Thus it fares with the warm blood, which has constantly flowed through the whole minute substance of every Muscle of voluntary motion in an animal body, from the time of their formation, or unfolding in the womb. And it is highly probable, that the quickening of the child in a woman is no other than the completion of that state, in which the blood begins freely to flow through, and to affect the instruments of voluntary motion; and, till it becomes familiar to them, produces those frequent shudders, or general muscular contractions in the whole frame of the fœtus, which for a fortnight or more are the constant signs, that it has now obtained an animal life.

And here arises an apparent difference, though it will be found the greatest uniformity, between the Muscles of voluntary and those of involuntary motion; and namely the heart; which, being appointed to protrude the vital fluids during the life of an animal, has a short alternate remission of its contracting cause; and is thereby rendered capable of admitting a constant and necessary supply of labour and stimulus together, without any force, or contradiction, to the natural order of the whole.

It follows undeniably from what has been said, that if we can prove, that a given Muscle of voluntary motion does really feel an increase of the familiar warmth of its contained blood, or an equivalent, to rise and fall instantly at the command of the will, we shall then duly account for the subsequent motion. Or, more particularly, if we can prove, that the will has a direct power of heightening, increasing, and rendering more acute, the sense of any nerve, distributed to a given Muscle, the same familiar positive degree of warmth in the contained blood will, to this more acute sense, appear to be proportionably heightened and increased, and the Muscle (by Lemma II.) will instantly contract, and continue in that state during the action of the will; allowing for a small feebleness, that will gradually arise from the gradual exclusion of the contracting cause, and from the blunting of this more acute, and, as it were, new sensation; which yet, as we see, may be proportionably compensated, by the will, for a time, even to the destruction of the nerve, the blood-vessels, and indeed the whole organ, by a mortification, which has been known to succeed a long muscular contraction.

We know from daily experience, that the will hath a power over all the organs of sense, to heighten, or render acute, and again to relax them, their proper objects, in a reasonable degree, being supposed present. And the same experience teaches us, that this power is greater or less, according to the more or less frequent use and exercise that is made of it. For it is obvious to every one, that any sound man is able to feel, to taste, to smell, to hear, and to see, more accurately when he pleases. And it is equally obvious and certain, that any one of these five senses, being exercised, with an uncommon degree of attention and industry, either from choice, or from necessity, arrives at an uncommon degree of accuracy and perfection. Indeed it is intirely from use and exercise, that a child learns to distinguish at all between the several objects of a given sense, or, which are the same, between the several degrees, or modes, of its proper object.

All these particulars being demonstrably true of every sense, that we can directly examine, the inference is very fair to the single sense (Lem. II.) that we cannot directly examine; and, in truth, the induction, in this case, is but one step below a complete experimental demonstration.

It appears therefore, that the will hath a direct power of heightening, increasing, and rendering more acute, the sense or feeling of a given nerve, dispersed throughout the whole contracting substance of a given muscle, with all its gradations of accuracy and perfection, by repeated use and exercise.

Solution, or answer to the problem. — It follows, therefore, that, a muscle being given, in its natural state, in a living animal body, the blood, which is present in every part of its contracting substance, and which, in effect, to the sense of the given Muscle (which is occasionally rendered more acute) puts on an increased heat, and again lays it down at the command of the will, is the immediate mechanical cause, by which the Muscle does instantly contract, and is again relaxed, at the command of the will.

Therefore, a full solution is given to the question proposed: which was to be done.

Corollary 1. Hence it appears, that muscular voluntary motion is performed merely as a sensation extremely acute, and under the nicest management of the will: which explains its velocity in a great measure.

Corol. 2. Hence it appears, that the Galenic distinction of nerves, into nerves of sensation and nerves of motion, which greatly puzzles physiology, has no real foundation in an animal body.

A short scholium. The solution, that is given to the problem, may be assumed in a philosophical synthesis, and the various appearances may thence be announced, as well in natural as in morbid cases; which again may be subjected to a strict examination. Some trial has been made of this, and a surprising agreement found: but the detail must be omitted. In the course of this inquiry, every foreign disquisition is industriously avoided, and such at this time would be a further question, why blood, in a certain, or apparent, degree of heat, contracts a muscular fibre?

The business of natural philosophy is, to observe and to note down facts that are constant; and, singling out those that are similar, to collect their proper universal, by a fair and regular induction; and to acquiesce in this, till a new collection of constant and similar facts affords an higher universal, and leads nearer the first cause. *Philosophical Transactions*, Vol. 47.

MUSCLE, in natural history; see the article MYTULUS.

MUSCLES *of vegetables*. — The Muscles of animal bodies have been the subject of numerous dissertations; but those in vegetables have been less regarded. Mr. Tournefort, however, has plainly proved, that many of the vessels of plants become in the drying fibres capable of tension; that in many plants there are great numbers of these fibres which have all the same direction, and always act all together, and can only shorten or contract themselves in one particular direction; wherefore the parts composedof these fibres are very properly compared to the Muscles of animals. By the word Muscle we understand a part composed of these fibres so determinately arranged, that by their contraction they can only move the part in some certain and determinate manner; and, in this which seems the received sense of the word, there are many instances in which it may be used to parts of plants, with the strictest justice.

All the pods of the leguminous plants, as pease, &c. are composed each of two valves, more or less convex on the outside; these are placed evenly upon one another, and fastened together by means of a great number of very fine vessels; they are fastened much more firmly together at the back, than at the fore-rim; and the large vessels which carry nourishment both to the valves and seeds, are lodged there, and send many ramifications both to one and the other of the valves of the pod.

Each valve is formed of two ranges of fibres; the exterior arrangement is formed into a sort of net-work, and the threads which compose it issue from the back of the pod, and are propagated longitudinally, and somewhat obliquely through the surface of the valves, and finally terminate at the edge or fore rim of the pod, after they have entered into the fleshy part, with

with the net-like plexus of vessels, of which they make frequent anastomoses.

The anterior plan or arrangement of fibres crosses the exterior, in the same manner as the interior intercostal Muscles in the human body cross the exterior; and these form the inner membrane of the pod: these fibres arise, like the others, from the back of the pod, and run obliquely to the edge. A necessary consequence of this structure is, that the arrangement of exterior fibres must become dry before the others, as must also the fleshy substance in which they lie; and the consequence of this is, that they must contract and draw the edge of the valve to which they belong at once upward and outward, and endeavour to separate it from the edge of the other valve, drawing with it the anterior arrangement of fibres; this therefore pulls open the pod, and the air which is very hot at the season when the seeds of these plants ripen, insinuating itself into the interstices of the internal arrangement of fibres which are exposed to it by the opening of the pod, soon acts upon them, and they begin to contract in their turn. These fibres were once the vessels which conveyed the nutritive juices to the pods and seeds; but when that use is no longer necessary for them, and when no more juices ascend, after the seeds have arrived at their destined size, they then shrink up, and no more perform the office of vessels, but become mere fibres. As these do not all dry up, and suffer this change together, but necessarily it happens, first to those which are situated at the greatest distance from the pedicle, and, consequently, those are the first of the anterior fibres which act by shortening themselves; this, therefore, begins at the extremity of the pod, and is continued up to the pedicle; and the effect is that, as these interior fibres are stronger and more numerous than the exterior, which are at this time as far shortened as they are capable of, they now draw backwards and inwards the lips of the edge of the pod towards the back. When the warm air acts upon these fibres to dry and contract them, it draws nearly equally at both their ends; and, therefore, if the two arrangements of fibres were regularly transverse, each valve of the pod must be drawn by this action into a sort of tube, or pipe; but as they are placed in an oblique direction, and parallel to one another, the natural effect of their contraction must be the drawing the valve into a spiral form, which we see is exactly the case. The lines which form the rim of each valve can make no resistance to this contraction, because they are so dried up by the warm air, and want of juices, that they may be crumbled to powder between the fingers, and easily break in any part with the smallest force. This class of plants gives numerous instances of this sort of Muscles in vegetables, and they are more obvious than most others, being not only common in the hedges, but cultivated in gardens for the uses of the kitchen, &c. The ingenious author of the system gives many other instances in other plants. *Mem. Acad. Par.* 1693.

MU'SHROOM (*Dict.*)— Mr. Miller says, that the true eatable Mushroom is distinguished from the poisonous and unpleasant kinds by these marks. When young, it appears of a roundish form like a button, the stalk as well as the button being white, and the fleshy part very white when broken, the gills within being livid. As they grow larger, they expand their head by degrees into a flat form, and the gills underneath at first are of a pale flesh colour, but, as they stand long, become blackish.

In order to propagate Mushrooms, the meadows and pastures should be searched for them in August and September; and, wherever they are found, the ground should be opened all about the roots, where there will be found abundance of small white knobs. These are to be taken up with lumps of earth about them. Then some new horse-dung is to be procured, and, the litter being shaken out, the dung must be laid together on a heap to ferment for eight days. A trench must then be dug, and the dung laid in it a foot thick, and covered over six or eight inches thick with light rich earth; and into this, on each side, should be put in the knobs of Mushroom spawn, as it is called, at six inches distance. After this, another layer of dung is to be made upon this earth, to six or eight inches thickness, or more, but observing to draw in the sides, so as not to cover the knobs of Mushrooms above half an inch; then another layer of earth is to be laid on this, and some more knobs of the Mushroom spawn placed on this at the sides, as in the former; then put on a third layer of dung, drawing it in still narrower, that it may not cover the second plantation; and cover this with another layer of earth, drawing this up into a ridge at top, and planting more of the Mushroom spawn in this, but still laying it in sideways as before. When all is thus finished, the whole bed is to be covered half a foot thick with dry litter, to prevent the earth from drying too fast. When the bed has been made a fortnight, it should be carefully looked over, drawing away the litter with the hands, to see whether any young Mushrooms appear; and they must be gathered as they grow large; for, if suffered to remain, they will rot upon the bed, and destroy all the young spawn that is about them. And, when they begin to produce, the bed must be searched every other day, all the year round, and every day in August and September, which is the time of their principal increase, to gather such as are fit for use. The manner of gathering them is, to pull them gently out of the ground, so that no part of their stalk may be left behind; but, if any part of the spawn is pulled up with the stalk, that must be carefully returned into the bed. As the cold or wet weather comes on, the covering of dry litter over the whole bed must be increased. A bed, thus managed, will remain good many months, and produce vast abundance of Mushrooms; and the spawn may be at times taken out from it to supply other new beds. At whatever time of the year this is taken up, it should be carefully laid up in a dry place till the month of July following, which is the proper time for planting it in new beds. *Miller's Gard. Dict.*

MUSQUETEE'RS, *mousquetaires*, in France, are troopers who fight sometimes on foot, sometimes on horse-back; they are gentlemen of good families, and are divided into two troops, the one called the grey Musqueteers, because of the colour of their horses; the other the black Musqueteers, for the same reason.

MU'STARD, *sinapi*, in botany. See SINAPI.

The common Mustard is cultivated in many places, both in gardens and fields, for its seeds. It is propagated by sowing the seeds in spring upon an open place, which has been well dug or plowed. When the young plants are come up, they must be cleared of weeds, and hoed up to about eight or ten inches asunder. They will then grow strong, and, when the seeds ripen, the whole plant is cut down, and the seeds thrashed out. But, besides this, there is another kind of Mustard, commonly known by the name of the white or garden Mustard, which is sown for a sallad herb in spring: the seeds of this are to be sown very thick in drills on a warm border, or a moderate hot-bed; they will be fit to cut for sallading in three weeks after the sowing. *Miller's Gard. Dict.*

MUTA'TIONES, among the Romans, postages, or places where the public couriers were supplied with fresh horses.

MUTEFE'RRIRA, a body of horse kept up in Egypt, in the service of the grand Signior; these, with the chaouses, were originally the guards of the Sultan of Egypt. This is a body of the greatest dignity, as is expressed by the word, which signifies a chosen people. *Pocock's Egypt.*

MYIA'GRUS *Deus*, in the heathen mythology, a name given sometimes to Jupiter, and sometimes to Hercules, on occasion of their being sacrificed to, for the driving away the vast numbers of flies which infested the sacrifices on certain public occasions. The word is generally spelt Myagrus; but this must be an error, as this word does not express the fly-destroyer, but the mouse-destroyer; and we have it sufficiently testified by the ancients, that flies were the only creatures against whom this deity was invoked.

MY'STRUM, among the ancients, a liquid measure, which was the fourth part of the cyathus.

MY'RTUS, *the myrtle*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the rosaceous kind, and is composed of several petals, arranged in a circular form. The cup finally becomes a fruit or berry of the shape of an olive, coronated at the end, divided into three cells, and containing kidney-shaped seeds.

There are several species of this plant preserved in our gardens; they are all easily propagated from cuttings. The best season for this is July, and the straightest and youngest vigorous shoots are to be chosen. These should be cut off about eight inches long, and the leaves of the lower part stripped off to about two inches high, and that part of the stalk twisted which is to be placed in the ground; they are to be planted in pots of light rich earth, at about two inches distance from each other, observing to close the earth very well about them, and give them a gentle watering. They are then to be removed into a moderate hot-bed, and shaded and watered once in two or three days, till they have taken root. In about a month's time they will be rooted, and will begin to shoot, and must then be inured, by degrees, to the air; and in August they should be removed into the open air, but placed in a warm situation, and sheltered from the winds; they should stand here till October, and then be removed into a green-house, where they should be placed so as to have as much air as possible. In the March following, they should be removed into separate pots of rich earth, and in May set out to the open air in a warm and well defended place. They will require in the summer frequent waterings, and the dead leaves should be carefully picked off. As they advance in growth, they are to be shifted at times into pots of a larger size; and this should be done either in April or in August; and, towards the end of October, they should always be removed into the green-house. *Miller's Gard. Dict.*

MY'TULUS, *the muscle*, in natural history, the name of a genus of shell-fish, the characters of which are these: it is a bivalve shell, of an oblong form, ending in a point, and having its two extremities equal. It is sometimes smooth, sometimes rough. In some species flat; in others elate, and in some has the beak elate. The tellina and pinna marina, of each of which there are several species, are properly of this genus.

Muscles are well known to have a power of fastening themselves very firmly either to stones, or to one another's shells, in a very strong and firm manner; but the method of doing this was not well understood, till the observations of the accurate Mr. Reaumur explained it.

Every one who opens and examines a common muscle will find,

find, that in the middle of the fish there is placed a little blackish or brownish body resembling a tongue; this in a large muscle is near half an inch long, and a little more than a sixth of an inch in breadth, and is narrower at the origin than at the extremity; from the root of this tongue, or that part of it which is fastened to the body of the fish, there are produced a great number of threads, which, when fixed to any solid substance, hold the muscle firmly in its place: these threads are usually from an inch to two inches in length, and in thickness, from that of a hair to that of a hog's bristle. They issue out of the shell in that part where it naturally opens, and fix themselves to any thing that lies in their way, to stones, to fragments of shells, or, which is the most common case, to the shells of other muscles; whence it happens that there are usually such large parcels of muscles found together. These threads are expanded on every side, and are usually very numerous; an hundred and fifty have been found issuing from one shell; they serve the office of so many cables, and each pulling in its proper direction, they keep the muscle fixed against any force that can be offered from whatever part it comes. The filaments are well known to all who eat muscles, who ever carefully separate them under the name of the beard; and Mr. Reaumur has found, that while the animal is living in the sea, if they are all torn away by any accident, the creature has a power of substituting others in their room: he found that, if a quantity of muscles were detached from one another and put into a vessel of any kind, and in that plunged into the sea, they in a little time there fastened themselves both to the sides of the vessel and to one another's shells; the extremity of each thread seemed in this case to serve in the manner of a hand to seize upon any thing it would fix to, and the other part which was slenderer and smaller to do the office of an arm in conducting it.

To know the manner of the muscle's performing this operation, this diligent observer put some muscles into a vessel in his chamber, and covered them with sea water; he here saw that they soon began to open their shells; and each put forth that little body before described by its resemblance to a tongue, and at the root of which these threads grow; they extended and shortened this part several times, and thrust it out every way, often giving it not less than two inches in length, and trying before, behind, and on every side with it, what were the proper places to fix their threads at: at the end of these trials they let it remain fixed for some time on the spot which they chose for that purpose, and then, drawing it back into the shell with great quickness, it was easy to see that they were then fastened by one of these threads to the spot where it had before touched, and remained fixed for a few minutes; and, in repeating this workmanship, the threads are increased in number one at every time, and, being fixed at different places, they sustain the fish at rest against any common force.

The several threads were found to be very different from one another, the new formed ones being ever whiter, more glossy, and more transparent than the others; and it appeared, on a close examination, that it was not, as might have been most naturally supposed, the office of the tongue to convey the old threads one by one to the new places where they were now to be fixed, but that these in reality were now become useless; and that every thread we see now formed, is a new one made at this time; and, in fine, that nature has given to some sea fishes, as well as to many land insects, a power of spinning these threads for their necessary uses. And that muscles and the like fish are, under water, what caterpillars and spiders are at land. To be well assured of this, however, Mr. Reaumur cut off all the beard or old threads of a muscle as close as he could, without injuring the part, and the proof of the opinion of their spinning new ones at pleasure was now brought to this easy trial, whether these muscles so deprived of their old ones could fix themselves as soon as others which were possessed of theirs, and could throw out their threads to as considerable distances. The experiment proved the truth of the conjecture, for those whose beards or old threads were cut off, fixed themselves as soon as those in which they were left, and spread their threads to as great distance every way.

When the mechanism of this manufacture was thus far understood, it became a natural desire to enquire into the nature of the part by which it was performed: this has hitherto been mentioned under the name of the tongue, from its shape; but it is truly the arm of the fish, and, whenever it happens to be loosened from its company, or fixed in a wrong place, it serves the animal to drag its whole body, shell, and all along, and perform its several motions. It fixes itself to some solid body, and then, strongly contracting its length, the whole fish must necessarily follow it, and be pulled towards the place where it is fixed. This is an use, however, that this part is so rarely put to, that it is not properly to be esteemed a leg or an arm, for this; but, according to its more frequent employment, may much better be denominated the organ by which the threads are spun.

Though this body is flat in the manner of a tongue, for the greater part of its length, it is however rounded or cylindric about the base or insertion, and it is much smaller there than in any other part; there are several muscular ligaments fastened to it about the root or base, which hold it firmly against the middle of the back of the shell; of those ligaments there are four, which are particularly observable, and which serve to move the body in any direction. There runs all along this body a slit or crack, which pierces very deeply into its substance, and divides it as it were into two longitudinal sections; this is properly a canal, and along this is thrown the liquor which serves to form the threads; and it is in this canal or slit that these threads are moulded into their form. Externally, this appears only a small crack or slit, because the two fleshy sections of the parts almost meet and cover it; but it is rounded and deep within, and is surrounded with circular fibres. This canal is carried regularly on from the tip of the tongue, as it is called, to its base, where it becomes cylindric; the cylinder in this part being no other than a close tube or pipe, in which this open canal terminates. The cylindric tube contains a round oblong body, of the nature of the threads, except that it is much longer; and from the extremity of this all the threads are produced, this serving as a great cable to which all the other little cordages, dispersed towards different parts, are fixed. The tube or pipe in which this large thread is lodged, seems the reservoir of the liquor of which the other threads are formed; all its internal surface being furnished with glands for its secretion. *Mem. Acad. Par.* 1711.

N.

NA'BLUM, in Hebrew, nebel, an inftrument of mufic among the Hebrews. The feventy and the vulgate tranflate it fometimes by Nablum, and at other times by pfalterion, or lyra, or even cithara.

The Nablum was a ftringed inftrument, very near of the form of a Δ, which was played upon by both hands, and with a kind of bow. See Calmet's Differtation concerning the inftruments of mufic of the ancient Hebrews, prefixed to his fecond volume of his Commentary upon the Pfalms. *Calmet's Dict. Bibl.*

NAILS, in building (*Dict.*) — The feveral kinds of Nails are very numerous.— As back and bottom Nails, made with flat fhanks to hold faft, and not open the wood.— Clamp Nails, thofe proper to faften the clamps in buildings, &c. Clafp Nails, whofe heads, clafping and fticking into the wood, render the work fmooth, fo as to admit a plane over it: they are of two kinds, viz. long, proper for fine buildings of fir, &c. and ftrong, fit for oak, and other hard wood. — Clench Nails, thofe ufed by boat, barge, &c. builders; proper for boarded buildings, that are to be taken down, becaufe they will drive without fplitting, and draw without breaking.—Clout Nails, thofe ordinarily ufed for nailing on of clouts to axle-trees. — Deck Nails, thofe proper for faftening of decks in fhips, doubling of fhipping, and floors laid with planks.— Dog Nails, proper for faftening of hinges to doors, &c.—Flat points, are of two kinds, viz. longs, much ufed in fhipping, and proper where there is occafion to draw and hold faft, yet no neceffity of clenching. —Jobent Nails, thofe commonly ufed to nail thin plates of iron to wood. — Lead Nails, ufed to nail lead, leather, and canvas to hard wood. — Port Nails, commonly ufed to nail hinges to the ports of fhips.—Pound Nails, are four-fquare in the fhank; much ufed in Norfolk, Suffolk, and Effex, though fcarce elfewhere, except for paling. — Ribbing Nails, ufed to faften the ribbing, to keep the ribs of fhips in their place in building. — Rofe Nails, are drawn four-fquare in the fhank, and commonly in a round tool.—Rother Nails, chiefly ufed to faften rother-irons to fhips. — Round-head Nails, proper to faften on hinges, or other ufes, where a neat head is required. —Scupper Nails, much ufed to faften leather and canvas to wood.—Sharp Nails, much ufed, efpecially in the Weft-Indies, made with fharp points, and flat fhanks. — Sheathing Nails, ufed to faften fheathing-boards to fhips: the rule for their length, is to have them full three times as long as the board is thick. — Square Nails, of the fame fhape as fharp Nails; chiefly ufed for hard woods. —To which may be added tacks; the fmalleft, ferving to faften paper to wood; middling, for wool-cards and oars; larger, for upholfterers and pumps.

In lathing, 500 Nails are ordinarily allowed to a bundle of five-feet laths.—In flooring, 200, i. e. 240, are allowed for a fquare of flooring.

Nails are faid to be toughened, when too brittle, by heating them in a fire-fhovel, and putting fome tallow or greafe among them.

NA'RDUS, an Egyptian mufical inftrument, made like two plates of brafs, and of all fizes, from two inches to a foot in diameter; they hold them by ftrings faftened to their middles, and ftrike them together fo as to beat time. They are ufed in the Coptic churches, and the Mahometan proceffions. *Pocock's Egypt.*

NA'MUR-*marble*, a name given by our artificers to a fpecies of black marble, which is very hard, and capable of a good polifh, but has no variegations of any other colour. It is common in Italy, France, and Germany, and is the fpecies called the Lucullean marble by the Romans. *Hill's Hift. of Foffils.*

NA'PLES-*yellow*, the common name in the colour fhops of London, and among our painters, for the ocre called giallalino. See GIALLALINO.

NA'PUS, in natural hiftory, a name given to a fpecies of voluta, approaching to the nature of the famous admiral fhell, and more commonly known by the name of the falfe admiral, or baftard admiral.

NA'RES, *the noftrils.* — Among the various diforders incident to the noftrils, none are of greater importance than hæmorrhages, which arife from a copious conveyance of blood to the head; in confequence of which, the fmall arteries in the tunica pituitaria are preternaturally filled, and their extremities, being too much diftended, are at laft opened, and difcharge their contained blood.

Such is the fabric of the noftrils, that they are eafily fubject to eruptions of blood; for, in their internal parts, the blood veffels, divided, into highly minute parcels, are copioufly diftributed through that coat which covers the vomer, the offa fpongiofa, and the ethmoidal bones, and are, at the fame time, externally covered with a very flender membrane. Hence, when the blood is copioufly conveyed to the noftrils, it is with difficulty returned through their fmall veins, but eafily ftops in the minute arteries, diftends their extremities, burfts them, and produces an hæmorrhage. It, alfo, fometimes happens, that this blood elevates the extremities of thefe minute arteries into fmall aneurifms, which afterwards prove the occafion of a copious dropping of blood.

That, in hæmorrhages of the nofe, there is a copious and violent afflux of the blood and humours to the head and noftrils, is fufficiently obvious from the violent motion of the heart and arteries, the ftrong pulfe, efpecially in the neck and temples, the fenfe of the weight in the head, the rednefs of the face, the fwelling of the face and whole head, a drynefs and heat of the internal noftrils.

The principal caufe of this congeftion is the unequal progrefs of the blood, efpecially through the ducts of the internal parts, whether conveying arteries, or returning veins: by which means it happens, that the blood is too fcantily conveyed to fome parts, and too copioufly to others, where it breaks the veffels, and difcharges itfelf.

Whatever, therefore, contributes to produce fuch an unequal motion of the blood, in a proportionable degree, excites, hæmorrhages. Now, all hæmorrhages, and more efpecially that from the noftrils, are generally accompanied or preceded by a ftricture of the fkin and external parts, a detumefcence of the veffels, an horripilation, a refrigeration, coftivenefs, a retention of the flatulences, rumblings in the abdomen, laffitudes of the limbs, and pains of the belly. Hence, it is obvious, that the caufe of this unequal circulation of the blood is a certain ftricture of the fibres and moft minute veffels, efpecially in the extremities; for when, by means of this fpafmodic ftricture, the veffels, efpecially fuch as return the blood, lymph, or any other humours, as, alfo, the excretory ducts of the fkin, through which, according to the laws of nature, the ferous part of the blood ought to be eliminated, are compreffed, the blood regurgitates to the large internal veffels, by which means a greater and quicker contraction of the heart and arteries is produced, and the blood itfelf more powerfully conveyed to the weak parts, efpecially where its congeftion and difpofition lay a foundation for hæmorrhages, and other diforders.

The cure. — When a violent hæmorrhage threatens danger, and too much impairs the ftrength, the affiftance of the phyfician becomes neceffary. The principal intentions of cure are, after difcovering the genuine caufes, to remove them by proper meafures.

When, therefore, a redundance of the blood and humours, together with their expanfive force and turgefcence, hinders their free and equal paffage through the minute veffels, and produces enormous hæmorrhages, which principally happens to young perfons in the fpring, after violent exercife, or the ufe of fuch fpirituous things as throw the blood into preternatural commotions, befides venefection, which diverts the courfe of the blood from the head, preparations of nitre are, above all other things, efficacious for checking the orgafm of the humours, and relaxing the fpafmodic ftricture of the parts. Thus Paracelfus and Hildanus, in all hæmorrhages, ufed purified nitre with great fuccefs: and Riverius, in his Praxis and Obfervations, greatly extols this medicine for ftopping all hæmorrhages. Of fimilar, though fomewhat inferior efficacy, are acids, whether of the mild kind, obtained from the vegetable kingdom, fuch as the juices of lemons and barberries, the water and juice of wood forrel; or of the more ftrong and powerful kind, obtained from the mineral kingdom, fuch as the phlegm, or fpirit of vitriol diluted, or the tincture of rofes, and flowers of the daify, prepared with water of wood forrel and fpirit of vitriol, and drank with fpring water; the efficacy of which is, alfo, very great in checking the inteftine and elaftic force of the blood.

But, becaufe, in thefe dangerous hæmorrhages, there is generally a certain fpafmodic ftricture of the nervous parts, which is foon fucceeded by an unequal motion of the fluids, befides the preparation of nitre already recommended, we muft have recourfe to gentle anodynes, fuch as preparations of poppies, the water, for inftance, the extract, or the fyrup of wild pop-

pies,

pies, the fyrup of white poppies, and emulfions prepared of the four cold feeds, the feeds of white poppies, and the waters of the flowers of the Egyptian thorn, elder, the lime-tree, meadow-fweet, the common chamomile, and primrofes.

In fymptomatic hæmorrhages, and thofe accompanying exanthematous diforders, meafles, fmall-pox, fcorbutic purple fever, and petechiæ, it is not expedient to exhibit any other medicines, than fuch as, by moderating the intenfe heat, may gently promote perfpiration. For this purpofe,

Take, of the water of chamomile flowers, four ounces; diftilled vinegar, one ounce; of crabs eyes and diafcordium, each one drachm; of nitre, one fcruple; and, of the fyrup of wild poppies, a fufficient quantity; make into a mixture: of which, let the patient take two fpoonfuls every two hours, and keep himfelf moderately warm in bed; and, if the diforder is malignant, a powder, compofed of diaphoretic antimony, depurated nitre, and camphire, is to be exhibited.

Apolypus in the noftrils. — The internal parts of the nofe, as other parts of the body, are often fubject to flefhy excrefcences, called polypufes, though they feldom have more feet or roots than one. This diforder is, by fome, called farcoma; and, by others, hyperfarcoma. But thefe caruncles are of various fizes and confiftences; fometimes foft, and capable of elongation, when drawn; fometimes, though very feldom, hard, and, as it were, rigid; fometimes white, and fometimes of a pale red colour: at firft, they are, for the moft part, fmall; but, in procefs of time, they increafe, fome flower, fome fafter; fo that I have feen fome, in three or four days, hang out of the nofe: though they are generally free from pain, yet, fometimes, they are attended with pain and hardnefs, become livid, and incline to a cancer. Some are confined to the nofe, others hang down to the lips; fome fill, greatly expand, and enormoufly dilate the nofe; fome appear as one caruncle, with an equal furface; others like a clufter. Some, again, grow backwards, through the aperture, by which the breath defcends from the nofe to the fauces; and are vifible behind the uvula, and then occafion not only a great difficulty of fpeaking and fwallowing, but likewife of breathing, and almoft ftrangle the patient. Sometimes, they expand themfelves both through the nofe, and fauces, though both noftrils are feldom obftructed by them. The polypus, as we have already obferved, has generally but one root, and that flender; fometimes, indeed, it is thick, and furnifhed with large veins; however, as it appears now and then with many roots, the ancients feem to have derived the name from thence. This excrefcence often proceeds from the inferior or middle part of the nofe, and, fometimes, from the pofterior and upper part, and even from the finufes of the cranium and os ethmoides; but it is, in general, formed in and from the pituitary membrane, and, particularly, from an obftruction of one or more of its glands; which, being gradually increafed by noxious humours, fills the nofe, or hangs down below it; and, confequently, it feems nothing more, than a morbid expanfion and elongation of the glands, and that fpongy membrane. But, in my opinion, the farcoma nafi is of a very different nature; for a polypus is generally foft, and hangs like a fig, by a flender or thick root, as by a ftalk; whilft the farcoma is fometimes foft, fometimes hard, and fixed upon a large, firm, and immoveable bafis.

From the preceding account of the nature and difpofition of a polypus, we cannot be at a lofs for the diagnoftic and caufes of it. And, firft, a white, reddifh, foft polypus, without pain, is of a mild nature: on the contrary, that is dangerous, which is painful, hard, livid, or black, or difcharges a pus, or acrid and fœtid humours; for fuch tend to a cancer. The caufes are often latent and internal, though it is fometimes produced by external violence. By a latent caufe, we mean an infpiffation of corrupt and glutinous blood in the fmall veffels and glands of the pituitary membrane; for that foft and fpongy membrane may be eafily diftended by a congeftion of noxious humours. The external caufes may be violent falls or blows, too frequent an introduction of the finger into the nofe, an irritation of the pituitary membrane, and too ftrong fternutatory powders. Laftly, the manifeft internal caufes are frequent catarrhs, a defluxion, ulcers of the nofe, or too profufe hæmorrhages. A farcoma proceeds from much the fame caufes; and both are fometimes attended with a fpina ventofa, and caries of the bones of the nofe: inftances of which have fometimes occurred to me.

The cure is eafier, and the danger is lefs, when the polypus is of a favourable kind; as when it is not feated very far in the nofe, when it has a flender root, and hangs loofely, or when it is capable of elongation, and laftly, when the patient is of a good habit: on the contrary, when it is inacceffible, has a thick root, and is incapable of elongation, the removal is more difficult, efpecially if the patient is afflicted with a fcorbutic or venereal diforder at the fame time. The danger of the cure is likewife increafed, by the difficulty of fuppreffing the profufe hæmorrhage, which attends the extirpation or evulfion of a polypus, efpecially if it is fixed on a deep and large bafis. If it tends to a cancer, that is, if it becomes hard, livid, and painful, which is very common, it is fafeft to palliate the diforder by lenitives; for it is dangerous to irritate this, as other cancers. In the like manner, when the polypus is inacceffible, or arifes from a fpina ventofa, as I have feen a large one, it is hardly poffible, after a removal, to prevent its fprouting again, unlefs the fpina ventofa be firft cured. Further, if it extends to the fauces, fpeech, deglutition, and even refpiration, are fometimes hindered, as Celfus obferves, and the cure is extremely difficult. Laftly, when it fills both noftrils, the cure is very difficult, becaufe, generally, it proceeds from fome worfe diforder. Thefe obfervations are equally true, with regard to a farcoma, efpecially if the bones of the nofe are afflicted with a fpina ventofa.

The cure of a polypus cannot be reafonably expected from any thing but a total removal, which may be accomplifhed by cauftic medicines, or proper inftruments; and this, either all at once, or at different times. The firft may be applied when the excrefcence is foft and fmall, or fhort and large, with this caution, that the cauftic may not corrode the found parts of the nofe. Among the mild corrofive medicines proper for this purpofe, the moft celebrated is powder of favin, burnt alum, red precipitate, white vitriol, and hermodactyl root, either alone or mixed with honey, or fome digeftive ointment, laid on the polypus with a tent; or, if it is feated externally, without a tent, by which, flight ones are fometimes removed. Poterius fays, the powder of heliotropium, or fcorpionwort, introduced into the nofe with cotton, twice a day, will remove a polypus very readily, and with little pain; but we are left in the dark as to the particular fpecies of heliotropium, or fcorpionwort, proper for this ufe. Rulandus recommends a mercurial water, with which he affirms he has cured a polypus, by wetting it every morning and evening. To this clafs alfo belong unguentum Ægyptiacum, the unguentum fufcum of Wurtzen, the oil of tartar per deliquium, the effence of favin, and particularly an effence prepared of fublimate mercury and fpirit of wine, with which Wedelius informs us he cured a cetain polypus. According to Nuck, in Operat. Chirurg. Cap. de Polypo, great fervice is done in polypufes by lime-water, efpecially if, after mixing a grain or two of fublimate mercury with it, it is made into a phagedenic water. The fame end is, alfo, anfwered by precipitate mercury, upon which fome fpirit of wine has been deflagrated; by water faturated with fal ammoniac; and, if we may believe Mufitanus, by the acid fpirit of fal ammoniac. If thefe prove ineffectual, then ftronger remedies muft be applied, fuch as the lapis infernalis, fublimate mercury, the arcanum corallinum, and others of a like nature; but thefe fhould be mixed with honey, or bafilicon, and laid on with great care, that they may not corrode the found parts; and, if the polypus lies concealed in the nofe, a fmall portion of the medicine fhould be introduced by a quill, or fome other tube. Of equal virtue, in removing a mild polypus, are the fpirit or oil of vitriol, aqua fortis, and butter of antimony, when applied with a feather or pledget: whatever is ordered muft, at every dreffing, be removed by fciffars, or a pair of forceps. Thibaut followed this method: he laid two plaifters between the polypus and found part, for the prefervation of the latter; when he carefully applied to the former butter of antimony, with a tent or pledget; and next, to prevent too deep a penetration, he wafhed it off with warm water. By this method Garengeot affirms that he performed the operation in a moment; but this author does not tell us, whether he applied the cauftic more than once, though, I am perfuaded, it muft be frequently repeated; for a fingle application will hardly produce the defired effect.

But, in general, inftruments are preferable to cauftics; and this operation may be performed by various methods. Before the operation the patient fhould be prepared, and then feated oppofite to the light, an affiftant reclining his head backwards, and fecuring it with his hands. When this is done, the furgeon may chufe either of the following methods, which feems to him beft fuited to the circumftances of the cafe. We fhall begin firft with the method defcribed by Celfus: 'The polypus, fays he, fhould be feparated from the bone by a fharp inftrument, in the fhape of a fpatula, taking care not to wound the cartilage beneath it, which would be difficult to cure. After the feparation it muft be extracted with a fteel hook; then, to fupprefs the hæmorrhage, the cavities of the nofe fhould be filled with a pledget, or fome folded lint moiftened with a proper medicine: after the fuppreffion of the hæmorrhage, the ulcer muft be deterged with lint. When it is cleanfed, the cicatrix muft be formed by injecting proper medicines, till the cure is completed.' The method propofed by Ægineta is not very different from this. He orders the patient to be placed againft the light, the furgeon to open and dilate his nofe with his left hand, whilft, with his right, he extirpates the polypus circularly, with a fharp fpatula, made for that purpofe, in the fhape of a myrtle leaf; applying the edge of the inftrument to that part where it adheres to the nofe, then turning the inftrument, to extract it with the handle. To induce a cicatrix, he ufes leaden pipes. We difcover the whole polypus to be removed, firft by the fight, then by the voice, and freedom of refpiration through the nofe. Albucafis advifes to extract the polypus out of the nofe with a fteel hook or forceps, and then remove as much as can be reached by incifion; and this to be repeated till the whole is taken off. If the excrefcence cannot be totally removed, Paulus and Albucafis order a pretty thick piece of linen, like a cord, full of knots, at a finger's breadth, or lefs, from each other,

ther, to be tied to the remains, and tranfmitted from the nofe to the palate; then to be drawn out of the mouth, which may be done with a forceps. The two ends of this cord, one hanging from the nofe, the other from the mouth, fhould be drawn backwards and forwards, till the remains of the polypus are deftroyed: for which purpofe the cord fhould be dipped in unguentum Ægyptiacum. Fabricius ab Aquapendente rejects thefe methods, and endeavours to eftablifh one of his own, which is performed by a fharp forceps. Thefe he gently introduces into the nofe, to the root of the polypus; and, with them, both extirpates and extracts the whole, or as much as he can reach. This he juftly prefers to all others, and fays, if the whole cannot be removed at once, it may be repeated, till nothing remains. If the wound bleeds plentifully, which is not very common, he orders the hæmorrhage to be fuppreffed with red wine alone, or mixed with alum. Sennertus and Glandorp followed this practice, and I myfelf have known it to fucceed often.

NASTU'RTIUM, *garden-creffes*, in botany, a genus of plants, whofe characters are:

It refembles, in all refpects, the thlafpi, or mithridate muftard, with a lefs foliaceous margin, and multifid leaves, to diftinguifh it.

This crefs has a fmall white ftringy root, from which fpring many finely laciniated winged leaves, three or four inches long, of a pleafant, hot, biting tafte; the ftalks about a foot high, fmooth, and round; the leaves which grow on them are lefs cut in, and have larger and broader laciniæ. The flowers are fmall, of four white leaves, fet together in tufts on the top of the ftalk, and are fucceeded by little round feed-veffels, flat on one fide, containing red round feed. It is fown every year in gardens, and flowers in May. The leaves and feed are ufed.

The leaves are much ufed in fpring as a fallad herb, their warming quality being ufeful to correct the coldnefs of others mixed with them; they are good for the fcurvy and dropfy, as alfo for the palfy and lethargy. A cataplafm of the leaves, with hog's lard, cures fcald heads. The feed, likewife, helps the fcurvy and dropfy, and fwelling of the fpleen, and opens obftructions in the female fex. *Miller's Bott. Off.*

Another fpecies of the Nafturtium is, water-creffes, which are frequently eaten in the fpring as a fallad. The whole plant is of a very acrid tafte, and is a powerful attenuant and refolvent. It is recommended as a kind of fpecific in the fcurvy, and is eaten in great quantities by many with that intent. It is good againft all obftructions of the vifcera, and, confequently, in jaundices, and other chronic difeafes. It is alfo a powerful diuretic and promoter of the menfes. People have pretended to preferve the virtues of this plant in waters, fyrups, and conferves; but the beft way of taking it is, either to eat it as a fallad, or to drink its expreffed juice fingly, or mixed with that of the other antifcorbutic plants, as brooklime, &c. which is often done.

NA'TRON or NATRUM (*Dict.*)— There have been various opinions about the natrum of the ancients, and fome have been of opinion, that our falt-petre or nitre was the fame fubftance; but this has always been difcountenanced by the more judicious. Dr. Hill, who had met with a falt from the fame part of the world whence the ancients had their natrum, and which anfwered to all the characters they have given of it, defines it to be a falt fometimes pure, and fometimes fouled with earth, fermenting with acids, and forming flat oblong cryftallifations, with four unequal fides, and two truncated ends. Thefe were the characters of that falt, and thefe perfectly agree with the accounts we have of nitre in the earlieft ages, though we have none fufficiently accurate, to take them all in. And, whatever may have been the opinion of fome, that the natrum or nitre of the Hebrews was very early loft, a careful examination of the ancients proves the contrary, and that this very falt was the nitre both of the Greeks and Romans, the nitrum and aphronitrum of Diofcorides, and the nitrum of Pliny. It is found in broad and flat maffes of various fizes, but ufually fmall, and, when broken, are found to be compofed of fafciculi or bundles of fmall fibres, of an oblong and flatted figure, and laid but loofely together.

It is naturally of a dufky white, but is fometimes found of a brown colour, and fometimes of a fine deep red. This is its pureft ftate; but, befides this, it is frequently found in form of powder mixed with dirt, and rifing in little hillocks on the furface of the ground. It is of an acrimonious pungent tafte, and is more like the alkaline falts produced by burning vegetables, than any of the native falts. It diffolves in a very fmall quantity of water, and ferments violently with aqua-fortis, or any other weaker acid menftruum.

It is found in great plenty in Iindy, a province in the inner part of Afia, and in many other parts of the Eaft, and might be had in any quantities. Perhaps it would be worth confidering as a branch of commerce, as it would fupply the place of pot-afhes in the making foap and glafs, as the fame author has tried.

The characters recorded of the nitre of the ancients are, 1. That it would ferment with vinegar; and, 2. That it had an abfterfive quality. Thefe we have from the fcriptures: and the reft were, that it was of an acid tafte; that is was found native in the eaftern parts of the world; that it ferved in the place of foap, and that, with fand, it would make glafs. All thefe properties this falt has; and it may be added, that no other native falt has them. *Hill's Hift. Foff.*

NA'TURAL, in mufic, is applied to a fong, the notes whereof move eafily and gracefully, giving the performer as little trouble as poffible; as when it is not carried too high, or funk too low, whereby the voice or inftrument is in no wife forced or ftrained. *Vid. Broff. Muf. Dict. in voc.*

NAVE *of a wheel*, is that fhort thick piece in the center of the wheel, which receives the end of the axle-tree, and in which the ends of the fpokes are fixed; it is bound at each end with hoops of iron, called the Nave bands; it has likewife, in each end of the hole, through which the end of the axle-tree goes, a ring of iron called the wifher, which faves the hole of the Nave from wearing too big.

NAVIGA'TION (*Dict.*)— The principal articles, in the act of navigation, paffed in the twelfth year of Charles II, are the following:

1. That no goods or commodities fhall be imported or exported to or from any of the Englifh colonies in Afia, Africa, or America, but on veffels built within the dominions of England, or really belonging to Englifhmen; and whofe mafters, and at leaft three-fourths of the crew are Englifh *, on pain of forfeiture of the goods and veffel.

* Under the name Englifh, here, are comprehended all the king's fubjects of England, Ireland, and the Plantations; as was explained in a fubfequent act, 13 and 14 Car. II. c. 11.

2. That no perfon born out of the fubjection of England, or not naturalifed, fhall exercife any commerce in thofe colonies for himfelf, or others.

3. That no merchandizes of the growth of Afia, or America, fhall be imported into any of the dominions of England on any other than Englifh veffels.

4. That no goods of foreign growth or manufacture that fhall be brought into England, Wales, Ireland, iflands of Jerfey or Guernfey, or town of Berwick on Tweed, in Englifh built fhipping, or other fhipping belonging to the forefaid places, and navigated by Englifh mariners as aforefaid, fhall be fhipped or brought from any other place or country, but only from thofe of the growth or manufacture thereof.

5. That all kinds of dried and falted fea-fifh, train-oils, blubber, and whale-fins, not caught by Englifh veffels, imported into England, fhall pay double duties.

6. That the commerce from port to port in England and Ireland fhall be carried on wholly by Englifh veffels, and Englifh merchants: the crew to be always three-fourths Englifh.

7. That none but Englifh veffels fhall reap the benefit of the diminutions made, or abatements to be henceforth made, in the cuftoms.

8. All veffels are prohibited importing into England and Ireland any of the commodities of Mufcovy, or even any mafts, or other timber, foreign falt, pitch, rofin, hemp, raifins, prunes, oil of olive, any kind of corn, or grain, fugars, afhes, and foap, wine, vinegar, or brandy, except veffels, whereof Englifh are owners or part-owners, and where the mafter and three-fourths of the mariners are Englifh.— And that no currants, or other commodities, the growth or manufacture of the Turkifh empire, fhall be imported, but in veffels of Englifh build, and navigated as aforefaid; except only fuch veffels as are of the building of the country or place whereof fuch commodities are the growth or manufacture, or of fuch part where fuch goods are ufually fhipped for tranfportation, and unlefs the mafter and three-fourths of the crew be natives of the country where they are laden.

9. All timber, mafts, boards, falt, pitch, tar, rofin, hemp, flax, raifins, figs, prunes, olive oils, corn, or grain of any kind, fugar, pot-afhes, brandies, and wines, and all goods of the growth and manufacture of Mufcovy, all currants and Turkifh goods imported into England, &c. in other than fuch fhipping, and fo navigated, fhall be deemed aliens goods, and pay accordingly.

10. That, to prevent frauds in buying and difguifing foreign veffels, the proprietors fhall take an oath, that they really belong to them, and that no alien has any part in them.

11. That Englifh veffels, and navigated by Englifh, may import, into the dominions of England, any merchandizes of the Levant, though not taken up in the places where they grow, or are manufactured: provided it be in fome part of the Mediterranean beyond the ftreights of Gibraltar. And the fame is underftood of commodities brought from the Eaft-Indies, provided they be taken up in fome port beyond the cape of Good Hope: and thofe from the Canaries, and other colonies of Spain; and the Azores, and other colonies of Portugal, which are allowed to be fhipped, the one in Spanifh ports, the other in Portuguefe.

12. Thefe penalties, prohibitions, and confifcations, not to extend to goods taken by way of reprifal from the enemies of England, nor to fifh caught by the Scots, or their corn, and falt, which may be imported into England by the Scotch built fhips.

13. Five fhillings per ton duty is impofed on every French veffel arriving in any port of England, fo long, and even three

months longer, as 50 ſols per ton lies on the Engliſh veſſels in France.

Laſtly, That ſugars, tobacco, and other commodities of the growth of the Engliſh colonies, ſhall not be imported into any other part of Europe, but the dominions of England. And that veſſels, going out of the ports of the ſame crown for the Engliſh colonies, ſhall give 1000 l. ſecurity, if under one hundred tons, and 2000 l. if above, before they depart, that they will import their cargo into ſome port in the ſaid dominions; and the like, before they quit thoſe colonies, that they will land their whole cargo in England.

NAU'TILUS, in natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it expreſſes, in general, in every ſpecies, the figure of a boat or veſſel, made for ſwimming on the water; but, in the different ſpecies, it is of very different figures, roundiſh, or oblong, thin, or thick, furrowed, or ſmooth, and ſometimes is auriculated, ſometimes not. Bonani obſerves that this genus of ſhell-fiſh is very well named from the Greek ναυτίλος, which ſignifies both a fiſh, and a ſailor, for that the ſhells of all the a Nautili carry the appearance of a boat, or ſhip, with a very high poop.

Different authors, among the ancients and moderns, have called the Nautilus by the name of pompilus, nauplius, nauticus, ovum polypi, polypus teſtaceus, and the French call it le voilier. It is ſuppoſed, that men firſt learned the method of ſailing in veſſels, by what they ſaw practiſed by this creature.

NEC'TARINE, a fruit greatly eſteemed for its delicious flavour, and ſuppoſed to have its name from the nectar of the gods, in heathen ſtories.

It differs in nothing from the peach, but in having a ſmoother ſkin, and a firmer pulp. See PEACH.

We have ten kinds of Nectarines cultivated by the curious in gardening.

1. Fairchild's early Nectarine; this is a ſmall fruit of a red colour, and very well taſted, and ripens in July, the earlieſt of all this kind.

2. The Elruge Nectarine; this is a larger fruit of a purple colour, on that ſide which was towards the ſun, and of a greeniſh yellow on the other parts. This is a very well flavoured Nectarine, of a ſoft, melting juice, and parts from the ſtone: it ripens towards the end of July.

3. The Newington Nectarine; this is a fair large fruit, of a fine red toward the ſun, and of a yellowiſh green towards the wall. It has a very rich juice, but the pulp adheres to the ſtone: this ripens in Auguſt.

4. The ſcarlet Nectarine; this is of a fine glowing red towards the ſun, and of a pale red towards the wall; it ripens in the end of July.

5. The Brugnon, or Italian Nectarine; this is a fair, large fruit, of a deep red next the ſun, but of a ſoft yellow next the wall. The pulp is firm, and of a rich flavour, but cloſely adheres to the ſtone, and is red in that part: this ripens in the middle of Auguſt.

6. The Roman red Nectarine; this is a very fair large fruit, of a deep purple towards the ſun, and of a greeniſh yellow next the wall. The pulp is very firm and well taſted, but it is red about the ſtone, and adheres firmly to it: this is ripe in the middle of Auguſt.

7. The murry Nectarine; this is a middle-ſized fruit, of a dirty red next the ſun, and of a greeniſh yellow next the wall. The pulp is tolerably well flavoured, and ripens in the middle of Auguſt.

8. The golden Nectarine; this is a fair handſome fruit, of a ſoft red next the ſun, but of a gold yellow next the wall; and its pulp is very yellow, but of a faint red about the ſtone to which it adheres: it is a very well flavoured kind, and ripens at the end of September.

9. Temple's Nectarine; this is a very fine kind; it is of a ſoft red towards the ſun, and of a yellowiſh green next the wall. It parts from the ſtone, and is of a very rich flavour; the pulp is white in other parts, but yellowiſh about the ſtone: this ripens in the middle of September.

10. The Peterborough Nectarine, called by ſome the late green Nectarine; this is a middle-ſized fruit, of a pale green colour towards the ſun, and of a whitiſh green toward the wall; the pulp is firm, and well flavoured: it ripens towards the end of September.

The pruning, planting, and whole culture of this plant are the ſame with that of the peach. *Miller's Gard. Dict.*

NEE'DLE (*Dict.*)— Needles make a very conſiderable article in commerce; and the conſumption thereof is almoſt incredible.— The ſizes are from N°. 1, the largeſt; to N°. 25, the ſmalleſt.

There is ſcarce any commodity cheaper than Needles; which will appear ſomething extraordinary to the reader, after he has been ſhewn the great number of operations they undergo before they are brought to perfection.

Manufacture of NEEDLES.— German and Hungary ſteel is of moſt repute for Needles. The firſt thing is to paſs it through a coal fire, and under a hammer, to bring it out of its ſquare figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron; returned into the fire, and drawn through a ſecond hole of the iron, ſmaller than the firſt: and thus, ſucceſſively, from hole to hole, till it have acquired the degree of fineneſs required for that ſpecies of Needles; obſerving every time it is to be drawn, that it be greaſed over with lard, to render it the more manageable. See WIRE-DRAWING.

The ſteel, thus reduced into a fine wire, is cut in pieces of the length of the Needles intended. Theſe pieces are flatted at one end on the anvil, in order to form the head and eye. They are then put in the fire, to ſoften them farther, and thence taken out, and pierced at each extreme of the flat part, on the anvil, by force of a punchion of well tempered ſteel, and laid on a leaden block, to bring out, with another punchion, the little piece of ſteel remaining in the eye.

The corners are then filed off the ſquare of the heads, and a little cavity filed on each ſide the flat of the head. This done, the point is formed with a file, and the whole filed over.

They are then laid to heat red-hot, on a long, flat, narrow iron, crooked at one end, in a charcoal-fire; and, when taken out thence, are thrown into a baſon of cold water to harden. — On this operation, a good deal depends; too much heat burns them; and too little leaves them ſoft; the medium is only to be learnt by experience.

When hardened, they are laid in an iron-ſhovel, on a fire more or leſs briſk, in proportion to the thickneſs of the Needles; taking care to move them from time to time. This ſerves to temper them, and take off their brittleneſs; care here, too, muſt be taken of the degree of heat.

They are then ſtraightened one after another with the hammer; the coldneſs of the water uſed in hardening them having twiſted the greateſt part of them.

The next proceſs is the poliſhing.— To do this, they take twelve or fifteen thouſand Needles, and range them in little heaps againſt each other on a piece of new buckram, ſprinkled with emery duſt. The Needles thus diſpoſed, emery duſt is thrown over them, which is again ſprinkled with oil of olives. At laſt, the whole is made up into a roll, well bound at both ends.

This roll is then laid on a poliſhing table, and over it a thick plank loaden with ſtones, which two men work backwards and forwards a day and a half, or two days ſucceſſively. By which means, the roll thus continually agitated by the weight and motion of the plank over it, the Needles within ſide, being rubbed againſt each other with oil and emery, are inſenſibly poliſhed.

In Germany, inſtead of hands, they poliſh with water-mills. After poliſhing, they are taken out, and the filth waſhed off them with hot water and ſoap: then wiped in hot bran a little moiſtened, placed, with the Needles, in a round box ſuſpended in the air by a cord, which is kept ſtirring till the bran and the Needles be dry.

The Needles, thus wiped in two or three different brans, are taken out and put in wooden veſſels to have the good ſeparated from thoſe whoſe points or eyes have been broken either in poliſhing or wiping; the points are then all turned the ſame way, and ſmoothed with an emery-ſtone turned with a wheel.

This operation finiſhes them; and there remains nothing but to make them into packets of two hundred and fifty each.

NEEDLE-*makers*.— Their buſineſs is a branch of the ſmithery, and light eaſy work, therefore fit for ſlight-made lads; but they ought to have good eyes, the finer ſorts requiring much nicety.

This trade is more extenſive than moſt people apprehend, their goods being not only conſumed in families, but uſeful to a great many trades: ſome of them alſo make fiſh-hooks, &c. and keep ſhops; others travel the country, to ſupply dealers there, though theſe are chiefly furniſhed by the haberdaſhers with finer ſorts, and by the ironmongers with the very large ſizes, as pack-needles, &c. by both which ſhop-keepers they are principally taken off the maker's hands, who moſtly work privately, and will take an apprentice with five pounds, whoſe hours are from ſix to eight; in which time a journey-man can earn two ſhillings, or two ſhillings and ſix-pence; and fifty pounds will ſet him up, if he makes for the ſhops only; but, if he intends to deal for himſelf, or keep ſhop, not leſs than 200 l. will be ſufficient.

They were incorporated into a company in the year 1656, in the time of Oliver Cromwel: livery-fine 3 l. 6 s. 8 d. But have no hall, therefore meet in Guild-hall to tranſact their buſineſs.

NE'GATIVE *power*, in algebra, is uſed for thoſe powers of a quantity which have a Negative ſign. Thus a^{-m} is called a Negative power. Negative powers ariſe from the diviſion of any power of a quantity by a greater power of the ſame quantity. Thus, $\frac{a^4}{a^6} = a^{4-6} = a^{-2}$; and in general, $\frac{a^m}{a^{m+n}} = a^{-n} = \frac{1}{a^n}$ for $\frac{a^m}{a^{m+n}} = \frac{1}{a^n}$. See POWER.

NE'GRO (*Dict.*)— We have a diſſertation on the colour of Negroes by Dr. John Mitchell, of Virginia, in the Philoſophical Tranſ-

Tranſactions, N°. 476, where he advances theſe propoſitions, and enters into a learned detail to ſupport them.

1. The colour of white people proceeds from the colour which the epidermis tranſmits; that is, from the colour of the parts under the epidermis, rather than from any colour of its own.

2. The ſkins of Negroes are of a thicker ſubſtance, and denſer texture, than thoſe of white people, and tranſmit no colour through them.

3. The part of the ſkin which appears black in Negroes, is the corpus reticulare cutis, and external lamella of the epidermis: all other parts are of the ſame colour in them, with thoſe of other people, except the fibres which paſs between thoſe two parts.

4. The colour of Negroes does not proceed from any black humour, or fluid parts contained in their ſkins; there being none ſuch in any part of their bodies, more than in white people.

5. The epidermis, eſpecially its external lamella, is divided into two parts by its pores and ſcales, two hundred times leſs than the particles of bodies on which their colours depend. This is founded on Leuwenhoek's obſervation that a portion of the epidermis, no bigger than what can be diſcerned with the naked eye, is divided into 125000 pores, and theſe pores muſt divide ſuch a portion of the ſkin into as many particles. But the particles of bodies on which their colours depend, are, by Sir Iſaac Newton's Optics, Lib. 2, p. 3, Prop. 7, 600 times leſs than theſe which can be diſcerned by the naked eye. Therefore, the particles of the ſkin muſt be about 200 times leſs than theſe, ſince $\frac{125000}{600} = 208\frac{1}{3}$. It may alſo be obſerved, that ſuch a ſmall portion of the epidermis is diviſible into 250 ſcales, which muſt increaſe the number of its parts.

6. From theſe propoſitions, and from Sir Iſaac Newton's Theory of Light and Colours, the doctor thinks he may conclude, that the proximate cauſe of the colour of Negroes is threefold; viz. the opacity of their ſkin, proceeding from the thickneſs and denſity of its texture, which obſtructs the tranſmiſſion of the rays of light; from the red and white parts under the ſkin, together with its greater refractive power, which abſorbs theſe rays; and the ſmallneſs of the particles of this ſkin, which hinders it from reflecting any light.

7. The influence of the ſun, in hot countries, and the manner of life of their inhabitants, are the remote cauſes of the colour of the Negroes, Indians, &c. And the ways of living, in uſe amongſt moſt nations of white people, make their colours whiter than they were originally, or would be naturally.

In ſupport of this propoſition, the doctor obſerves, that the ſkin is deprived of its white colour, by the force and influence of the ſun, four ways. 1. By being rendered opaque, from a diſſipation of its more aqueous and pellucid juices. 2. By a concretion of its veſſels and glandules, from this diſſipation of their aqueous contents, which renders the ſkin both thicker and denſer, or more callous and rigid. 3. By a new accretion of many new membranes, which render it thick and opaque. 4. By increaſing thoſe parts or principles in this compoſition of the epidermis, which have the greateſt refractive power, as the terreſtrial and fixed ſaline; but eſpecially the tenacious ſulphureous, which refract and abſorb light more ſtrongly than any other ſubſtances; while the more tranſparent and pellucid principles, as the aqueous, ſpirituous, and volatile ſaline, are evaporated by the heat, which cauſes the other more fixed principles to be accumulated; and theſe particles, being likewiſe more comminuted by the ſun, will, on this account, be black; as happens to oil, when boiled. Theſe cauſes, with thoſe firſt-mentioned, may, the doctor thinks, by conſpiring, make the ſkin quite black; eſpecially if we add another effect of the ſun's power, a peculiar necroſis of the epidermis, occaſioned by the forcible vibrations, contractions, and exſiccations of its fibres by the ſun-beams, which cauſe it to turn black, as theſe, or other parts do, by the heat of an inflammation, or a fever, in gangrenes, black tongues, &c.

We cannot pretend to follow the author in all the detail of his obſervations on this ſubject, nor of his anſwer to a material objection already mentioned from Mr. Boyle, that the ſun cannot be the cauſe of the colour of Negroes, becauſe ſeveral nations, in the ſame latitude with thoſe Negroes, are not made black by it. He ſeems to think the heat of Africa greater than that of other parts of the world. Whether it be ſo, or not, is, we doubt, not eaſy to determine; but it would be a ſtrong confirmation of his doctrine, if we could ſee any people, originally white, become black and woolly by tranſplantation, or vice verſa.

NEIEM-*el-ſalib*, *Egyptian cock's-foot-graſs*. It is a ſlender ſort of graſs, with white, geniculated, and creeping roots. The branches are geniculated, and adorned with four ſpikes, which repreſent the perfect figures of a croſs; whence the Egyptians call it Neiem-el-ſalib, that is, gramen crucis, the graſs of the croſs, or croſs-graſs.

The ſeeds, which are very minute, and like thoſe of common graſs, are very much uſed by all thoſe who are afflicted with the ſtone in the kidneys, or bladder, being eſteemed a good lithontriptic for diſſolving ſtony concretions in the bladder, which is a diſtemper very familiar, and, in a manner, endemial in Egypt. The women make very great uſe of the root in decoctions for their children, when ſeized with the ſmall-pox, or meaſles; and, alſo, for themſelves, when labouring under a ſuppreſſion of the menſes. Some regard a decoction of the ſeeds, moderately bruiſed, as a great ſecret, and a choice remedy for promoting the exanthematous eruptions, which we call peticulæ or petechiæ, in peſtilential fevers. The whole herb, but eſpecially the root, are much employed, alſo, in the cure of wounds in ulcers. The root is ſaid to be cold and dry, and of very fine parts, though the decoction thereof is very commonly uſed to provoke ſweats. *Raii, Hiſt. Plant.*

NEPHRI'TIS (*Dict.*)— The ſimple Nephritis is carefully diſtinguiſhed from the calculoſe one; for the former may, for a long time, affect a patient without any thing of a ſtone being in the caſe; and, on the contrary, a ſtone may be long lodged in the kidneys, without its bringing on any ſuch complaint as the Nephritis.

In the ſimple Nephritis there is always a ſenſation of pain and heat about the loins, which is plainly perceived to lie deep within the fleſh, but is never very acute. On the contrary, in the calculoſe Nephritis, the pain is violently ſharp.

In the ſimple Nephritis, the urine, after it has ſtood ſome time, ſhoots to the ſides of the pot pellucid cryſtals of a rediſh colour. But, in the calculoſe, the heavy matter immediately precipitates itſelf to the bottom, and is ſabulous and gritty; and the ſimple Nephritis is always greatly relieved by a gentle motion of the body, as walking, or the like; whereas all motion of the body exaſperates the calculoſe Nephritis.

The Nephritis is diſtinguiſhed alſo from the iſchiatic pains, which ſometimes run up to the ſame parts, by its being evidently perceived to lie deep within the fleſh, whereas thoſe pains affect the external muſcles; yet there is ſuch a connection and conſent of parts in theſe caſes, that not unfrequently the one is taken for the other.

Signs of it. Theſe are a pain in the region of the loins, which does not uſually affect both, but only, or, at leaſt, principally, one ſide, uſually the left. The pain is at firſt tenſive and dull, but afterwards becomes more acute; in the beginning it is often attended with a chillneſs, and general trembling, which is ſucceeded by a heat, and acrid gnawing, ſcarce to be ſupported; and this is uſually attended with a want of appetite, and loſs of ſtrength, and a continual, though not violent, thirſt. The ſleep is unſound, and there uſually is either a dull pain in the head, or a vertiginous complaint, more or leſs violent; and very frequently nauſeas, and reachings to vomit, attend the fits, or prognoſticate the acceſs of them.

The pain never extends itſelf down the whole thigh, nor is that ever wholly numbed, or rendered torpid by it; and the diſorder does not ſeem continual, but attacks the patient at different times, and theſe, after conſiderably long intervals, if he live regularly.

The diſorder, when the inflammation is known to be preſent, by its peculiar ſigns is to be cured, firſt, by the general remedies appropriated to the cure of all inflammations; ſuch as veneſection, revulſion, and dilution. Secondly, by mild, emollient, and antiphlogiſtic decoctions, drank in large quantities: thus: Take of the recent leaves of chervil, brook-lime, and pellitory of the wall, each two handfuls; of the roots of wood-ſorrel, ſuccory, and burdoc, each two ounces; of red chiches, an ounce and an half; of the bruiſed ſeeds of white poppy and lady's thiſtle, each four drachms. Boil in three pints of water for half an hour, and let the patient take two ounces of the decoction every quarter of an hour.

Or take, of the roots of graſs, ſix ounces; of bruiſed melon-ſeeds, an ounce and an half; and, of liquorice, one ounce. Boil in three pints of water, and let the patient uſe the decoction in the ſame manner, and for the ſame purpoſes, with the former.

And, by this method alone, a Nephritis, ariſing from a ſtone impacted in the ureters or kidneys, may be ſafely cured.

The remedies, moſt conducive to the cure of this ſpecies of Nephritis, are agrimony, vervain-mallow, ladies-mantle, marſh-mallows, brook-lime, the leſſer daiſy, middle conſound, chervil, wild carrot, dandelion, fennel, liquorice, ſtrawberries, graſs, rupture-wort, lettuce, hart's-tongue, Engliſh mercury, moneywort, white lily, reſt-harrow, pellitory of the wall, arſe-ſmart, ſcabious, golden-rod, and nettles, Fernelius's ſyrup of marſh-mallows, ſyrup of maiden-hair, ſyrup of ſuccory with rhubarb, ſyrup of white poppies, ſyrup of wild poppies, and ſyrup of violets, ſal ammoniac, ſal-gemmæ, and ſea-ſalt.

If the cauſes of a Nephritis are ſo ſtrong and powerful, that the diſorder can neither be removed by reſolution, nor any other method, but is protracted beyond the ſeventh day, an abſceſs is to be dreaded, the formation of which may be known from a remiſſion of the pain, which is ſucceeded by a pulſation, a frequently returning horror, a weight and ſtupor of the part. That an abſceſs is already formed, is obvious, from the former ſigns having preceded, from the pulſation, heat, and tenſion in the part, and from the purulent, fœtid, and apparently ſaline and putrified urine. As ſoon as we are certain that the abſceſs is formed, we are firſt to uſe powerfully maturating and emollient medicines; then, when the urine appears purulent, we muſt exhibit diuretics, conſiſting of pure medicated

medicated waters, whey, and other liquors of a like nature, using, at the same time, balsamics.

But, if this suppuration should continue for a long time, the whole kidney, being consumed, forms a kind of bag, of no use; and, in this case, a tabes renalis is frequently present.

If a schirrhus is formed here, there arises an incurable palsy, or lameness of the subjacent leg. Hence, also, are frequently produced a slow consumption and a dropsy.

But, if a small quantity of the inflammatory matter remains coagulated in the minute follicule of the urine, it forms a kind of basis or ground-work, to which the sabulous matter of the urine gradually adhering, forms a stone in the kidnies, which is by degrees augmented.

A Nephritis, also, sometimes degenerates into a gangrene, as is obvious from the violence of the cause and symptoms; the want of relief by remedies; and the sudden remission of the pain, without any apparent cause, accompanied with a cold sweat, a weak and intermitting pulse, a hiccup, either no discharge of urine at all, or an evacuation of such as is livid, black, full of hairs, fœtid, and rendered unseemly by brown or black caruncles; and a sudden and considerable loss of strength. In this case no measures are of any service, either for the relief or safety of the patient.

From what has been said it is obvious, that there are almost an infinite number of various species of a Nephritis; that their different causes are as numerous; that one of these causes is the stone; and that, at the same time, all these different species are to be cured almost in the same manner. Hence we understand the crisis of a Nephritis, and why this disorder so often happens in fevers. Hence, also, we are enabled to know and cure an ischury, arising from a fault of the kidnies or ureters.

NEPHRO'TOMY, in surgery, the cutting into the kidnies, in case of the stone being lodged there, and taking it out in in the same way as from the bladder.

This is an operation which has been very little practised, and usually supposed to be attended with very great danger: few authors who have treated of these diseases have so much as mentioned this operation, and the few that have named it, have generally condemned it. Sinibaldus, fancying that it was an operation anciently practised, strove very earnestly, indeed, to have it revived. He has called in the opinion of Hippocrates to support his account of its having been done with safety, and advises the surgeons to try their hands on brutes first, and accustom themselves to the operation, and, then, not to fear it in regard to men.

It is certain that a stone in the kidney is so terrible a disease, that it is very much to be wished that some safe operation could be invented to cure it; but it is making too free with Hippocrates, to say, that he countenances or directs such an operation in general. His words seems to express only the making an incision near the kidney; but, even if they are to be understood as directing the cutting into it, it is under such restrictions, that opportunities will very seldom offer; and, when they do, a common surgeon would not scruple performing all that is directed, without either consulting Hippocrates, or trying his skill upon brutes. Hippocrates only advises it in case of a swelling and imposthumation, where there is matter formed, and the tumor manifests itself upon the surface. In this case every surgeon would know it was his business to make an incision. *Phil. Transf.* N°. 223.

Cases requiring this are frequent, and that even without a stone. An inflammation in a kidney degenerates into an abscess, and, when matter is formed, the surgeon opens the tumor, and the matter is discharged. Sometimes stones, bred in the kidnies, cause imposthumations; the surgeon opens these, and the stones are brought away together with the matter. Nay, nature herself has done the whole for some people, and the stones have made way through the kidnies, and through the integuments, &c.

Tulipus gives an account, from his own observation, of a man who had a stone in his kidney, which, after many years, discharged itself through the loins, and occasioned a fistula in the part, through which the urine was long voided, together with the matter. The attempts of many surgeons to heal this fistula were vain, and, at length, one succeeding so far as to stop up the mouth of the ulcer, the matter which was used to be discharged from it was thrown into the abdomen, and the man died of a fever. Tulipus gives the death of this person as an objection against the operation of Nephrotomy in general, as he supposes a similar fate might attend the wounds made in these parts by the surgeon.

From an impartial examination of the works of Hippocrates, it does not appear that the cutting for the stone in the kidnies was regularly practised in his time, nor, indeed, for many ages after; for Celsus makes no mention of it, although he is very particular upon the operation of cutting for the stone in the bladder. Galen is so copious a writer, that he never misses any thing practised either in his own time, or before it, in his account of diseases; yet, he mentions nothing of this operation, though he is very long upon the article of the diseases of the kidnies. Cardan, indeed, mentions this operation, as one of those of the ancients, which were practised in his time. His hasty reading the works of Hippocrates has led him into this error, and he lays the fault of its being now lost, in a great measure, on Galen's omitting to mention it. It is wrong to accuse Galen of this omission, since neither Celsus, nor Ruffus, who preceded him, nor Aretæus who was his contemporary, nor, indeed, any of the Greek or Latin physicians, have named it, though they, as well as the moderns, mention, occasionally, an abscess in the kidnies, and the manner of curing it.

The Arabians, indeed, mention the operation as practised and countenanced by some persons before their time; but they all join in condemning it as a bold and hazardous operation, from which very little good is to be expected, and which sets the life of the patient in the most imminent danger. Avicenna speaks of it as the act of a madman, and it seems, that it was sometimes practised in his time, but, by his manner of naming it, seems to have been only done by some mountebanks, who, having no reputation to lose, ventured boldly, and sometimes had success. The rest of the Arabians are silent about the operation, and it seems to have been only practised by a few people in the days of this author, and wholly discountenanced afterwards, from its bad success.

Among the moderns, the first who has named it is Rousset, in his treatise on the Cæsarian Section. In order to invite men to countenance the Cæsarian operation, he recommends several other desperate ones, and, among the rest, this of Nephrotomy: but he is not able to produce one instance of its having been practised, either in his own, or earlier times, but when there was an abscess and an external tumor. Cælius Rodiginus gives, indeed, a very remarkable instance of an operation of this kind being performed by chance, by a woman, who, in the agony of her pain from the stone in the kidney, scratched with her own nails, till she tore through the flesh so deep, that eighteen stones were discharged at the wound.

The general opinion of authors is thus against the operation; and the most famed among those who have treated of wounds of the kidnies, say, that any wound which enters into the pelvis is mortal. Yet, this opinion, though general, is not certain or determinate; and we have an account, in the Philosophical Transactions, of the operation of Nephrotomy being performed with success, by Marchetti of Padua, on Mr. Hobson, the English consul at Venice.

NE'RVE (*Dict.*)— *Wounds of the* NERVES.— Upon the division of Nerves, the limb to which that Nerve was extended becomes instantly rigid, void of sensation, and withers: so that it is no wonder that a man instantly expires, upon the division of those Nerves which are sent to the heart or diaphragm: a wound also is attended with great danger where the Nerve is only partially wounded, and not intirely divided; for the wounded fibres contract themselves, and those which remain undivided suffer too great extension, which will bring on most violent pain, spasms, convulsions, inflammations, and gangrenes, and sometimes death itself. *Heister's Surgery.*

NET.— The places for using fowling nets to most advantage, are the morning and evening haunts where the birds come to feed. The Sportsman is to be at the place at least two hours before the time of their coming, and the Net must immediately be spread flat and even upon the ground, and the two ends fastened down with stakes. At the lower part there is to be a long cord fixed to the upper edge of the Net, by means of which it may be immediately raised and pulled over. The sportsman is to hide himself behind some natural or artificial shelter, at the extremity of his line, and some cut grass must be strewed all over the Net as it lies on the ground, to hide it from the fowl: and some live bird, that has been taken before, should be staked down before the Net, by way of a stale to draw in the others.

As soon as a sufficient number of birds are within the compass of the Net, it is to be pulled swiftly over them, and the fowler, having taken those that are under it, may stake down two or three more live ones, and spread the Net, covering it with grass as before. This sort of sport may be continued from as soon as it is light in the morning, till an hour after sun-rise; but, after that time, the birds have done feeding ravenously, and the sport is over for that day.

NEWT, or EFT.— The land Newt, or, as naturalists often call it, the land salamander, has something very remarkable in its outer coat. Its skin often appears dry, like that of the lizard kind, but often, also, it appears wetted, and as if covered with a fine shining varnish: the change from one to the other of these states is usually performed in an instant, and is frequently wet all over on the touching it. It also contains, under the skin, a sort of milky liquor, which spurts out to a distance on pressing the body of the animal.

The passages for this milk are a vast number of pores or holes, many of which are plainly visible to the naked eye; and very probably the first-mentioned liquor, which covers the skin in manner of a varnish, may be the same with this, its white colour not being distinguishable, when it is spread so thin over the surface of the animal. This milk resembles very much the milky juice which the lithymals, and many other of the succulent plants, afford on being cut or broken. It is of an insupportably acrid and styptic taste; and, though the tongue receives no injury from touching it, yet the sensation is so violent,

lent, that one is apt to imagine there muſt be a wound made in it. This animal, when bruiſed, yields alſo a very diſagreeable ſmell.

It has generally been ſuppoſed, that this animal is of a poiſonous nature; and the famous ſalamander of the old writers ſeems to be of the ſame genus, if not the ſame animal. Mr. Maupertuis, determined to inform the world of the truth, in regard to theſe remarkable particulars, cauſed a large number of theſe animals to be brought to him, which the country people, who had caught them about the bottoms of old walls, brought to him with as much caution as if they had been vipers.

The firſt experiment he made, was that of the incombuſtible quality of theſe animals: to this purpoſe, he threw ſeveral of them into a common fire; moſt of them periſhed immediately, but a few made ſhift to crawl out; but theſe could not get away on a ſecond trial, but periſhed like the reſt. It was obſerved, however, that, the moment they were thrown into the fire, the whole quantity of milky juice they contained was driven out at all the pores, and drying in an inſtant, ſtood in round globules, like ſo many pearls, till wholly conſumed by the heat.

It is poſſible, that the obſerving this creature to have a power of throwing out theſe juices, and covering itſelf at pleaſure with wet, might give riſe to the imaginary property of its ſubſiſting by the ſame means unhurt in the fire.

This trial being made, the next was to be certainly determined whether the creature were poiſonous or not. This Mr. Maupertuis propoſed to try two ways; the firſt, by making the creature bite ſome animals; the other, by making ſome other creature eat the Newt. But theſe experiments were attended with more difficulties than might be imagined, for it was neither eaſy to make it bite any thing, nor to make any creature eat it. No provocation could make the Newt bite, and, when its jaws were opened by force, its teeth were found ſo ſmall, and ſo placed, that they ſeemed rather intended to ſaw, or cut things to pieces, than to bite with; and when a chicken was brought to be bit, and the feathers removed from the part, the jaws had no force to make the teeth penetrate, and, when preſſed together, the teeth rather broke, or were put out of their places, than entered the animal, ſo that it was neceſſary to take off the ſkin, and the chicken then received ſeveral wounds, by forcibly preſſing the jaws of the Newt, together with parts of the raw fleſh between: after this, the lips and tongue of a dog, and the tongue of a turkey, were bitten in the ſame manner by other Newts. The animals were let looſe, and not one of them received the leaſt injury from the bite.

The following trial was made, whether the fleſh of the creature, or its milky juice, were poiſonous, when received into the ſtomach. Several animals were kept hungry a conſiderable time, on purpoſe to make them eat the animal, but none of them would touch it; ſo well has nature defended this little creature by the acrid juice under its ſkin, of which other animals are warned, as by inſtinct, and refuſe to ſwallow ſo diſagreeable a repaſt. A dog was at length compelled to ſwallow a Newt cut into ſeveral pieces while alive, and a turkey was forced to ſwallow, in like manner, a ſmall one. The dog's mouth was tied up for half an hour, and, half an hour after it was untied, he vomited up the tail and the feet of the animal, and received no injury; nor did the turkey, which ſwallowed the young one. After this, pieces of bread were ſoaked in the milky juice alone, and chickens were made to ſwallow them, and wounds inflicted with weapons dipped in the ſame juice, but no harm ever enſued to the creatures from either.

From all theſe trials, it appears very evident, that the ſtories of this creature's being poiſonous are as idle, and groundleſs, as thoſe of its living in the fire.

One thing remarkable this gentleman obſerved in his diſſections of the animal, which was, that he found in ſeveral of the females, at once, cluſters of eggs and living young ones. The eggs formed cluſters reſembling thoſe of the ovaries of birds, and the young ones were contained in two tubes, or long pipes, the coats of which were perfectly tranſparent, and the young ones were eaſily diſtinguiſhed through them, and there were counted in one female fifty-four of theſe, all living and vigorous. *Mem. Acad. Par.* 1721.

NICETE'RIA *Athenæ*, in antiquity, an Athenian ſolemnity, in memory of Minerva's victory over Neptune, when they contended which of them ſhould have the honour of giving a name to the city afterwards called Athens. *Potter, Archæol.*

NI'COL, in natural hiſtory, a word uſed by the miners in Germany, to expreſs a greeniſh cruſt covering ſeveral of the ſpecies of marcaſites and cobalt; it emits fumes that ſmell of garlic in the calcination, and is very injurious to the workmen, cauſing contractions of their limbs, and other diſorders. It is ſometimes found in maſſes alone, but that more rarely.

NI'GHTINGALE, *philomela*, in zoology. See PHILOMELA.

Virginian NIGHTINGALE, in zoology, the common, but improper, name of a bird of the groſs-beaked kind, called by authors the coccothrauſtes Indica criſtata.

It is a little ſmaller than our blackbird; it has a black ring ſurrounding the eyes and noſtrils; the beak is very large and thick, but not altogether ſo large as in the common groſs-beak; and its head is ornamented with a very high and beautiful creſt, which it moves about very frequently. It is all over of a very fine and lively red, but paler on the head and tail than elſewhere. It is brought to us from Virginia, and is valued in England, for its beauty and delicate manner of ſinging. It is very fond of almonds, and the like fruits. *Ray's Ornithol.*

NI'GHTSHADE. See SOLANUM.

NINTH, in muſic, one of the diſſonant intervals in muſic. It is properly the ſecond doubled, but is differently uſed. When an upper part ſyncopates, the ſecond is accented and treated as a Ninth; i. e. it is reſolved by an eighth, and accompanied by a third or fifth, and often a ſyncopated ſeventh. But, when the lower part ſyncopates, the ſecond is not thus uſed, but is accompanied by the fourth and ſixth. In thorough baſs, the Ninth has always, or, at leaſt, commonly, an eighth placed after it, thus, 9 8; to ſhew that this is reſolved by deſcending to the octave. *Broſſ. Dict. Muſ.*

NI'PPERS, in the manege, are four teeth in the fore-part of a horſe's mouth, two in the upper, and two in the lower jaw. A horſe puts them forth between the ſecond and third year. See TEETH.

NIPPERS, is alſo an inſtrument in uſe among ſmiths and farriers, being a kind of pincers, wherewith, in ſhoeing a horſe, they cut the nails before they rivet them. It is alſo uſed in taking off a ſhoe.

NIPPERS, *in a ſhip*, are ſmall ropes, about a fathom or two long, with a little truck at one end, and ſometimes only a wale-knot. Their uſe is to help to hold off the cable from the main, or jeer capſtan, when the cable is ſo ſlimy, ſo wet, or ſo great, that they cannot ſtrain it to hold it off with their bare hands.

NI'TRE (*Dict.*)—This ſalt gives the greateſt of all proofs of the effects of ſynthetical or recompoſing chemiſtry. It is firſt ſeparated or analyſed, in the following manner: take two pounds of refined ſalt-petre in fine powder; pour upon it one third of its weight of oil of vitriol, and diſtil it in a glaſs retort, in a ſtrong ſand heat, there will be produced a ſtrong acid ſpirit of Nitre, which cannot, by any experiment, be found to participate at all of the nature of the oil of vitriol uſed in its preparation. Then take a pound of freſh Nitre, melt it in a crucible, and throw into it, at times, pieces of charcoal, till it will no longer keep in fuſion with the ſame degree of fire; then increaſe the fire, and melt it, and then pour it into a proper veſſel; leave it to cool itſelf. This is fixed nitre, and is an alkali: now diſſolve this fixed Nitre in water, and exactly ſaturate that water with the acid ſpirit of Nitre before diſtilled; this compound liquor will, by ſtanding, ſhoot into true and perfect cryſtals of nitre. And the experiment ſucceeds as well, if a ſolution of pot-aſhes, or any other fixed alkali, be uſed inſtead of that of fixed Nitre. *Shaw's Lectures.*

If there is any highly penetrating and corroſive liquor, which, inſinuating itſelf into all bodies, corrodes, diſſolves, deſtroys, and changes their craſis and mixture, it is certainly the highly acid and concentrated ſpirit of nitre, deprived of all its phlegm, rendered inflammable, and totally volatile, and by the application of which, excreſcences, warts, and preternatural tumors of the human body, may be commodiouſly deſtroyed and eradicated. Notwithſtanding theſe circumſtances, this ſpirit, by the addition of the volatile ſalt of ſal ammoniac, or ſalt of tartar, is, after its effervescence, totally deprived of its corroſive quality, ſince the mixture degenerates into a nitrous ſalt; which, when diſſolved in water, affords a powerful diuretic liquor, excellent for provoking urine, in ſerous and cachectic diſorders: beſides, the corroſive quality of this ſpirit is excellently corrected, by mixing eight parts of highly rectified ſpirit of wine with one part of it, and diſtilling from an alembic, by means of a ſand heat; by which means, there is yielded a ſpirit of a fragrant ſmell, an acrid penetrating taſte, entirely free from a corroſive quality, excellently adapted for diſcuſſing and reſolving viſcid humours, and, conſequently, carminative. This dulcified ſpirit, in conſequence of the vaporous ſulphur it contains, is, alſo, poſſeſſed of an anodyne and ſedative virtue, highly efficacious in pains and ſpaſms; for which reaſon it is of far more uſe in practice, than the common ſpiritus nitri dulcis.

The reaſon of the proceſs is this, that highly rectified ſpirit of wine is nothing but a very ſubtile oil, immediately mixed with phlegm; for which reaſon, it is united and intimately mixed with this corroſive ſpirit, and both of them, when united, form a mixture of a third nature; which, when diſſolved in the inflammable ſpirit, comes over the helm, and conſtitutes the dulcified ſpirit of Nitre. But it is to be obſerved, that, at leaſt, five, ſix, or eight parts of the rectified ſpirit of wine ought to be added to one part of this ſpirit; for, if only two or three of the former were uſed, a violent conflict would be produced, and the corroding acid quality of the latter not totally deſtroyed: but, in the preparation of this ſpirit, it is to be obſerved, that the ſpirit of wine is not to be poured into the corroſive ſpirit; otherwiſe a violent conflict is produced, accompanied with a thick red ſmoke, which is prejudicial to the health of the by-ſtanders, and ſometimes ſucceeded by the breaking

breaking of the glaſs. But when the corroſive ſpirit is in ſmall quantities, and gradually mixed with the ſpirit of wine, all theſe diſadvantages are prevented.

This dulcified ſpirit, when poured into a ſilver ſpoon, and ſet on flame, leaves behind it a greeniſh ſpot on the ſpoon, which is a proof of an acidulated ſubtile nitrous ſalt: in ſuch a caſe, it is, therefore, expedient to dulcify theſe ſpirits more, and augment its virtues, by pouring into it a proper quantity of the vinous ſpirit of ſal ammoniac: when the acid of this ſpirit is thus corrected, it no longer leaves any ſpot on the ſpoon, and its anodyne and ſedative virtues are at the ſame time rather augmented.

This dulcified ſpirit of Nitre differs from the common ſort ſold in the ſhops, ſince the former is of a far more penetrating taſte and ſmell, and conſequently more efficacious. They alſo differ with reſpect to the preparation, ſince that of the ſhops is prepared with aqua-fortis, and mine with a duly dephlegmated ſpirit, impregnated with a vitriolic and highly concentrated ſulphur: my ſpirit produces a violent conflict and effervescence, with highly rectified ſpirit of wine; but the common dulcified ſpirit of Nitre none at all: hence it alſo happens, that there is not an intimate union of the acid of Nitre with the oleous parts contained in the rectified ſpirit of wine, which happens in my highly concentrated ſpirit. In the preparation of my ſpirit, nothing remains in the cucurbit, but all the fluid aſcends; whereas, in the preparation of the common ſpiritus nitri dulcis, the acid and corroſive liquor of the Nitre remains after diſtillation.

My dulcified ſpirit of Nitre, by the addition of a proper quantity of ſalt of tartar, loſes almoſt all its acid acrimony, and may for this reaſon be commodiouſly mixed with common water, for drink in burning fevers: thus, if two drachms of it are mixed with about two pints of ſpring water, they make a drink which powerfully allays thirſt, provokes urine, and procures ſleep. In inflammations of the fauces, eſpecially ſuch as attend quinſies, nothing affords more immediate relief, than this ſpirit mixed with ſugar, and a ſmall quantity of the ſpirit of camphire, diluted in common water, and uſed as a gargariſm. Sugar itſelf, alſo, ſwallowed in a ſmall quantity, affords relief in inflammations of the fauces.

This dulcified ſpirit of Nitre, when mixed in a ſmall quantity with rectified volatile ſpirit of hartſhorn, acquires a bezoardic and diaphoretic virtue; for which reaſon it is highly beneficial in all malignant fevers, where ſweating is neceſſary. *Hoff. Obſ. Phyſ. Chym.*

NI'TRUM *calcarium*, in natural hiſtory, a name given by Dr. Liſter to a peculiar ſpecies of neutral ſalt, which he firſt publickly deſcribed in his book on the Medicinal Waters of England. He very improperly calls it nitre; becauſe it has none of the properties or qualities of nitre, but only a ſort of general reſemblance in its external form. He obſerves that this ſalt, though very little known, was abundantly the moſt copious of all the ſorts afforded by the mineral waters in general; and ſays, its cryſtals were long and ſlender, and conſiſted of four ſides, and were terminated by a point compoſed of two triangular planes. He adds, that this ſalt doubtleſs had its origin from a mixture of the acid of ſulphur and a calcarious earth of an alkaline nature.

This ſalt is found in almoſt all the mineral waters of Germany, and is very juſtly obſerved by Hoffman to be of the nature of Glauber's ſalt: that it is not nitre, is evident from this, that it is not inflammable, nor will yield aqua-fortis by diſtillation. It ſeems, indeed, true Glauber's ſalt, compoſed of the acid of vitriol or ſulphur, for this is in both the ſame, and of that alcaline earth which is the baſis of ſea ſalt: this is its origin, in the veſſels of the chemiſt, as well as in the bowels of the earth; and probably the figure of the cryſtals of that obſerved by Dr. Liſter was the ſame in the point, as well as in the body, both being quadrilateral columns, terminated by pyramids compoſed of a number of triangular planes. *Hoff. Opera.*

NITRUM *nitratum*, in chemiſtry, the name of a preparation of nitre, made by adding a ſufficient quantity of ſpirit of nitre to a lixivium of pure nitre, and afterwards evaporating it to a pellicle, and ſetting it by to ſhoot. The cryſtals formed by this liquor are perfectly nitrous in their figure, but they will be of an acid taſte.

We ſee, by this, that it is poſſible to alter a ſalt, and to reduce it into the appearance of a different body, by means of ſubſtances before ſeparated from itſelf; and, in this caſe, the alteration is made, in almoſt any degree, at pleaſure; the ſalt produced being more or leſs acid, as more or leſs of the acid ſpirit is uſed: but it is to be obſerved, that, the more acid there is uſed, the more difficultly the ſalt dries, and the more difficultly it is kept dry, it being always ſubject to run in the air. This preparation of nitre is a good medicine in burning fevers. *Boer. Chem.*

NOAH's *ark-ſhell*, in natural hiſtory, the name of a kind of ſea ſhell, which authors were always puzzled about referring to any genus, till a late French author has referred it to a new genus he has made under the title cordiformis taking in the bucardia and triangular heart-ſhells. The cabinet of the curious affords us three ſpecies of this ſhell; the common kind, a yellow and white kind, with broad irregular lines, and a variegated kind. *Hiſt. Nat. Eclair.*

NOCTA'MBULI, (*Dict.*)—This is a very ſtrange and remarkable diſtemperature of the imagination, and, in different perſons, differs greatly in degree. Thoſe who are but moderately affected with it, only repeat their actions of the day, and, getting out of the bed, go quietly to the places they frequent at other times; but thoſe who are afflicted with it in the moſt violent degree, go up to dangerous places, and do things that would terrify them to think of, when awake: theſe are by ſome called lunatic night-walkers, becauſe fits are obſerved to return with moſt frequency, and violence, at the changes of the moon.

Cauſes of it. The only material cauſe that can be aſſigned, in this caſe, is a plethora, or over-fulneſs of blood; but this is influenced by an immaterial one, that is, by the fancy, which is buſily employed in dreams about particular objects.

Method of cure. The primæ viæ are firſt to be cleared of all their foulneſſes by a ſtrong purge; after this it is proper to bleed in the foot, taking away eight or ten ounces; then powders compoſed of nitre, cinnabar, and crabs eyes, ſhould be taken three or four times a day, and particular regard ſhould be had to the changes of the moon. It will be proper to ſet a veſſel of water by the bed-ſide, in ſuch a manner that the perſon will naturally ſtep into it on getting out, and be awaked by that means; and, if theſe things fail, a perſon ſhould be ſet up to watch him, and beat him, every time it happens. *Junker's Conſp. Med.*

NOCTU'RNA. The Roman catholics beſtow this name on that part of the church office or prayers, which they alſo call matutina or mattins, which are commonly divided into three nocturns, ſo called, becauſe they were uſed to be ſung only by night; which is ſtill obſerved in ſome cathedral churches, where they ſing their mattins at midnight, in imitation of the primitive Chriſtians, who, by reaſon of the Heathen emperors perſecutions, were forced to meet at nights, which gave their adverſaries occaſion of loading them with moſt abominable calumnies. *F. Simon.*

NOMO'THETÆ, Νομοθέται, among the Athenians, were a thouſand in number, and choſen by lot out of ſuch as had been judges in the court Heliæa. Their office was not (as their name ſeems to imply) to enact new laws by their own authority, for that could not be done without the approbation of the ſenate, and the people's ratification; but to inſpect the old, and, if they found any of them uſeleſs, or prejudicial, as the ſtate of affairs then ſtood, or contradictory to others, they cauſed them to be abrogated by an act of the people. Beſide this, they were to take care that no man ſhould plough, or dig deep ditches, within the Pelaſgian wall; to apprehend the offenders, and ſend them to the archon. *Potter. Archæol. Græc.*

Fracture of the NOSE.—In the Noſe both bone and cartilage are ſubject to fractures, which happen ſometimes on either ſide, and ſometimes in the middle, from blows or falls; if either of the bones in the front of the Noſe are fractured, it produces a flatneſs in the Noſe, and the air meets with obſtructions in its paſſage through the noſtrils; and, if the bone on either ſide is fractured, the part becomes hollow. When the cartilage is diſturbed, the Noſe inclines too much on one ſide. Theſe fractures ſometimes happen without a wound, but more uſually they are attended with a wound of the common integuments. If the injury of the Noſe is very great, the fracture can never be ſo perfectly cured, but that ſome deformity will remain. The vicinity of this part to the brain alſo, which is frequently injured at the ſame time, renders caſes of this kind often dangerous. A caries alſo, or an ozæna, or polypus, are no uncommon attendants on this diſorder. In order to reſtore the bones of the Noſe to their proper ſituation, the patient is to be placed in a ſeat oppoſite to the light, and his head held back by an aſſiſtant. The ſurgeon is to raiſe the depreſſed parts with a ſpatula, a probe, or a quill, applying externally the thumb of one hand, and the fore-finger of the other. If the bones of the Noſe are fractured on both ſides, they are to be on each in this manner, and the cavity of the noſtrils is to be filled up with long doſſils, to prevent the bones from collapſing; covering the part alſo for this end with ſome plaiſter, and applying firſt the dreſſings common to recent wounds. If the bone is fractured into ſeveral ſplinters, they are to be reduced into their proper places by the fingers; but if a ſplinter is ſo entirely ſeparated from the bone, that it will not eaſily unite with it again, it is to be taken out with the forceps. The bones will unite, when properly replaced, in about fourteen days, if no caries or abſceſs intervene. If the bone ſhould require a ſtronger ſupport than what has hitherto been mentioned, one may be formed out of ſtrong paper, either ſingle, or double, and adapted to each ſide of the Noſe, and ſupported by bolſters, and the whole muſt be kept in its place by a four-headed bandage not tied too tight. *Heiſter, Surg.*

NOTA'RICON, the third part of the Jewiſh cabala. Rabbi Nathan, in his great Aruch, ſays, that Notaricon is when a ſingle letter is taken for the ſign of a thing, i. e. for a whole name.—He adds, that the word comes from the Latin notarius, a perſon who writes in notes, or ſhort-hand.—And Rabbi Elias Levita gives the ſame account in his Theſbites, except that, in lieu of one letter for a word, he mentions 2 or 3. But,

But, after all, neither the one nor the other ſeems alone ſufficient: for, as ſingle letters frequently make a word, ſo, in the Notaricon, a whole word ſometimes ſtands for a ſingle letter.

There are therefore two principal kinds of Notaricon: the firſt is, when by aphæreſis, or apocope, the firſt or laſt letter of ſeveral words are joined to make a ſingle word, or phraſe; which therefore is of two kinds, the one initial, the other final: and each is done ſeveral ways, viz. either by taking the letters the common way, or backwards: though there is alſo a third kind, made, as the Rabbins call it, by leaps, i. e. by ſkipping over ſome letters. The firſt of theſe kinds, which the rabbins call raſche theboth, appears very antient; and is ſuppoſed by ſome, well verſed in the Hebrew, to have taken its origin from the pſalms, and other places of ſcripture, proceeding alphabetically; i. e. the firſt verſe beginning with א, the firſt letter of the alphabet; the ſecond with ב, the ſecond letter, &c.

The ſecond kind is alſo very common, and called ſophe theboth, i. e. the end of words. For inſtance, by telling the laſt letters of the words, מ ה שמו מה לי Mihi quodnam nomen eſt. Quodnam? they find the name of God, Jehovah. This becomes ſtill more puerile, when they take the letters backwards.

The third kind is more modern, more groſs, and perplexed: here a letter gives a whole word, inſtead of a word's only giving a letter; ſo that a word ſhall furniſh a whole phraſe.

Thus, for an example, in the firſt word of Geneſis, בראשית bereſchit, is found, "he created the heaven and the earth, "the ſea, the abyſs," &c.

NOTES, in muſic, (*Dict.*)—Of the ſeven muſical Notes, ut, re, mi, fa, ſol, la, ſi; the firſt ſix are aſcribed to Aretine, who is ſaid to have invented them at Pompoſa, in the dutchy of Ferrara. The ſeventh, viz. ſi, was added, according to ſome, by Vander Putten; according to others, by de Muris. It ſerves very good purpoſes, in avoiding the difficulty of the diviſions remaining in Guido's ſcale.

Indeed Voſſius will not allow Guido the honour of inventing any of them, but ſhews the Egyptians had uſed them long before him; in which he is confirmed by the teſtimony of Halicarnaſſeus: however, common fame aſcribes to him not only the notes, but alſo the lines, letters, or cleffs, flats, and ſharps.

The Notes ut, re, mi, &c. he is ſaid to have taken from a hymn, in the veſpers of St. John Baptiſt, Ut queant laxis reſonare fibris, &c.

Hitherto, the Notes only ſerved to expreſs the degrees of tune: they were all of equal value as to time, till about the year 1330, when John de Meurs, or de Muris, a doctor of Paris, gave different figures to the ſeveral points, to expreſs the quantity of time each was to be dwelt upon.

There are three things to be conſidered in theſe Notes. 1ſt, The quantity, i. e. the ſize and figure of the head. 2dly, The quality, i. e. the colour of the head, whether it be white or black, full or open. 3dly, The properties, as the Italians expreſs themſelves; viz. whether the Note is accompanied with a virgula, or comma, or not. It muſt likewiſe be conſidered whether the Notes be ſeparate and diſtinct, or bound together.

The ſeveral muſical Notes are, the large, which contains 8 meaſures; though Merſennus and ſeveral others make it 12; the long, containing 4 meaſures; the breve, containing 2; the ſemibreve, containing 1; the minim, $\frac{1}{2}$; the crotchet, $\frac{1}{4}$; the quaver, $\frac{1}{8}$; the ſemiquaver, $\frac{1}{16}$; and the demiſemiquaver, $\frac{1}{32}$.

Uſually we only diſtinguiſh ſix principal Notes, repreſented by as many different characters; viz. the ſemibreve, equal to two minims; the minim, equal to two crotchets; the crotchet, equal to two quavers; the quaver, equal to two demiquavers; and the ſemiquaver, equal to two demiſemiquavers.

The mathematicians compute, that one may make 720 changes, or varieties, with ſix Notes, without ever repeating the ſame twice; and that of the Notes of each octave one may make 40320 different tunes or ſongs.

NOVE'MVIRI, (*Dict.*) — Theſe nine magiſtrates of Athens government laſted but for one year; the firſt of which number was called archon, or prince; the ſecond baſileus, or king; the third polemarchus, or general of the army; and the ſix others were called the ſmothetæ or legiſlators. They took an oath exactly to obſerve the laws, and, in caſe of failure, obliged themſelves to beſtow upon the commonwealth a golden ſtatue as big as themſelves. Thoſe who diſcharged their office with honour, were afterwards received into the number of the ſenators of the Areopagus. *Plutarchus in Solon. & Pericle.*

NOVENDIA'LE, (*Dict.*)—This ſacrifice the Romans continued for nine days to divert the miſchiefs wherewith they were threatened by prodigy, and to appeaſe the anger of the Gods, in caſe the ſenate ſent an order to the high prieſt or prætor of the city, for the obſervation of this ſolemnity. Tullus Hoſtilius, the fourth king of Rome, was the firſt inſtitutor of theſe ſacrifices, after he had been informed of the prodigious hail which fell upon mount Aban, in the country of Latium, the bigneſs and hardneſs whereof made them to be taken for ſtones. *Titus Livius.*

NOVE'NSILES, certain Gods thus called by the Romans, either becauſe they were of ſhort ſtanding, or nine in number, as Health, Fortune, Veſta, Hercules, Romulus, Æſculapius, Bacchus, Æneas, and Faith; or, that they thought they preſided over novelties and changes. Others will have it, that was a name given to the nine muſes. *Lib. Gyrald. de Syntagm. Deor.*

NUAY'HAS, *the ague-tree*, a name given by the Indians to a ſort of bamboe cane, the leaves of which, falling into the water, are ſaid to impregnate it with ſuch virtue, that the bathing in it afterwards will cure the ague.

They uſe alſo a decoction of the leaves to diſſolve coagulated blood, giving it internally, and, at the ſame time, rubbing the bruiſed part externally with it. It is ſaid that this plant bears its flowers only once in its life, that it lives ſixty years before theſe appear, but that, when they begin to ſhew themſelves, it dies away in about a month afterwards, that is, as ſoon as it has ripened the ſeed; and from theſe ſeed only the vegetable can be propagated.

NUDIPEDA'LIA, ſacrifices which the Jews ſolemniſed with their bare feet, to be delivered from ſome great incumbent affliction. After having continued their prayers for thirty days together, and abſtained from wine, they ſhaved their heads, and went bare-foot to the temple, and offered their ſacrifices. The Jews finding themſelves oppreſſed by Florus, governor of Judea, for the emperor Nero, celebrated this bare-foot ceremony with extraordinary ſolemnity; Berenice, king Agrippa's ſiſter, accompanying them therein, and appearing alſo bare-foot in behalf of the Jews, before the tribunal of Florus, but without ſucceſs. Joſeph de Bello Judaic. S. Hieron. adverſ. Jovinian. The Greeks, Romans, and other nations alſo obſerved the like ſolemnities, as Tertullian informs us in his Apologetic.

NUM'BER, (*Dict.*)—*Figurate* NUMBERS. Thoſe of the firſt order are 1, 1, 1, 1, &c. Thoſe of the ſecond order the ſucceſſive ſums of thoſe of the firſt order, viz. 1, 2, 3, 4, 5, &c. and form an arithmetical progreſſion. Thoſe of the third order are the ſucceſſive ſums of thoſe of the ſecond, viz. 1, 3, 6, 10, 15, and are the triangular Numbers. Thoſe of the fourth order are the ſucceſſive ſums of the third, viz. 1, 4, 10, 20, 35, and are the pyramidal numbers, and ſo on.

The figurate numbers of any order may be found without computing thoſe of the preceding orders, by taking the ſucceſſive products of as many of the numbers 1, 2, 3, 4, 5, &c. in their natural order, as there are units in the Number, which denominates the order of figurates required, and dividing thoſe products always by the firſt product. Thus the triangular numbers are found by dividing the products 1×2, 2×3, 3×4, 4×5, 5×6, &c. each by the firſt product 1×2. The pyramids alſo are found by dividing the products, $1 \times 2 \times 3$, $2 \times 3 \times 4$, $3 \times 4 \times 5$, $4 \times 5 \times 6$, &c. each by $1 \times 2 \times 3$. In general, the figurate numbers of any order denoted by M are found by ſubſtituting ſucceſſively 1, 2, 3, 4, 5, &c. in the place of x in the general expreſſion $\frac{x \,.\, x+1 \,.\, x+2 \,.\, x+3, \ \&c.}{1. \quad 2. \quad 3. \quad 4. \quad \&c.}$ where the factors in the numerator and denominator are ſuppoſed to be multiplied by each other, and to be continued, till the Number in each be equal to that which expreſſes the order of the figurates required, diminiſhed by unity. And, when a figurate Number of any order is divided by the correſponding figurate of any higher order, the numerator of the quotient is invariable, and x. is in its denominator of as many dimenſions as there are units in the difference of the numbers that denote thoſe orders.

NUME'RIA, a Heathen goddeſs preſiding over numbers and accounts. *Auguſtin. de Civit. Dei.*

NUMMULA'RIA, *moneywort*, in botany, a genus of plants whoſe characters are:

The leaves are orbicular and conjugated; the calyx is quinquefid, incloſing a ſeminal veſſel, and conſiſting of five long ſlender ſegments, which expand themſelves in form of a ſtar. The flower is monopetalous, rotated, quinquefid, being cut even to the nail, or unguis, and furniſhed with five ſtamina, which, ariſing from the circumference of the baſe of the flower, grow together into one, in proceeding from the wings of the leaves. The placenta is ſeated in the bottom of the calyx, and on it grows the ovary, which becomes a round veſſel cloſely lodged within the calyx, and ſhooting forth a long tube.

Its leaves are ſouriſh, ſtyptic, and give a deep red tincture to blue paper: the acid abounds in the moneywort, and produces with the earth an aluminous ſalt, involved in a little oil, ſo that it is very aſtringent and vulnerary. Camerarius affirms, that, being boiled with milk, it is good for the ſcurvy. Fragus adviſes to boil it with wine and honey, and to give the decoction to drink to thoſe that have an ulcer in the lungs. The ſame author commends it in the dyſentery, loſs of blood, and the whites. Fuchſius preſcribes the herb, applied as a cataplaſm, to dry up ulcers. Matthiolus ſays it is very good for ruptures in children. *Martyn's Tournefort.*

NUN, in zoology, the common Engliſh name for the parus cæruleus, or blue tit-mouſe, diſtinguiſhed from the common by by its having a blue head, ſurrounded by a white line. *Roy's Ornithol.*

Nun, is alſo the name of a peculiar ſpecies of pigeon, called by Moore the columba veſtalis. It is but a ſmall pigeon, but ſomething larger than the jacobine, and has a very particular plumage, from which it has taken its name, its head being as it were covered with a veil.

The body of this ſpecies is all white; the head, tail, and ſix of the flight feathers black, red, or yellow; the eyes are pearl coloured, and the hood white: this is a large tuft of feathers on the hinder part of the head, and, the more numerous they are, the more the bird is eſteemed.

This is a very beautiful ſpecies of pigeon, and is very much eſteemed. Some of its feathers, however, will vary ſometimes from their true colour. Theſe birds are called foul-feathered. But it is a mere accidental variety, the young of ſuch being often as perfect and beautiful as of any others. *Moore's Columbarium.*

NU'RSERY, in gardening (*Dict.*) — Of this ſort there are great numbers in the different parts of this kingdom, but particularly in the neighbourhood of London, which are occupied by the gardeners, whoſe buſineſs it is to raiſe trees, plants, and flowers for ſale; and in many of theſe there is at preſent a much greater variety of trees and plants cultivated than can be found in any other part of Europe. In France, their Nurſeries (which are but few, when compared with thoſe in England) are chiefly confined to the propagation of fruit-trees, from whence they have the appellation of pepinier. For there is ſcarce any of thoſe gardens, where a perſon can be ſupplied either with ever-greens, flowering ſhrubs, or foreſt-trees. And, in Holland, their Nurſeries are principally for flowers: ſome few of them indeed propagate tender exotic plants. But thoſe Nurſeries in the neighbourhood of London do, ſeveral of them, include all theſe; and from hence moſt of the curious perſons abroad are ſupplied with furniture for their gardens. But I do not propoſe, in this place, to treat of theſe extenſive Nurſeries, or to give a deſcription of them; therefore ſhall confine myſelf to treat of ſuch Nurſeries only as are abſolutely neceſſary for all lovers of planting to have upon the ſpot, where they deſign to make their plantation. For, if theſe are large, the expence of carrying a great number of trees, if the diſtance is great, will be no ſmall article, beſides the hazard of their growing; which, when plants have been trained up in good land, and removed to an indifferent one, is very great. Therefore it is of the utmoſt conſequence to every planter, to begin by making of a Nurſery. But in this article I muſt beg leave to obſerve, that a Nurſery ſhould not be fixed to any one particular ſpot: I mean by this, that it would be wrong to continue the raiſing of trees any number of years upon the ſame ſpot of ground; becauſe hereby the ground will be ſo much exhauſted by the trees, as to render it unfit for the ſame purpoſe. Therefore all good Nurſery-gardeners ſhift and change their land, from time to time; for, when they have drawn off the trees from a ſpot of ground, they either plant kitchen herbs, or other things, upon the ground for a year or two, by which time, as alſo by dunging and trenching of the land, it is recovered, and made fit to receive other trees. But this they are obliged to from neceſſity, being confined to the ſame land; which is not the caſe with thoſe gentlemen, who have a large extent of ground in the country. Therefore all ſuch perſons I would adviſe to make Nurſeries upon the ground which is intended for planting, where a ſufficient number of the trees may be left ſtanding, after the others have been drawn out, to plant in other places; which, for all large-growing trees, but particularly ſuch as are cultivated for timber, will be found by much the moſt advantageous method: for all thoſe trees which come up from the ſeed, or which are tranſplanted very young into the places where they are deſigned to remain, will make a much greater progreſs, and become larger trees, than any of thoſe which are tranſplanted at a greater age. Therefore the Nurſeries ſhould be thinned early, by removing all thoſe trees which are intended for other plantations, while they are young; becauſe hereby the expence and trouble of ſtaking, watering, &c. will be ſaved, and the tree will ſucceed much better. But in expoſed ſituations, where there are Nurſeries made, it will be neceſſary to permit the trees to ſtand much longer, that, by growing cloſe together, they may ſhelter each other, and draw themſelves up: and theſe ſhould be thinned gradually, as the trees advance; for, by taking away too many at firſt, the cold will check the growth of the remaining trees. But then thoſe trees which are taken out from theſe Nurſeries, after a certain age, ſhould not be depended on for planting; and it will be prudence rather to conſign them for fuel, than by attempting to remove them large, whereby, in endeavouring to get them up with good roots, the roots of the ſtanding trees will be often much injured.

What has been here propoſed, muſt be underſtood for all large plantations in parks, woods, &c. but thoſe Nurſeries which are only intended for the raiſing of ever-greens, flowering ſhrubs, or plants which are deſigned to embelliſh gardens, may be confined to one ſpot, becauſe a ſmall compaſs of ground will be ſufficient for this purpoſe. Two or three acres of land, employed this way, will be ſufficient for the moſt extenſive deſigns; and one acre will be full enough for thoſe of moderate extent. And ſuch a ſpot of ground may be always employed for ſowing the ſeeds of foreign trees and plants; as alſo, for raiſing many ſorts of biennial and perennial flowers, to tranſplant into the borders of the pleaſure garden; and for raiſing many kinds of bulbous-rooted flowers from ſeeds; whereby a variety of new ſorts may be obtained annually, which will recompenſe for the trouble and expence, and will moreover be an agreeable diverſion to all thoſe perſons who delight in the amuſements of gardening.

Such a Nurſery as this ſhould be conveniently ſituated for water: for, where that is wanting, there muſt be an expence attending the carriage of water in dry weather. It ſhould alſo be as near the houſe as it can with conveniency be admitted, in order to render it eaſy to viſit at all times of the year; becauſe it is abſolutely neceſſary, that it ſhould be under the inſpection of the maſter; for, unleſs he delights in it, there will be little hopes of ſucceſs. The ſoil of this Nurſery ſhould alſo be good, and not too heavy and ſtiff; for ſuch land will be very improper for ſowing moſt ſorts of ſeeds; becauſe, as this will detain the moiſture in the ſpring and winter, ſo the ſeeds of moſt tender things, eſpecially of flowers, will rot in the ground, if ſown early. Therefore, where perſons are confined to ſuch land, there ſhould be a good quantity of ſand, aſhes, and other light manures buried, in order to ſeparate the parts, and pulveriſe the ground; and, if it is thrown up in ridges, to receive the froſt in winter, it will be of great uſe to it; as will alſo the frequent forking or ſtirring of the ground, both before and after it is planted.

The many advantages which attend the having ſuch a Nurſery, are ſo obvious to every perſon who has turned his thoughts in the leaſt to this ſubject, that it is needleſs for me to mention them here: and, therefore, I ſhall only beg leave to repeat here what I have frequently recommended, which is, the carefully keeping the ground always clear from weeds: for, if theſe are permitted to grow, they will rob the young trees of their nouriſhment. Another principal buſineſs is, to dig the ground between the young plants at leaſt once a year, to looſen it for the roots to ſtrike out: but, if the ground is ſtiff, it will be better to be repeated twice a year, viz. in October and March; which will greatly promote the growth of the plants, and prepare their roots for tranſplanting.

The ground you intend for the flower Nurſery ſhould be well ſituated to the ſun, but defended from ſtrong winds by plantations of trees, or buildings; and the ſoil ſhould be light and dry, which muſt always be obſerved, eſpecially for bulbous-rooted flowers, which are deſigned to be planted therein.

In this Nurſery ſhould be planted the off-ſets of all your bulbous-rooted flowers, where they are to remain until they become blowing roots; when they ſhould be removed into the pleaſure garden, and planted either in beds or borders, according to the goodneſs of the flowers, or the management they require.

You may alſo, in this ground, raiſe the ſeveral ſorts of bulbous-rooted flowers from ſeeds, by which means new varieties may be obtained; but moſt people are diſcouraged from ſetting about this work, from the length of time before the ſeedlings will come to flower: however, after a perſon hath once begun, and conſtantly continued ſowing every year, after the parcel firſt ſown has flowered, the regular ſucceſſion of them, coming annually to flower, will not render this method ſo tedious as it at firſt appeared.

The ſeedling auricula's, polyanthus's, anemonies, carnations, &c. ſhould be raiſed in this Nurſery, where they ſhould be preſerved until they have flowered; when you ſhould mark all ſuch as are worthy of being tranſplanted into the flower garden; which ſhould be done in their proper ſeaſons: for it is not ſo well to have all theſe ſeedling flowers expoſed to public view in the flower garden; becauſe it always happens, that there are great numbers of ordinary flowers produced among them, which will make but an indifferent appearance in the pleaſure garden. *Miller's Gard. Dict.*

NYCTE'LIA, feaſts in honour of Bacchus, ſo called, becauſe they were celebrated in the night; from the Greek word νὺξ, which ſignifies night, and τελεῖν, to ſacrifice, or perform any religious ceremony. Theſe feaſts were celebrated every three years, in the beginning of the ſpring, by night, with flambeaux and drinking, and accompanied with the worſt of inſolences and impurities; wherefore, alſo, the Romans forbad the ſolemniſing of them, becauſe of the horrid diſorders committed at them. *S. Auguſt. de Civitate Dei. Dempſter Paralipom. in Roſin. Antiq.*

NYC'TEUS, the ſon of Neptune by Celene, daughter of Atlas. He had two daughters, Antiope and Nyctimene, by Amalthæa, a nymph of Crete; Nyctimene, by the help of an old nurſe, as the ſtory goes, lay with her own father: but, the thing coming to be known, the father would have ſlain his daughter, had not Minerva out of pity turned her into an owl. *Propert. Ovid.*

NY'MPHA (*Dict.*)—*Nymphs of flies*, in natural hiſtory, is that ſtate of the fly-claſs, which is between their living in the form of a worm, and their leaving that form for that of their parent fly.

In this ſtate, in many genera of the flies, the worm, or maggot,

got, makes a ſhell of its own ſkin, which hardens, and becomes brown, or reddiſh, while the whole of its body becomes detached from it; and, after having lain ſome time in the form of an oblong ball, without any viſible parts of the creature that is to be produced from it, acquires, by degrees, the form of the fly, and all its limbs, and appears an embryo fly wrapped up in an extremely thin and fine membrane. This is properly the nymph ſtate, and, in theſe flies, when the parts of this nymph are more confirmed, and hardened, it is, in reality, no other than the fly wrapped up in this bag, which is ſo very tranſparent that every lineament of the inſect it contains may be clearly diſcerned through it. The wings, however, in this ſtate, appear as if they were not yet perfectly formed, but the truth is, that they are only very nicely and regularly folded together. The creature, however, in this ſtate, though ever ſo perfect, ſeems quite inanimate. When all the parts, however, have acquired their due ſtrength, the creature puts itſelf into motion, and gets looſe from its covering, which is no ſmall difficulty; for, though the ſkin of this is very fine and thin, yet, as it ſerves as a nice caſe to every part of the animal, the effects by which it is to get rid of it muſt be ſomewhat difficult to the creature. A much greater difficulty, however, it will neceſſarily be imagined to be for the embryo fly to get out of the outer ſhell, or caſe, which is uſually firm, hard, and rigid; but nature has ſo ordered it, that no more force ſhall be required for this great work than the creature is able to exert. One of the two ſorts of ſhells of theſe inſects, the one in form of an egg, and the other of the worm itſelf, are the two ways for the fly's egreſs.

For the firſt of theſe, it is always from the ſame end of the ſhell, in form of an egg, that the embryo fly is ſeen to make its way out. This is always that end which is near the head of the fly, and which was, originally, the head of the worm.

The head of the fly, however, is provided with no inſtrument to make this great opening. The point of the trunk is yet very ſoft, and, even when at its utmoſt hardneſs, it could only make a very ſmall and, in a manner, imperceptible hole. Nature has furniſhed the creature with another means of freeing itſelf from this ſhell. The cap at the top of this is made, as it were, of two halves, and they ſo looſely attached both to one another, and to the other part of the ſhell, that they very readily ſeparate with a ſmall force, and fall off from it. But this is not all; for, in every one of theſe ſhells, towards the joining on of the cap to the head part, there are two ribs, or prominent lines, diametrically oppoſite to one another, and reaching to ſome diſtance in the ſhell. Theſe ſeem formed to ſtrengthen the ſhell, but are, in reality, intended to weaken it, and are the places at which it not only eaſieſt breaks, but even ſplits and opens with a ſmall force. This, with the falling off the cap, gives ſufficient room of egreſs to the fly, and may be eaſily diſcovered to be intended ſo to ſeparate by nature itſelf; ſince, in breaking any other parts of the ſhell, it cracks irregularly and indeterminately, but here it ſeparates only at theſe lines.

It is eaſy, indeed, for us by a ſlight force to ſeparate the two pieces of the cap of the ſhell in theſe caſes, and a ſmall force does it; but this, though ſmall to us, is great in proportion to the ſtrength and circumſtances of the nymph, incloſed as it is on all ſides.

The ſkull of the fly to be conſidered, however, is ſolid and cruſtaceous, and of a conſtant and regular figure, as in other larger animals; yet, the fly, in this ſtate, is able to inflate and contract its head alternately, and by that means effects much of the great buſineſs of its liberty. This, extending the bulk of the head, is aſſiſted by a ſort of bladder, which the creature, at each of theſe inflations, puſhes out to ſome diſtance from its head, and which, ſometimes, even equals the head itſelf in ſize.

The air is the only means by which the fly can, in this manner, inflate and ſwell its head; and, when neceſſary, it ſwells its whole body in the ſame manner. The inflation of the head, and the throwing out this ſort of bladder, which is an operation the fly is never able to do afterwards through its whole life, are evidently meant to diſlodge and throw off the cap, and open the ſide lines of the ſhell. *Reamur, Hiſt. Inſect.* Vol. IV.

NYMPHÆ'A, *the water-lily*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of ſeveral petals arranged in a circular form; the ſeed veſſel ariſes from the cup of the flower, and is, when ripe, of a globoſe or conic figure, multicapſular, and filled with oblong ſeeds.

The beſt method to propagate theſe plants is, to procure ſome of their ſeed veſſels, juſt as they are ripe, and ready to open: theſe ſhould be thrown into canals, or large ditches of ſtanding water, where the ſeeds will ſink to the bottom; and, the following ſpring, the plants will appear floating upon the ſurface of the water, and, in June and July, will produce their beautiful large flowers. When they are once fixed to the place, they will multiply exceedingly, ſo as to cover the whole ſurface of the water in a few years.

In ſome ſmall gardens, I have ſeen theſe plants cultivated in large troughs of water, where they have flouriſhed very well, and have annually produced great quantities of flowers; but as the expence of theſe troughs is pretty great (their inſides requiring to be lined with lead, to preſerve them) ſo there are few people who care to be at that charge. *Miller's Gard. Dict.*

The plant is of a nitrous, paregoric, aperitive, moiſtening, refrigerating, and ſomewhat narcotic quality. The juice is drank in inflammations of the kidney and bladder. Of the flowers is prepared an oil, which has the ſame virtue as oil of olives, or oil of roſes. The leaves, bruiſed, make an excellent cataplaſm for inflamed parts; and a decoction of the roots and flowers is beneficial in burning fevers, by refrigerating; and the more, if the ſame remedy be applied to the ſoles of the feet and the groins. Of the expreſſed juice of the ſtalks, leaves, and fruit, boiled, is prepared a ſyrup, which is a moſt efficacious remedy for a gonorrhœa, and not the leſs proper when the diſorder is attended with an immoderate heat; for it was always a celebrated medicine for heat of urine. This ſyrup partakes ſomewhat of a narcotic quality, and is, therefore, extolled as a ſpecific in want of ſleep; it, alſo, prevents nocturnal pollutions, and extinguiſhes thirſt. *Hiſt. Plant. adſcript. Boerhaave.*

NYMPHÆ'UM, the name given to a ſort of public baths in the city of Rome, of which there were twelve in number; they were places of pleaſure, adorned with pleaſant fountains, cool grotto's, and curious ſtatues of nymphs, which were very delightful. Hiſtory tells us of many places of this kind that were built in Rome and Conſtantinople, but are now ruined by length of time. Only there is a building ſtill to be ſeen of this kind between Naples and mount Veſuvius in Italy. It is all of marble, and of a ſquare figure, and hath only one gate of entrance, which by ſome ſteps leads down to a large grotto paved with marble of divers colours, and the walls are all covered with ſhell work, in a curious manner repreſenting the twelve months of the year, and the four cardinal virtues. The water of a curious fountain, at the entry of the grotto, fills a canal that ſurrounds the place; and the whole is adorned with the ſtatues and pictures of divers nymphs, and abundance of other pleaſant figures. *Roſin. Ant. Rom.*

NYMPHOI'DES, in botany, the name of a genus of plants, approaching to the nature of the water-lily, or nymphæa, in external appearance, and thence uſually eſteemed a ſpecies of that genus, but improperly.

The characters of this genus of plants are theſe: the flower conſiſts of one leaf, uſually of a rotated form, and divided into ſeveral ſegments at the edge. The piſtil ariſes from the cup, and perforates the bottom of the flower, and finally ripens into a ſoft fruit, or capſule, of an oblong, compreſſed figure, having only one cell, and containing many ſeeds wrapped up in a calyptra.

O.

OAK (*Dict.*)— The characters are:

All the sorts of Oaks are propagated from acorns, which should be sown as soon as possible after they are ripe; for, if they are kept too long out of the ground, they seldom grow.

The manner of sowing these acorns, if designed for a small plantation, or to be removed, is, to prepare some beds of fresh earth, neither too strong and heavy, nor too light and dry; in these beds you should place the acorns in rows one foot asunder, and about two inches distance in the rows, covering them about two inches thick with the same fresh earth; observing to leave none of them uncovered, to entice the vermin, which may, in a short time, destroy all the seeds.

In the spring, when the plants begin to appear, you must carefully clear them from weeds; and, if the season proves dry, you should refresh them now-and-then with a little water, which will greatly promote their growth. In these beds the plants should remain until the following autumn, observing constantly to keep them clear from weeds; at which time you should prepare a spot of good fresh earth, in size proportionable to the quantity of plants, which should be trenched and levelled: then, towards the middle or latter end of October, you should carefully take up the plants, so as not to injure their roots, and plant them out in rows three feet asunder, and eighteen inches distance plant from plant; observing never to suffer the plants to abide long out of the ground, because their roots would dry, and endanger the growth of the plants.

When they are planted, you should lay a little mulch upon the surface of the ground, near their roots, to prevent the earth from drying too fast; and, if the season should prove very dry, you should give them a little water, to settle the earth to their roots.

When the plants have taken root in this nursery, they will require little more care than to keep them clear from weeds, and dig the ground between the rows every spring; in doing of which, you should cut off such roots as extend very far from the trunk of the trees, which will render them better for transplanting again: you should also prune off such side-branches as extend themselves very far, and would retard the upright shoot: but you should by no means cut off all the small lateral branches, some of which are absolutely necessary to be left on, to detain the sap for the augmentation of the trunk; for I have often observed, where trees have been thus closely pruned, that their heads have overgrown their bodies, so that they have bent downward and become crooked.

When these trees have remained in the nursery three or four years, they will then be large enough to transplant to the places where they are to remain; for it is not proper to let them grow very large before they are planted out; because these are very hazardous trees to remove when old, or after they have taken deep root.

The season for this work is, as I said before, in the autumn; at which time, if they are carefully taken up, there will be little danger of their succeeding. When they are planted, the surface of the ground should be mulched about their roots, to prevent its drying too fast: and, if the season is very dry, they should be watered, to settle the earth to their roots, which may be repeated two or three times in very dry weather: but you must carefully avoid giving them too much water, which is very injurious to these trees, when newly removed.

You should also stake them to prevent their being shaken and disturbed by the winds, which would retard their rooting. In transplanting of these trees, you should by no means cut their heads, which is too much practised: all that should be done, must be only to cut off any bruised or ill-placed branches, which should be taken off close to the place where they are produced: but there can be no greater injury done to these trees, than to shorten their shoots; for, when the leading bud, which is absolutely necessary to draw and attract the nourishment, is taken off, the branch often decays intirely, or, at least, down to the next vigorous bud.

The trees, thus raised and managed, will, if planted in a proper soil, grow to a considerable magnitude, and are very proper for a wilderness in large gardens, or to plant in clumps in parks, &c. but, if they are designed for timber, it is much the better method to sow the acorns in the places where they are to remain; in order to which, you should provide yourself in autumn with a sufficient quantity of acorns, which should be always taken from straight, upright, vigorous-growing trees; these should be gathered from under the trees as soon as may be after they are fallen, and, if possible, in a dry time, laying them thin in some open room to dry; after which they may be put in dry sand, and preserved in a dry place until the end of November, when you should prepare the ground for planting them.

The directions here given are designed only for small plantations in a garden or park, which are only for pleasure: but, where these trees are cultivated with a view to profit, the acorns should be sown where the trees are designed to grow; for those which are transplanted will never grow to the size of those which stand where they are sown, nor will they last near so long sound. For, in some places, where these trees have been transplanted with the greatest care, and they have grown very fast for several years after, yet, they are now decaying, when those which remain in the place where they came up from the acorns, are still very thriving, and have not the least sign of decay. Therefore, whoever designs to cultivate these trees for timber, should never think of transplanting them, but sow the acorns on the same ground where they are to grow; for the timber of all those trees which are transplanted, is not near so valuable as that of the trees from acorns. I shall therefore add some plain directions for the sowing of acorns, and managing of the young trees, during their minority, until they are out of danger, and require no farther care.

The first thing to be done is that of fencing the ground very well, to keep out cattle, hares, and rabbits; for, if either of these can get into the ground, they will soon destroy all the young trees. Indeed, they will in a few years grow to be out of danger from the hares and rabbits; but it will be many years before they will be past injury from cattle, if they are permitted to get into the plantation; therefore, durable fences should be put round the ground. If, in the beginning, a pale fence is made about the land, which may be close at the bottom, and open above; and within the pale a quick-hedge planted; this will become a good fence, by the time the pale decays, against all sorts of cattle; and then the trees will have got above the reach of hares and rabbits, so that they cannot injure them; for the bark of the trees will be too hard for them to gnaw.

After the ground is well fenced, it should be prepared, by plowing of it three or four times, and, after each plowing, to harrow it well, to break the clods, and cleanse the ground from couch, and the roots of all bad weeds. Indeed, if the ground is green sward, it will be better to have one crop of beans, pease, or turneps, off the ground, before the acorns are sown, provided these crops are well hoed to stir the surface, and destroy the weeds: for, if this is observed, the crop will mend and improve the land for sowing; but, in this case, the ground should be plowed as soon as possible, when the crop is taken off, to prepare it for acorns; which should be sown as soon as may be after the acorns are ripe: for, although these may be preserved in sand for some time, yet they will be apt to sprout; and, if so, the shoots are in danger of being broken and spoiled: therefore, I should advise the sowing early, which is certainly the best method.

In making choice of the acorns, all those should be preferred, which are taken from the largest and most thriving trees: and those of pollard trees should always be rejected, though the latter are generally the most productive of acorns; but those of the large trees commonly produce the strongest and most thriving plants.

The season for the sowing of the acorns being come, and the ground having been plowed, and levelled smooth, the next work is to sow the acorns; which must be done by drawing of drills across the ground, at about four feet asunder, and two inches deep; into which the acorns should be scattered, at two inches distance. These drills may be drawn either with a drill plough, or by hand, with an hoe; but the former is the most expeditious method, therefore, in large plantations should be preferred. In the drawing of the drills, if the land has any slope to one side, these should be made the same way as the ground slopes, that there may be no stoppage of the wet by the rows of plants crossing the hanging of the land. This should be particularly observed in all wet ground, or where the wet is subject to lie in the winter. When the acorns

are

are ſown, the drills ſhould be carefully filled in, ſo as to cover the acorns ſecurely; for, if any of them are expoſed, they will entice the birds and mice; and, if either of theſe once attack them, they will make great havock with them.

The reaſon of my directing the drills to be made, at this diſtance, is for the more convenient ſtirring of the ground between the rows, to keep the young plants clean from weeds: for, if this is not carefully done, it cannot be expected, that the young plants ſhould make much progreſs; and yet this is generally neglected by many who pretend to be great planters, who are often at a large expence to plant, but ſeldom regard them after: ſo that the young plants have the difficulty to encounter the weeds, which frequently are four or five times the height of the plants, and not only ſhade and draw them, but alſo exhauſt all the goodneſs of the ground, and conſequently ſtarve the plants. Therefore, whoever hope to have ſucceſs in their plantations, ſhould determine to be at the expence of keeping them clean for eight or ten years after ſowing, by which time the plants will have obtained ſtrength enough to keep down the weeds: the neglecting of this has occaſioned ſo many young plantations to miſcarry, as are frequently met with in divers parts of England.

About the end of March, or beginning of April, the young plants will appear above ground; but, before this, if the ground ſhould produce many young weeds, it will be good huſbandry to ſcuffle the ſurface over with Dutch hoes, in a dry time, either the latter end of March, or the beginning of April, to deſtroy the weeds, whereby the ground will be kept clean, until all the plants are come up ſo as to be plainly diſcerned; by which time it may be proper to hoe the ground over again; for, by doing it early, while the weeds are ſmall, a man will perform more of this work in one day than he can in three or four, when the weeds are grown large: beſides, there will be great hazard of cutting off or injuring the young plants, when they are hid by the weeds; and ſmall weeds, being cut, are ſoon dried up by the ſun; but large weeds often take freſh root, and grow again, eſpecially if rain ſhould fall ſoon after, and then the weeds will grow the faſter for being ſtirred; therefore, it is not only the beſt method, but alſo the cheapeſt huſbandry, to begin cleaning early in the ſpring, and to repeat it as often as the weeds are produced.

The firſt ſummer, while the plants are young, it will be the beſt way to perform theſe hoeings by hand; but afterwards it may be done with the hoe-plough; for, as the rows are four feet aſunder, there will be room enough for this plough to work; and, as this will ſtir and looſen the ground, it will be of great ſervice to the plants: but there will require a little hand labour where the plough is uſed, in order to deſtroy the weeds, which will come up in the rows between the plants; for theſe will be out of the reach of the plough, and, if they are not deſtroyed, they will ſoon overgrow and tear down the young plants.

After the plants have grown two years, it will be proper to draw out ſome of them, where they grow too cloſe; but, in the doing of this, great care ſhould be had not to injure the roots of thoſe left; for, as the plants which are drawn out are only fit for plantations deſigned for pleaſure, ſo theſe ſhould not be ſo much regarded in their being removed, as to ſacrifice any of thoſe which are deſigned to remain. In the thinning of theſe plantations, the plants may, at the firſt time, be left about one foot aſunder, which will give them room enough to grow two or three years longer: by which time it may be eaſy to judge which are likely to make the beſt trees. Therefore theſe may be then fixed on, as ſtandards, to remain: though it will be proper to have a greater number at this time marked than can be permitted to grow, becauſe ſome of them may not anſwer the expectation: and, as it will be improper to thin theſe trees too much at one time, ſo the leaving double the number intended at the ſecond thinning will not be amiſs. Therefore, if they are then left at about four feet diſtance in the rows, they will have room enough to grow three or four years longer: by which time, if the plants have made good progreſs, their roots will have ſpread over the ground; therefore it will be proper to take up every other tree in the rows. But, by this, I do not mean to be exact in the removing, but to make choice of the beſt plants to ſtand, whichever rows they may be in, or if they ſhould not be exactly at the diſtance here aſſigned: all that is deſigned here, is, to lay down general rules, which ſhould be as nearly complied with as the plants will permit: therefore every perſon ſhould be guided by the growth of the trees in the performance of this work.

When the plants have been reduced to the diſtance of about eight feet, they will not require any more thinning. But, in two or three years time, thoſe which are not to remain will be fit to cut down, to make ſtools for underwood; and thoſe which are to remain, will have made ſuch progreſs as to become a ſhelter to each other; for this is what ſhould be principally attended to, whenever the trees are thinned: therefore, in all ſuch places which are much expoſed to the wind, the trees ſhould be thinned with great caution, and by ſlow degrees: for, if the air is let too much at once into the plantation, it will give a ſudden check to the trees, and greatly retard their growth; but, in ſheltered ſituations, there need not be ſo great caution uſed as in thoſe places; the plants will not be in ſo much danger of ſuffering.

The diſtance which I ſhould chuſe to allow to thoſe trees which are deſigned to remain for timber, is, from twenty-five to above thirty feet, which will not be too near, where the trees thrive well; in which caſe their heads will ſpread, ſo as to meet in about thirty or thirty-five years: nor will this diſtance be too great, ſo as to impede the upright growth of the trees. This diſtance is intended that the trees ſhould enjoy the whole benefit of the ſoil. Therefore, after one crop of the underwood, or, at the moſt, two crops are cut, I would adviſe the ſtubbing up the ſtools, that the ground may be intirely clear, for the advantage of the growing timber, which is what ſhould be principally regarded: but, in general, moſt people have more regard for the immediate profit of the underwood than the future good of the timber, and, frequently, by ſo doing, ſpoil both: for, if the underwood is left after the trees have ſpread ſo far as that their heads meet, the underwood will not be of much worth; and yet, by their ſtools being left, they will draw away a great ſhare of nouriſhment from the timber trees, and retard them in their progreſs.

The ſoil in which Oak makes the greateſt progreſs, is a deep rich loam, in which the trees grow to the largeſt ſize; and the timber of thoſe trees which grow upon this land, is generally more pliable than that which grows on a ſhallower or drier ground; but the wood of the latter is much more compact and hard. Indeed there are few ſoils in England in which the Oak will not grow, provided there is proper care taken in their cultivation; though this tree will not thrive equally in all ſoils: but yet it might be cultivated to a national advantage upon many large waſtes in many parts of England, as alſo to the great profit of the eſtates where theſe tracts of land now lie uncultivated, and produce nothing to the owner. And, ſhould the preſent temper of deſtroying the timber of England continue in practice ſome years longer, in the ſame degree which it has for ſome years paſt, and as little care be taken to raiſe a ſupply, this country, which has been ſo long eſteemed for its naval ſtrength, may be obliged to ſeek for timber abroad, or be content with ſuch a naval ſtrength as the poor remains of ſome frugal eſtates may have left growing: for, as to the large foreſts, from whence the navy has been ſo long ſupplied, a few years will put an end to the timber there: and how can it be otherwiſe, when the perſons to whoſe care theſe are committed, reap an advantage from the deſtruction of the timber? *Miller's Gard. Dict.*

OAK-*leaf galls.*— Theſe are of ſeveral kinds; the remarkable ſpecies, called the muſhroom gall, is never found on any other vegetable ſubſtance but theſe leaves; and, beſides this, there are a great number of other kinds.

The double gall of theſe leaves is very ſingular, in that, as the generality of productions of this kind affect only one ſide of a leaf, or branch, and grow all one way, this kind of gall extends itſelf both ways, and is ſeen on each ſide of the leaf, in form of two protuberances, oppoſite the one to the other. Theſe are of differently irregular ſhapes, but their natural figure ſeems that of two cones, with broad baſes, and very obtuſe points, though, ſometimes, they are round, or very nearly ſo. Theſe make their firſt appearance on the leaf in April, and remain on till June, or longer. They are at firſt green, but afterwards yellowiſh, and are ſofter to the touch than many other of the productions of this kind: they are uſually about the ſize of a large pea, but ſometimes they grow to the bigneſs of a nut. When opened, they are found to be of that kind which are inhabited each by one inſect only, and each contains one cavity. The cavity in this is, however, larger than in any other gall of the ſize, or even in many others of three times the ſize; the ſides of it being very little thicker than the ſubſtance of the leaf.

On opening theſe leaf galls, which are properly the habitation only of one animal, it is common to find two, the ſtronger preying upon the body of the other, and ſucking its juices, as it does thoſe of the leaf; often, it is found wholly employed in devouring its unoffending neighbour at once: this is probably the caſe when its time of eating is nearly over; and, in fine, when we find the gall inhabited by only one inſect, or containing only one chryſalis, as it ought in its natural ſtate to do, we are never certain that this is the proper inhabitant, as it may be one of theſe deſtroyers who has eaten up the other, and ſupplied its place. *Reaumur's Hiſt. Inſ.*

OAK *puceron*, a name given by naturaliſts to a very remarkable ſpecies of animal of the puceron kind. The generality of ſuch animals live on the ſurface of the branches and leaves of trees and plants; but theſe bury themſelves in the clefts of the Oak, and ſome other trees, and, getting into the crevices, where the bark is a little ſeparated from the wood, they there live at eaſe, and feed to their fill, without being expoſed to their common enemies.

Black OATS.— Theſe are commonly ſown upon an etch crop, or on a lay, which they plow up in January, when the earth is moiſt, taking care to turn the turf well, and to lay it even and flat. Oats are to be ſown earlier in the northern parts of England than in the ſouthern.

Oats are ſown with a broad caſt, at twice, as they do barley, harrowing it well in; but this muſt always be harrowed the

ſame

fame way that the furrows lie of a lay, or but very little crofs, for fear of raifing the turf, but upon an etch, as foon as the land is plowed on an edge, they fow and harrow it in once; then fow it a fecond time, the full quantity, and harrow it five or fix times over, obferving to harrow once or twice acrofs, which breaks the clods, and covers the feed better than harrowing all one way. They commonly fow them upon a broad ridge, which they give the land but one plowing for. The ufual time for fowing black Oats, is, in the beginning of February, or a very few weeks later, fometimes not till the beginning of March: they are a hardy grain, and will bear any thing of wet or cold. Four bufhels of feed is the quantity for an acre; but they grow beft on a moift land, though they will not mifs any where. The farmer knows that his Oats are ripe when the ftalks turn yellow, the grain feels hard, and the hufk begins to open, and fhew the feed. After they are cut, they fhould lie for the dew and the rain to plump them, and make them thrafh well; and, if weedy, to kill the weeds: but, if there happen much rain, they muft be got in again as foon as dry, otherwife the Oats will foon fall out of the hufks, and great part of the crop be loft.

Red OATS.— The red Oat is a kind of corn very common in Staffordfhire, and fome of the northern counties; it is a fort of naked Oat, and is very proper for making Oat-meal, becaufe the kernel thrafhes out of the hull, without carrying it to the mill, or drying of it. This Oat is cultivated in the fame manner as barley.

White OATS.— This kind of Oats is commonly fown upon an etch, after wheat, rye, or barley: they only give the land one plowing, and fow them, and harrow them, as they do the black Oats, except the land is fubject to weeds; in that cafe, it is good to plow up the wheat, or rye ftubble, in November, which will make it rot the better, and be a kind of winter fallowing. Only, if you have a very dry burning ground, which black Oats will not delight in, in that cafe, they often fow them upon a lay. March and April are the ufual time of fowing white Oats, and the drier the weather is when they are fown, the better; they grow beft upon a dry, gravelly, or fand, land, and they are the beft of all to be fowed upon a land very fubject to weeds, becaufe, being fowed late, they allow a very late plowing, and, growing very quick after this, they over-top the weeds fooner than any other plant. The reaping of white Oats is the fame with that of the black, and they generally yield about the fame quantity, that is, twenty bufhels, or there abouts, from an acre. *Mortimer's Hufbandry.*

Wild OAT, in hufbandry, a kind of Oat, or Oat-grafs, which comes up of itfelf, without fowing, and is much hated and dreaded by the farmers. This, in many counties of England, is the greateft of all hindrances of the good crops of barley, and often of other grain. It is a rough and hairy Oat, and ufually black. In the wetter years, and after much froft, this is found to be moft troublefome.

The beft remedy the farmer has againft this, is, to fow the land moft apt to produce it with beans, and, when they are come up to about three inches high, to turn in fheep upon the ground, about twenty fheep to an acre; thefe will eat up all the fhoots of the wild Oat, and not touch the beans, fo long as there is any of the Oat fhoots left. *Morton's Northampt.*

O'CCUPIERS *of walling*, a term in the falt works for the perfons who are fworn officers, that allot, in particular places, what quantity of falt is to be made, that the markets may not be overftocked, and fee that all is carried fairly and equally between the lord and tenant. Thefe perfons always appoint how many houfes fhall work at a time; and, when there is falt to be made, thefe appoint a cryer to proclaim it to all the workers, that they may put to their fires at the fame time; and a like proclaiming of the time when they fhall leave off; and thofe who continue to work, after this prohibition, are to have their falt fpoiled or deftroyed. *Ray's Englifh Words.*

O'CHRA *vitrioli*, in natural hiftory, a name given to that yellow earth or ochre, which is one of the principles or conftituent parts of all vitriol. This is feparated from it by folution in water, and falls to the bottom of the veffel; and the yellow fubftance that tinges the fides of fountains, and fprings of chalybeate waters, in many places, is the fame fubftance, and fhews that they are only folutions of vitriol; which, as fuch, muft needs depofit that earth, which, though retained imperceptibly in the vitriol, yet cannot be fuftained in water fo well as while that falt was folid. A great proof of the earth called Ochra vitrioli being contained in a large quantity in that falt is, that it requires no earth befides to be mixed with it in diftillation: whereas common falt, nitre, and the other falts, require a great quantity of common earth to be added to them, to prevent their fufion. Alum, and vitriol alone, require no fuch additions, the firft of thefe containing a very large quantity of an alcalious white earth, as the other does of an ochreous yellow one.

O'CHRE, in natural hiftory, the name of a large genus of earths, ufed principally by the painters. The moft common kinds are either yellow or red, though there are brown, blue, and green Ochres, and a number of diftinct fpecies of all thefe colours. Of the yellow Ochres, Dr. Hill, in his Hiftory of Foffils, defcribes eleven fpecies. Of the red, the fame number. Of the brown, two. Of the blue and green, one fpecies each; and, of the black, two.

The greater number of thefe are, or have been, at one time, or other, in ufe in painting, in different parts of the world. Some, however, there are, efpecially of the yellow and red kinds, which that author has, himfelf, difcovered in different parts of our own and other kingdoms, which are worthy the trials of the perfons concerned in that branch of trade, as they have already been proved, at his requeft, in fmall quantities, and found to anfwer very well. *Hill's Hift. of Foff.*

Dr. Lifter obferves, that ochreous earths are feparated, in greater or lefs quantities, from all the medicinal fprings in England, and it is to thefe and the nitrous and muriatic falts that they all owe their virtues. The Ochre they contain, is ufually of the nature of that which our painters, to diftinguifh it from the yellower kind, call brown Ochre. This is produced from the iron ores that are met with in the way of the current of thefe waters; and, among the reft, the pyrites afford a great deal of them. All kinds of the pyrites, and all the lime-ftones of England, when they are fubject to be much moiftened under ground, will, in time, fhoot out their falts, and part with their earths. *Lifter. de Font. Med. Angl.*

The earth of the pyrites is Ochre, and the falt of the limeftone is the calcarious nitre, an alkaline falt of the nature of the natrum of Egypt; and from thefe two fubftances, and a fmall portion of common falt, which the waters take up in their paffage through the earths that contain it, all the virtues of them are owing. The falt of the pyrites being green vitriol, it might be expected, that this fhould be found in the waters impregnated by that fubftance; but Dr. Lifter obferves, that, though there are many fprings in England which are well known to receive their virtues from this foffil, yet there is no fuch thing as vitriol to be obtained from any of them; and this is not wonderful, fince we know that the pyrites will not yield its vitriol, when newly taken out of the earth, but muft be expofed a confiderable time firft to the air; fo that the Ochre is the only fenfible thing that it receives from this fubftance, and, perhaps, with it fome faline matter which is the bafis of vitriol, and would be vitriol in time, on a due expofition to the air.

OCTA'NDRIA, in botany, a clafs of plants with hermaphrodite flowers, and eight ftamina, or male parts, in each. See *Plate* XXXVI. *fig.* 4.

* The word is formed of the Greek ὀκτὼ, eight, and ἀνὴρ, male.

The plants of this clafs are the maple-tree, heath, &c.

OCU'LUS *beli*, in natural hiftory, the name of one of the femipellucid gems of the genus of the hydrophanæ, and called by Dr. Hill hydrophanes albido-cinereus, flavo-variegatus, nucleo centrali nigerrimo, or the greyifh white hydrophanes, variegated with yellow, and with a black, central, nucleus. See *Plate* XXXVI. *fig.* 5.

It is a very elegant and beautiful gem. Its bafis, or ground, is a whitifh grey, variegated with yellow, and fometimes with red, and a little black, but that more rarely, and is found in fmall maffes from half an inch to an inch in diameter; of a rounded figure, and thickeft in the middle, tapering away gradually to the fides. The outer part of the ftone, or that toward the edges all round, is ever of a whitifh grey, more or lefs variegated with yellow, &c. and its central nucleus is always of a deep and fine black, furrounded by a broad circle, of a pale yellow, and reprefenting very beautifully the pupil and iris of the eye; thefe are inclofed in the matter of the ftone, and are often furrounded by other very fine concentric circles, of a pale flame colour; but more frequently there is only the black pupil, furrounded by the yellow iris, and that placed in the body of the ftone which reprefents the white of the eye: the fhape of the ftone alfo favours its refemblance of an eye, and the whole is very elegant. It is of the hardnefs of the agate, and takes a tolerable polifh; when thrown into water, it has, in a great meafure, the property of the oculus mundi, the whole ftone becomes greatly more bright and lucid, and the grey part becomes of a plainly yellowifh caft.

There are many things improperly called Oculus Beli by our jewellers, but the genuine fpecies is very rare. Nothing is more common than to find in the agates little circular veins of different colours round a central fpot; thefe the lapidaries frequently cut out, with a proper quantity of the ftone about them, and call them Oculus beli. They are not peculiar to the agate, but are common alfo in the cornelian, and ftand fometimes fingle, fometimes two or three together, and, according to the colours of the circles, reprefent the eyes of various animals.

OCULUS *mundi*, in natural hiftory, the name of one of the femipellucid gems of the genus of the hydrophanæ. It is of one plain and uniform colour, which is a whitifh grey, and has no veins, or other variegations. It is found in fmall maffes, of the fhape of our common flints and pebbles. It has but a very obfcure degree of tranfparence, and is not capable of a fine polifh. This ftone, however, though of little beauty, has this fingular property, that, when thrown into a bafon of water, in the fpace of half a minute, it begins to change its appearance, and, very foon, inftead of a pale grey, becomes of of a very bright, and confiderably pellucid, pale yellow, like that of amber, or the yellow cornelian; this it retains as long as it remains in the water, but as foon as taken out, and dried, it refumes its grey colour, and becomes as opake as before. It is found, fo far as is yet known, only in China; but the fhores of fome of our own rivers afford us ftones coming up to its qualities in fome degree, though not fo beautifully tranfparent in water as the oriental. *Hill's Hiftory of Foffils.*

OLDENLA'NDIA, in botany, a genus of plants, whofe characters are:

It hath a rofe-fhaped flower, confifting of one leaf, which is divided into four parts, almoft to the bottom, and refts on the empalement; which empalement, afterwards, becomes an almoft globular fruit, having two cells, which contain many fmall feeds.

This plant was difcovered in America by father Plumier, who gave this name to it, in honour to Henry Bernard Oldenland, a German, who was a difciple of Doctor Herman, at Leyden, and was a very curious botanift. *Miller's Gard. Dict.*

OEDE'MA (*Dict.*)—The immediate caufe of an Oedema is doubtlefs to be afcribed to the too great ferofity or vifcidity of the blood, which ftagnates in the minute veficles of the fat or tunica cellulofa, and diftends the fkin. This diforder of the blood proceeds either from a cold and phlegmatic habit, or old age; and it happens moft frequently in cold weather, when the inclemency of the air increafes the difeafe, by coagulating the ftagnating blood. It is not, therefore, furprifing, that the tumor prodigioufly increafes, though it may feem favourable and much diminifhed in the morning; which is certainly to be afcribed to the warmth of the bed. This diforder may, alfo, proceed from an irregularity in diet, from an excefs in eating and drinking, or from the ufe of cold, crude, and hard meats. Fevers, particularly thofe of the intermitting kind, frequently conduce to this difeafe, efpecially if the patient has indulged himfelf in intemperate drinking, while the heat and thirft are upon him. Another caufe may be a profufe difcharge of blood, either by wounds or vomiting, or from the nofe, lungs, hæmorrhoids, or uterus. It may, alfo, arife from obftructions of the menftrual difcharge in women, or from a compreffion of the vena cava by the fœtus or a fcirrhus in the abdomen, by which means the reflux of the blood from the lower extremities is greatly impeded. It may likewife be afcribed to a life too fedentary, or too great an indulgence of lying in bed and fleeping; or to a phthifis, and difficulty of breathing; or to any other difeafe or fatigue of the body, which weakens the natural vigour of the heart in propelling the blood.

Hence it may eafily appear, by what fymptoms an Oedema may be known; but it is neceffary to obferve, that the harder the tumor is, and the longer it retains the print of the finger, the ftagnating blood or humour is the thicker and more tenacious.

An Oedema upon the feet can fcarcely be cured without removing the diftemper whence it fprings. In pregnant women, efpecially thofe of a robuft conftitution, œdematous tumors are attended with little or no danger; for they generally difappear fpontaneoufly after delivery, the vena cava being then freed from its compreffion. In weakly women the danger is greater, if they continue after delivery; as they are frequently fucceeded by a dropfy, an afthma, and even a fuffocation. The longer the duration is of thefe phlegmatic tumors, the greater is the danger, and the cure more uncertain; but, when they are recent, and attended with no other difeafe, the cure may be readily effected. Thofe, alfo, which follow an intermitting fever are milder than thofe which proceed from a too copious difcharge of blood, or any other weaknefs. If they proceed from the obftruction of a natural evacuation, they are beft cured by removing that obftruction. This diforder of the feet is eafily remedied in young perfons, but in the aged it is often incurable. When the feet are violently tumefied, and remedies, efpecially external applications, have little effect upon them, the confequence is, generally, a difficulty of breathing, fuffocation, and, at laft, death.

The cure of oedematous tumors is different, according to the different difeafes whence they proceed; and, therefore, it is, in the firft place, neceffary to inquire into their caufe. When they appear to arife from an internal diforder, recourfe muft not only be had to outward application, but principally to internal medicines. With regard to external applications, 1. Ufe frequent frictions, with warm cloths every morning and evening, till the feet grow red, and glow with heat. 2. In order to defend them from the inclemency of the air, efpecially in winter, let the legs be wrapped in furs, or other thick coverings; and, at night, let warm ftones, or pieces of oak, be laid under the feet in bed, for attenuating the blood. 3. Let a proper bandage be applied, beginning with the foot, and proceeding gradually to the knee, which will greatly ftrengthen the relaxed limb, prevent any collections or ftagnations of the blood, and the fkin from being diftended by the infpiffated blood. 4. Digeftive and ftrengthening medicines fhould likewife outwardly be applied; thus let the affected leg be placed over burning rectified fpirit of wine, and fo covered with cloths, as to receive and retain the vapour: by this method the ftagnating blood will either be perfpired in fweat, or returned to the circulation; and the relaxed leg will be wonderfully ftrengthened. 5. A remedy, often ufed by the vulgar, is the greater celandine, bruifed and applied with cloths to the feet. Others ufe in the fame manner water-pepper, either alone, or mixed with celandine, and not without fuccefs; for they are both powerful refolvents. Others apply the fcrapings of horfe-radifh, or a warm cataplafm of dittander, boiled in wine. An excellent difcutient, for this purpofe, is a cataplafm of pigeons dung mixed with falt and vinegar, which muft be often applied warm. Of equal efficacy are the following fomentations, a lixivium prepared from the afhes of oak, and the water in which blackfmiths cool their hot iron, which may likewife be mixed with fome ounces of fpirit of wine and a fmall quantity of alum, and applied warm with compreffes; or the feet may be bathed twice a day in this liquor. Lime-water applied in the fame manner, either alone, or mixed with fpirit of wine and alum, is very beneficial in this cafe, as is the following mixture:

Take of fpirits of wine, and wine vinegar, each a pound; crude alum, an ounce and an half; vitriol, a drachm: mix them together.

It is neceffary to obferve, that, after the ufe of the friction and fomentations, the leg muft be carefully wrapped up with bandages, and warm ftockings, or coverings; and the patient muft not only be very moderate in eating and drinking, but muft alfo ufe frequent motion and exercife, and never neglect proper internal medicines, without which all the external applications will nothing avail. Sometimes the mineral waters are very efficacious, in this diforder, though they do not always fucceed. Dr. Harris fays, that he has frequently removed this difeafe, by exhibiting the aperitive crocus of iron, mixed with the Peruvian bark; others affert, that they have done it with the bark alone, though fome condemn thefe remedies. It is therefore, proper, in this point, to take the advice of a phyfician. *Heifter's Chirurg.*

OENA'NTHE, *water dropwort*, in botany, the name of a genus of umbelliferous plants, the characters of which are thefe: the flower is of the rofaceous kind, compofed of feveral heart-fhaped petals, which are irregular in fize, and are difpofed in a circular form, on a cup, which afterwards becomes a fruit compofed of two oblong gibbofe ftriated feeds, which are flatted and fmooth on their inner fide, and end in a fort of prickles, the middle one of which is longer and ftronger than the others.

One of the fpecies of this plant, diftinguifhed by its yellow juice, and by its growing near waters, is a very terrible poifon. Many accounts have been given of people dying by it, but none which fets its terrible effects in fo juft a light, as one which happened very lately to fome French prifoners with us, and which is recorded in the Philofophical Tranfactions. Eleven French prifoners had the liberty of walking in, and about, the town of Pembroke; three of them, being in the fields, a little before noon, found, and dug up, a large quantity of this fatal plant, with its roots, taking it to be wild celeri, in order to eat with their bread and butter, after dinner; and, when they had wafhed it, they all three tafted, or eat a fmall quantity of it, in the fields.

As they were entering the town, one of them, without any previous notice of ficknefs at the ftomach, or diforder in the head, was immediately feized with convulfions; the other two ran home, and fent a furgeon to him, who attempted to relieve him by bleeding, but in vain, for he died in a very little time. The other two prifoners, wholly ignorant of the caufe of their comrade's death, and of their own danger, gave the roots they had brought in to the other eight prifoners, who all eat more or lefs of them with their dinner. A little while after dinner, the two remaining perfons who had gathered the roots, were feized in the fame manner as the firft, and one of them died, but the other recovered, having been blooded, and a vomit having been, with great difficulty, forced down his throat, as his jaws were, in a manner, locked together. The other eight were all immediately bled and vomited, and all recovered.

It is obfervable, that none of thefe perfons had thofe comatofe fymptoms which are well known to attend thofe who have eaten the common cicuta, or hemloc.

This root is well known in all that part of England, under the name of the five-fingered root, and is in frequent ufe externally with the common people, for the felon, or worft fort of whitloe. The Frenchmen eat only the root, and none of the leaves or ftalk.

It is extremely neceffary that this dangerous plant fhould be well known, as it grows very plentifully with us all about the banks of the Thames; and Mr. Watfon has caufed a fine drawing, both of this, and another poifonous plant, which it is often confounded with, the cicuta aquatica, or water hemlock of Wepfer, to be prefixed to that number of the Tranfactions where this account is given: and, this feems the more neceffary, as the plant appears to have been miftaken, in a manner, by all the world, not only the common people, but the more verfed in plants, having miftaken it at times for feveral very different things. The fame gentleman informs us, from various authors, that eight lads in Ireland had been poifoned by it, miftaking it for the root of the water parfnip; two men died by miftaking it for the Macedonian parfley; and Wepfer, who wrote an exprefs treatife on the poifonous nature of the water hemlock, has confounded this plant with it, faying, that Lobel had defcribed the water hemlock, under the name of this Oenanthe, or dropwort; and the generally accurate Hoffman, when treating of the vegetable poifons, makes no mention of the difference between thefe two plants.

OESO'PHAGUS (*Dict.*)—Conftrictions, whether in the pharynx, or middle of the gullet, when neglected, not only become chronical, but, alfo, by hindering the deglutition of the aliments, readily bring on a confumption, they, therefore, deferve to be expeditioufly treated by proper and fuitable remedies: and thefe remedies are of two kinds; the one calculated for allaying the fpafms, and the other for removing the caufes contributing to their production.

The former of thefe intentions is obtained by antifpafmodics and anodynes, joined with difcutients, and ufed both internally and externally; but, the more violent the conftriction is, the more expedient it is to begin the cure with external applications, becaufe internal medicines can hardly be fwallowed without the greateft difficulty. Some of thefe external medicines, by drawing the afflux of the humours to the inferior parts, and rendering the circulation of the blood equal, breaks the force of the fpafms: of this kind are clyfters, and bathing the feet. The clyfters ought to be prepared of emollient fubftances, with an addition of corroboratives, and repeated twice or thrice. The baths for the feet are to be pretty warm, and the legs are to be immerfed pretty deeply in them. The topics to be applied to the part affected are generally paregoric and nervous linaments, which may be prepared of aqua Anhaltina, fpirit of fal ammoniac, the effences of faffron and nutmeg, caftor, and camphire, and the balfam of life; which, if mixed with the anodyne mineral liquor, is an excellent medicine, when the difeafe is at its greateft height. It alfo proves beneficial, when a few drops of it are poured upon fugar, kept in the mouth, and flowly fwallowed. This intention is, alfo, anfwered by a few grains of theriaca, kept under the tongue, and fpit out. An ox's bladder full of fome warm emollient decoction, and applied to the part affected, is, alfo, of confiderable fervice in relaxing the fpafms.

Among internal antifpafmodics, the moft valuable are the oils of fweet almonds, and of olives, mixed with fperma-ceti; antifpafmodic powders, prepared of cinnabar; the pulvis Marchionis, prepared amber, and the extracts of faffron and caftor, or the nitrous powders, with one or two grains of camphire; as, alfo, the anodyne liquor, either alone, or mixed with effence of caftor; the fpiritus befoardicus buffii, or the fuccinated fpirit of hartfhorn, or the fpiritus nitri dulcis, mixed with a few drops of the genuine oils of chamomile or mace: but, when the diforder becomes chronical, we may ufe alternately, every other day, with thefe, antifpafmodic pills, which I generally prepare of the extracts of yarrow, chamomile, and St. John's-wort, mithridate, the extracts of faffron and caftor, and the diftilled oils of mace or mint.

When the fpafms are alleviated, the phyfician who intends to remove the material caufes of the diforder, ought carefully to inquire, which of them contribute to its production; for, if the diforder is produced by acrid fubftances, poifons, draftic purgatives, or emetics, their force is, with all expedition, to be obtunded with mucilaginous and oleous fubftances, and with preparations of milk. This intention is anfwered by pretty pinguious broths, and draughts of warm water continued to a naufea, that, thus, a gentle vomiting being excited, the poifon may be again carried off.

Sometimes acids fubdue the force of poifon: and by thefe Hoechftetterus, in a cafe of this nature, affirms that he cured a conftriction of the gullet, produced by malmfey wine in which confound had been boiled. And Foreftus, in the part before-mentioned, informs us, that a conftriction of the gullet, produced by aqua-fortis, was happily cured by mucilage of quinces.

When violent anger, excited at meals, brings on fpafms of the gullet, there generally happens, at the fame time, an effufion of bile into the ftomach. In this cafe, befides the mitigation of the commotions, the bile is to be corrected, left it acquire a corrofive and virulent quality; after which, it is to be eliminated from the body by gentle emetics or cholagogues. The bile is corrected by abforbent or mucilaginous fubftances, fuch as decoctions of oats or barley. The bile, on the other hand, is moft commodioufly eliminated by preparations of manna, joined with thofe of rhubarb, or by vomit, when thefe preparations are heightened by one or two grains of emetic tartar or ipecacuanha. But we are to take care, that the emetic, or the purgative, be not exhibited immediately after the fit of anger.

But if the fpafms of the gullet are produced by a dyfcrafy of the whole mafs of humours, or, particularly, if acrid and vifcid fordes of the primæ viæ lay a foundation for a long-continued diforder of this kind; thefe fordes are to be corrected by inciding, refolvent, digeftive, and abforbent medicines; and evacuated by preparations of manna, rhubarb, and the pilulæ balfamicæ. But as the diforder frequently proves obftinate to this treatment, there will be no medicine found more efficacious, than medicinal waters; among which, the beft are thofe of Sedlitz drank for about four days, and then fucceeded by thofe of Egra. In hypochondriacal diforders, alfo, where the excretions of blood, whether by the uterus or hæmorrhoidal veins, are fuppreffed, befides venefection and exercife, the Caroline baths, duly ufed, are, of all other things, the moft beneficial.

Chronical fpafms of the Oefophagus, which depend on a weaknefs of the nervous fyftem, and often recur, are rather to be cured by dietetic preparations and aliments, than by ftrong medicines; for, in this cafe, we are, for ordinary drink, to chufe decoctions prepared of viper's-grafs, fuccory, and cinnamon. All malt liquors are to be abftained from, and the patient is to ufe generous wine moderately. The aliments are to be light, and fmall in quantity, but exercife is to be frequently ufed. For corroborating the ftomach, balfamic elixirs, prepared without a fpirituous menftruum, are to be ufed. The redundance of the blood is to be diminifhed by properly repeated venefections; and the generation of fordes in the primæ viæ is to be prevented by gentle laxatives. But, above all, the paffions of the mind, which fo greatly contribute to the production of fpafms, are to be carefully guarded againft; then the Caroline fprings, and afterwards the baths of Toeplitz, are to be ufed. *Frederic Hoffman.*

O'FFA *Helmontiana*, the name of a celebrated chemical medicine prepared in the following manner:

Take of the alcaline fpirit of fal ammoniac, fo ftrong as to leave much of its falts undiffolved at the bottom; put it into a cold and dry cylindrical glafs, with a narrow mouth, fo as to fill about one half thereof; pour to it, gradually, a quantity of pure cold alcohol, fo as to run gently down the fides of the veffel, till it be full; a white coagulation will be made upon the furface, where the lighter alcohol refts upon the alcaline fpirit. If the glafs be now inverted, there will inftantly appear a white opake coagulation, where the alcohol and alcaline fpirit mix; and, when they are both well fhaken together, the whole becomes a white opake confiftent mafs, concreted together like ftone, fo that not a drop will fall out of the glafs, while inverted. Stop the veffel clofe, and fet it by: thus the mixture will foon refolve into a fluid, that floats at top, and a denfe, faline concretion, that falls to the bottom; fo that, in a year's time, the falt will almoft become folid below, with a liquor floating above it. If the whole mafs, thus produced, be diftilled with a foft fire, an alcaline, balfamic, oily, folid falt will fublime. The colder the feafon, and the place, in which the experiment is made, the better it will fucceed.

Remarks.— This is one of the moft difficult experiments in chemiftry, as it requires both the liquors to be perfect, and the obfervance of feveral circumftances, any one of which, being wanting, will caufe it to mifcarry; but, if they all be obferved, it will fucceed. Here, then, we fee, that pure volatile alcaline falt will clofely attract to itfelf the moft fubtile oil that is known, that is, alcohol; whence the foap fo produced is the moft fubtile and penetrating of all foaps, confifting of an exceeding fubtile and volatile alcali and oil, wonderfully united together in an inftant. If this medicine be diluted with canary, and taken upon an empty ftomach, it paffes, perhaps, through all the veffels of the body, refolves concretions, open obftructions, excites the vital powers, and thus fuccefsfully cures many dangerous diftempers, proceeding from an obftructing matter, capable of being refolved by it. But its virtue vanifhes too foon, as being fo extremely volatile, and therefore becomes unequal to the more ftubborn diftempers. It is highly commended in the jaundice, unattended with an acute inflammation; it does not diffolve the ftone, or prevent the concretion or increafe thereof; it feems to agree with falt of tartar rendered volatile; it diffolves in a gentle heat, like ice, and returns to a folid form in the cold. If pure alcohol be thus mixed with one third of dry volatile alcali, it makes a much more folid foap, as being without water, which is always double the quantity in the ftrongeft alcaline fpirit, with refpect to the pure falt. Helmont needed not have apprehended the fudden generation of the ftone from hence; for this matter is not the ftone, but diffolves with heat, dilutes with water, and proves totally and fpontaneoufly volatile, fo that it has nothing in common, nor like to the ftone. Helmont was not the inventor of the experiment, though the production be called Offa helmontiana; but Raymond Lully, long before him, and the Englifh author upon the Alcaheft, fuppofed to be George Starkey, inconfiderately pretends, that this foap, brought to a liquor by repeated diftillation, will become the alcaheft of Helmont. *Boerhaave's Chemiftry.*

OIL (*Dict.*)— In the diftillation of Oils there is a confiderable difference, with refpect to the quantities yielded; for fome vegetables afford a large portion, others a moderate quantity, and others but very little. Among all the productions of the earth, I know no fimple, which, befides its turpentine, yields a larger quantity of Oil, than favine; fince one pound of it, in the alembic, yields almoft three ounces of Oil. Hence, from two pounds of it, if the diftillation is duly managed, at leaft five ounces of Oil may be obtained. Savine is fucceeded by nutmegs, a pound of which yields one ounce of oil, which,

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by diſtillation from an alembic, is raiſed, whilſt, at the ſame time, there is left at the bottom a large quantity of Oil which does not paſs over the helm, but is generally expreſſed from the nutmegs. Hence, it is obvious, that theſe nuts abound with a large quantity of mild and fixed Oil, which is obtained by expreſſion, as, alſo, with a ſubtile Oil procured by diſtillation.

Among flowers, thoſe of the ſpike abound moſt in Oil. Hence, four pounds of thoſe flowers, when dried, afford full three ounces of Oil; but a ſmaller quantity is obtained from the flowers of lavender, ſince four pounds of them yield only one ounce of Oil; which, however, is of a far more grateful and fragrant ſmell, than that of ſpike. Four pounds of the leaves of mint, gently dried, yield an ounce and an half of Oil; whilſt, from an equal quantity of the leaves of marjoram, hardly one ounce can be obtained. From fifty pounds of calamus aromaticus I only obtained two ounces of Oil: there is but a very ſmall quantity of Oil in mother of thyme, neither is there a large quantity of Oil afforded by rue: and, though this plant is of an acrid taſte, and penetrating ſmell, yet ten pounds of it yield only half an ounce, or two or three drachms, of Oil. Hence it is certain, that, in this ſimple, the ſaline is ſuperior to the oleous principle.

The flowers of the common and Roman chamomile yield but a very ſmall quantity of Oil; for which reaſon it muſt, when genuine, be ſold at a pretty dear rate; for the Oils of that kind, as commonly ſold, are almoſt all adulterated: the calamus aromaticus, alſo, though of a pretty acrid taſte, affords but little Oil.

The four carminative ſeeds, which are, aniſe, dill, caraway, and fennel, yield a large quantity of Oil; but thoſe commonly ſold are generally adulterated.

We are, alſo, to advert to the ſpecific and diſtinguiſhing taſte and ſmell of ſome Oils. Thus, the Oils of thyme and ſavory are ſo acrid as to corrode the noſtrils. The Oil of wormwood, which is highly bitter, fills the head with a fœtid vapour; and it is to be obſerved, that this oil, when diſtilled from green wormwood, is green; but of a browniſh-yellow colour, when obtained from old wormwood. The Oil of chervil, in taſte, reſembles that of fennel; Oil of tanſey, in ſmell, greatly reſembles the herb from which it is obtained.

It is in a particular manner to be obſerved, that plants, and their various parts, whether ſeeds, flowers, or leaves, do not in all ſeaſons, and at every age, yield equal quantities of Oil; for, if mint, thyme, rue, balm, or marjoram, when recent, tender, and young, are ſubjected to diſtillation, they yield little or no Oil; but they muſt be arrived at a juſt degree of vigour and perfection; when, for inſtance, they begin to riſe into ſmall heads or flowers: and, as, in old animals, the ſtrength is much impaired and diminiſhed, ſo, alſo, old plants loſe a great deal of their virtues, and yield but little Oil. Hence, it is obvious, that the perfect ſtrength and maturity of plants conſiſts in the abundance of the Oil they contain, and which is either large or ſmall, according to the period of their age.

It is, alſo, to be obſerved, that the ſeaſons and conſtitutions of the year contribute greatly to the obtaining a larger or ſmaller quantity of Oil; for I have often obſerved, that, if the ſpring or ſummer are too moiſt or rainy, herbs, and their flowers, ſpike, for inſtance, or lavender, do not yield ſo large a quantity of Oil, as when the ſeaſons are moderately warm and dry: hence we learn, that a due temperature, purity, and drineſs of the air and weather, contribute greatly to bring vegetables to their due maturity and perfection.

Adulteration of diſtilled OILS.— It is a ſhameful, though true, aſſertion, that the true and genuine Oils of plants are rarely to be had in the ſhops; ſince, in order to increaſe their weight and price, it is cuſtomary, in diſtilling them, to mix with them ſome pinguious or other ſubſtances of little value. As for the dear aromatic Oils exported from Holland, it is certain from experience, that they are almoſt all adulterated, as is obvious in the Oils of cinnamon, cloves, nutmegs, and mace. But in theſe the fraud is eaſily detected, by pouring alcohol of wine, or highly rectified ſpirit of wine, upon them; for this liquor immediately reſolves and imbibes the particles of the purer Oil, leaving, in the bottom, a large quantity of expreſſed Oil, either of almonds, or ben-nuts. But the more ſkilful of the chemiſts have an artful method of concealing this piece of fraud; for they adulterate pure Oil of cinnamon, or cloves, by adding an equal quantity of highly rectified ſpirit of wine, which may be ſo prepared, that one part of the ſpirit may abſorb one part of the Oil, whilſt the taſte remains, and the ſmell continues ſufficiently ſtrong and penetrating, ſo that the impoſition is with difficultly diſcovered. But this piece of fraud is, alſo, quickly diſcovered, if theſe Oils are poured into common water; for, then, the water immediately becomes milky, which effect is not produced by pure oil, when put into cold water, and left to itſelf. There is ſtill another method of adulterating Oils of plants, by mixing Oil of turpentine, or pine, with the herbs to be diſtilled; and this piece of fraud is moſt commonly committed in preparing cephalic Oils from plants, which abound with a balſamic reſin, ſuch as mint, origanum, ſage, roſemary, marjoram, ſavory, thyme, mother of thyme, the flowers of ſpike and lavender, and baſilicon; from which, by the addition of theſe Oils, they obtain a large quantity of Oil, though of a bad kind, and inconſiderable virtues; but ſuch Oils, if the plants are recent, retain their ſpecific and diſtinguiſhing taſte and ſmell. But this piece of fraud is eaſily detected; for, if ſuch Oils are kept ſome time, they loſe their grateful ſmell, and the diſagreeable odour of the turpentine remains. But there is ſtill a more expeditious method of diſcovering this fraud; for, if a piece of cloth macerated in ſuch Oil is put into a warm place, or expoſed to an hot furnace, the ſubtile fragrance is immediately exhaled, and the ſmell of turpentine diſcovers itſelf.

Beſides, the cephalic Oils, adulterated with turpentine, or Oil of pines, are more limpid than the genuine Oils, which are of a deeper colour. There is, alſo, another method of detecting this fraud; which is, when the letters of the ſignature put upon the mouth of the glaſs become ſucceſſively pale, which does not happen with the genuine Oils; for the effluvia of the turpentine contain a ſubtile acid, which, in proceſs of time, deſtroys the colour of the ink. Some, in the diſtillation of theſe Oils, inſtead of turpentine, add ſeeds which contain a large quantity of pinguious juice, ſuch as thoſe of poppies; and, by this means, that thick Oil, which at other times is generally expreſſed, with difficulty paſſes the helm, is raiſed and diſtilled in conjunction with a portion of ſubtile and ethereal Oil: and this is the uſual method of adulterating the Oil of rue; for, though rue is of a ſtrong taſte, and penetrating ſmell, yet there is hardly any plant, which affords a ſmaller quantity of oil: but pure Oil of rue is eaſily diſtinguiſhed from that which is adulterated, ſince, when genuine, it does not become thick and coagulated, when expoſed to the cold; but is inſpiſſated, when it is adulterated with any expreſſed oil. The Oils of chamomile and the tops of yarrow, when pure and recent, are of a beautiful bluiſh colour, which is afterwards changed into that of brown; for, if this bluiſh colour of the Oil of chamomile flowers remain above a year, it is a ſure ſign that it is adulterated; for it is cuſtomary to mix with it Oil of turpentine, which is of a deep bluiſh colour, on account of the tincture it receives from the copper of the veſſel. It is of great importance to the phyſician to be able to diſtinguiſh genuine from adulterated Oils; for theſe balſamic and cephalic Oils not only loſe much of their efficacy, but, alſo, acquire a foreign quality, by being adulterated; and it is ſufficiently known, that all terebinthinaceous ſubſtances violently exagitate the maſs of blood and humours, and create an intenſe heat in the body.

OIL *of ſtone.* In the manufacture of the Chineſe porcelain, they uſe a liquid matter of a white colour, which they call by this name, on which the great myſtery of finiſhing their work depends; yet, this has been leſs enquired into by the imitators of that ware in Europe, than many other articles of leſs conſequence. The ſtone of which this Oil is made, is of the ſame degree of hardneſs with that which the petunſe is prepared of. They procure it from quarries, and chuſe ſuch as is of a good white colour, and has many dark green ſpots in it.

Theſe ſpots are of the colour of the leaves of cypreſs. Sometimes a ſtone is choſen which has a brown ground, variegated with ſpots and blotches of a reddiſh colour. They firſt carefully waſh this ſtone; then, laying it in a clean place, they break it to pieces with iron inſtruments, and afterwards grind theſe to a perfectly fine and impalpable powder, by rubbing them in large mortars, with peſtles of ſtone faced with iron, and turned either by the labourers, or by water. When the whole is thus reduced to a fine powder, they throw it into a veſſel of water, and ſtirring it briſkly about, they let the coarſer part ſubſide to the bottom, and there ſwims a fine thick matter like cream, for two or three inches depth, on the ſurface. This they carefully ſcum off, and putting it into another veſſel of clear water, they let it throw down any coarſe matter it may yet contain; and, finally, taking off the thick ſurface again, they mix this with ſome freſh water in another veſſel, and leave it to ſubſide; then pouring off the clear water, they take out the remainder at the bottom of the veſſel, which is perfectly fine, and reſembles a thick cream. To every hundred pounds of this they add one pound of a ſubſtance of the nature of which we are not yet perfectly informed. It is ſaid to be a mineral reſembling alum. They calcine this firſt, and then beat it to a fine powder, and this, being added to the cream, or oil, as it is called, ſerves to keep it always in the ſame liquid ſtate. This ſubſtance, when finiſhed in this manner, has very little title to the name of an Oil; it is rather a varniſh, and is always uſed in mixture with another varniſh, which is called at this time fern Oil, and uſed to be called lime Oil; it is prepared in the ſame manner with the other after burning. See FERN *Oil.*

Animal OIL, *oleum animale*, in medicine, the name of an eſſential Oil diſtilled by a retort from blood, and recommended as a powerful remedy in epilepſies, the gout, and other obſtinate diſeaſes.

OIL *of camphor*, a name given by the chemiſts to a ſolution of camphor in ſpirit of nitre. It is uſed to exfoliate carious bones, and on other the like occaſions. It is obſervable, that camphor, which is ſoluble in this acid, in the proportion of one half its quantity, is not at all ſoluble in ſpirit of vitriol, ſpirit of of alum, or distilled vinegar; and that it is the only known vegetable resin that is soluble in this menstruum.

Connecting OIL, in chemistry, a term used by Boerhaave, and his followers, to express a certain Oil, found in all vegetable substances, but wholly differing from, and independent of, their essential Oil. This is not possessed of any of their virtues, or qualities, but seems the same in all plants, and is the means of their consistence and solidity, giving tenacity to their earth, which, without it, falls to dust, and the plant exists no more.

Red OIL, in the porcelain manufacture, a name given to a peculiar colour used on the China ware, or to those pieces of the ware which are coloured with it. It is a very elegant ornament, and would be worth our attempting to imitate in England, on our better sorts of wares. They who have visited the Chinese works affirm that it is done in the following manner: they mix the red colour called tam-tan-hum, or the copperas red, with Oil of stone (see OIL *of stone*) and with another Oil, as they express it, of the same kind, made of a whitish sort of pebble, or agate, found on the shores of their rivers, and the place of which might probably be supplied, with us, by common crystal. The powder is to be thoroughly mixed with these liquors, and the vessel dipped carefully into the mixture, or some parts of it only covered with it in figures: after this, it is to be set by to dry, and, when thoroughly dried, it is to be baked in the common way. The general method is that of covering the vessel all over, both inside and out, with this red; and it comes out of the most bright and brilliant colour imaginable, but it will not ring when struck upon, as our common China ware does. We seldom see this in any degree of perfection, but it is very elegant when fine. *Observ. sur les Cout. de l'Asie.*

OIL *of earth, oleum terræ.*— This Oil is of two kinds, the red and the black; the red is brought from the East-Indies, and is of a pellucid red colour, and has a strong smell like petroleum, but more grateful, as Schroder says; but, as to what we know of this Oil, it is either the same with petroleum, or else is unknown in our shops.

The Indian Oil of earth, described by Neuhovius, is scarcely ever brought over to us, but ingrossed by the Asian potentates; but, whether it be a species of petroleum, or naphtha, I cannot certainly determine. What is brought to us from the Indies, and sold for Oil of earth, is prepared of expressed Oil of the cocoa nut, mixed with medicated earths, as I have been informed by a person very skilful in these matters, and therefore wholly belongs to the class of vegetables. *Boerhaave.*

These kinds of bitumen differ only in degree, as some think, so as that the more spirituous and subtile part of it is the naphtha, the next to it the petroleum, and the grosser and more feculent part asphaltum; just as we see in amber, from which, by distillation, there is obtained, first, a spirituous and limpid Oil, representing naphtha; soon after, comes off a yellow and thicker Oil, resembling petroleum; and, last of all, a black feculent matter, which might pass for asphaltum. *Dale.*

OLIGAE'DRA, in natural history, the name of a genus of crystals.

The word is derived from the Greek ὀλίγος, a few, and ἕδρα, a plane, or side; and expresses a crystal which is composed of only a few planes.

The bodies of this class are crystals of the imperfect kind, being composed of columns affixed irregularly to some solid body at one end, and, at the other, terminated by a pyramid, being both pentangular; the whole consists only of ten planes, not, as the common kind, of twelve.

OLIVE-*tree, olea,* in botany, a genus of trees, whose characters are:

The leaves are, for the most part, oblong and ever green: the flower consists of one leaf; the lower part of which is hollowed, but the upper part is divided into four segments: the ovary, which is fixed to the center of the flower-cup, becomes an oval, soft, pulpy fruit, abounding with a fat liquor, inclosing an hard rough stone.

There are five sorts of Olive-trees preserved in the gardens of the curious, where they are planted either in pots or cases, and removed into the green-house in the winters, with oranges, myrtles, &c. but they are most of them hardy enough to endure the cold of our ordinary winters in the open air, provided they are planted upon a dry soil, and in a warm situation, though in severe winters they are demolished, or at least lose their heads, or are killed to the surface; but this is what they are liable to in the south parts of France, in which country these trees abound; and yet in very sharp winters are most of them destroyed. There was a parcel of these trees growing in the gardens of Camden-house, near Kensington, a few years since, which were seven or eight feet high; and in some good seasons produced very good fruit: these were planted against a south wall, but were permitted to grow up rude without pruning, or fastening to the wall, (which they do by no means care for; and, during the time they were below the top of the wall, they throve very well; but, after their heads were gotten above the wall, the north winds usually greatly prejudiced them every winter; and I believe the hard winter, 1739, intirely demolished them.

These plants may be propagated by laying down of their tender branches (in the manner practised for other trees) which should remain undisturbed two years; in which time they will have taken root, and may be taken off from the old plants, and transplanted either into pots filled with fresh light earth, or into the open ground in a warm situation. The best season for transplanting them is the beginning of April, when you should, if possible, take the opportunity of a moist season; and those which are planted in pots, should be placed in a shady part of the green-house until they have taken root; but those planted in the ground should have mulch laid about their roots, to prevent the earth from drying too fast, and be now-and then refreshed with water; but you must by no means let them have too much moisture, which will rot the tender fibres of their roots, and destroy the trees.

When the plants have taken fresh root, those in the pots may be exposed to the open air, with other hardy exotics; with which they should be housed in winter, and treated as myrtles, and other less tender trees and shrubs; but those in the open air will require no farther care until the winter following, when you should mulch the ground about their roots, to prevent the frost from penetrating deep into them: and, if the frost should prove very severe, you should cover them with mats, which will defend them from being injured thereby; but you must be cautious not to let the mats continue over them after the frost is past, lest, by keeping them too close, their leaves and tender branches should prove mouldy for want of free air, which will be of as bad consequence to the trees, as if they had been exposed to the frost, and many times worse; for it seldom happens, if they have taken much of this mould, or have been long covered, so that it has entered the bark, that they are ever recoverable again; whereas it often happens, that the frost only destroys the tender shoots; but the body and larger branches, remaining unhurt, put out again the succeeding spring.

These trees are generally brought over from Italy every spring, by the persons who bring over the oranges, jasmines, &c. from whom they may be procured pretty reasonably; which is a better method than to raise them from layers in this country, that being too tedious; and those which are thus brought over, have many times very large stems, to which size young plants in this country would not arrive in ten or twelve years growth. When you first procure these stems, you should (after having soaked their roots twenty-four hours in water and cleaned them from the filth they have contracted in their passage) plant them in pots filled with fresh light sandy earth, and plunge them into a moderate hot-bed; observing to skreen them from the violence of the sun in the heat of the day, and also to refresh them with water, as you shall find the earth in the pots dry. In this situation they will begin to shoot in a month or six weeks after, when you should let them have air in proportion to the warmth of the season; and, after they have made pretty good shoots, you should inure them to the open air by degrees; into which they should be removed, placing them in a situation where they may be defended from strong winds: in this place they should remain till October following, when they must be removed into the green-house, as was before directed. Having thus managed these plants until they have acquired strong roots, and made tolerable good heads, you may draw them out of the pots, preserving the earth to their roots, and plant them in the open air in a warm situation, where you must manage them as was before directed for the young ones, and these will in two or three years produce fruit, provided they do well. The Lucca and box-leaved Olives are the hardiest, for which reason they should be preferred to plant in the open air; but the first sort will grow to be the largest trees.

OMBRO'METER *, a machine to measure the quantity of rain that falls.

* The word is formed from the Greek ὄμβρος, rain, and μέτρον, to measure.

The following Ombrometer is that lately used by Mr Pickering.

This machine consists of a tin funnel, whose surface is an inch square, a flat board and glass tube let into the middle of it in a groove (the length and breadth of both board and tube being ad libitum) and an index. My board is about three feet long, to answer the height of the rails that go round the top of my house, to one of which it is hung, clear of any obstacle to prevent the free fall of the rain, with four little staples that slide over as many tenter-hooks. The bore of my tube is about half an inch; which, at a medium, is the best size, a larger bore obliging you to make your graduations the more contracted, and, consequently, the less plain and accurate; and a lesser not permitting you to return the water out of the tube when full, without the adhesion of a great deal to its sides; which, when you have placed the tube in its perpendicular situation, subsides, and sometimes fills up $\frac{1}{10}$ of an inch; which, without care, must necessarily make great mistakes in the diary. The method of graduating the board is this:

I had

I had a veſſel of tin made, whoſe contents were exactly a cubic inch. With this veſſel, filled with water exactly to its ſurface, I frequently gauged the tube, till, by repeated trials, I had found the height to which a cubic inch of water would riſe in it. The ſpace anſwering to this on the board I had graduated into 32 equal parts, and took the ſame method with the reſt of the tube, till in the ſame manner I had graduated four ſuch inches. Now, the ſurface of the funnel being, as has been ſaid, exactly a ſquare inch, no rain can by it get into the tube, but ſuch as falls within the ſquare of one inch, which, as the ſhower is more or leſs, has its exact quantity ſhewn upon the board, on which a moveable index is placed. This machine has highly anſwered my expectation; its form being very ſimple, and eaſily repaired, if any accident happen; for, ſhould the tube be broke, it is only rubbing out the graduation, which is marked with a black-lead pencil upon the board painted white, and gauging you a new tube with the cubic meaſure for a new graduation, and your machine is again complete. In winter it will be neceſſary to let no depth of water remain in the tube; for, ſhould there be a froſt, the expanſion of the ice will certainly break it. The machine will equally ſerve for diſſolved hail and ſnow. Its figure may be ſeen *Plate* XXXI. *fig.* 17. where *a a* is the board, *b b* the tube, *d* the funnel fixed, *c* a larger view of the funnel. *Philoſophical Tranſ.* Nº. 473.

OMENTUM, (*Dict.*) — As the Omentum is a ſoft and pinguious part in conſequence of its laxity, highly ſubject to receive the humours conveyed to it from other parts, it is for this reaſon, as well as the Omentum and pancreas, ſubject to various diſorders; which, however, are not deſcribed by authors, becauſe they can hardly, if at all, be diſcovered in live perſons; and are only to be inveſtigated by laying open their carcaſes, as is obvious from the caſes recorded by various authors. Thus Veſalius informs us, that in a certain carcaſe, when laid open, he ſaw the Omentum ſo preternaturally tumid, that it weighed about five pounds; whereas, in its natural ſtate, it hardly exceeds half a pound. Rouſſet, in his treatiſe de Partu Cæſareo, tells us that, upon laying open a carcaſe at Paris, there was a very conſiderable abſceſs found on the Omentum. Riolanus, alſo, in his Anthropographia, informs us, that, upon laying the body of a young gentleman of nineteen years of age, he ſaw the Omentum full of a large number of glands, from which a conſiderable quantity of ſordid humours had been conveyed to it; whilſt, at the ſame time, the meſentery and pancreas were, by means of the abſceſs, putrified; and the ſpleen ſo greatly diminiſhed, as to be almoſt entirely conſumed. And I myſelf, upon laying open the body of a canon of Montpelier, ſaw the Omentum ſcirrhous, poſſeſſing the whole epigaſtric region, and about four fingers breadth in thickneſs. The colour of this tumor of the Omentum reſembled that of the ſpleen: ſo that it is highly probable that the melancholic humour was tranſlated from the ſpleen, and accumulated in that part, ſince the patient was of an highly melancholic conſtitution, and ſince, through the ſplenic ramifications, there is a ſufficiently potent conveyance from the ſpleen to the Omentum. According to Hippocrates, in a dropſy, the waters are alſo frequently conveyed from the ſpleen to the Omentum, from which they gradually drop into the cavity of the abdomen.

But as the tumors of the Omentum are not, by all the efforts of art, to be diſtinguiſhed from thoſe of the meſentery, ſo their diagnoſtic or diſtinguiſhing ſigns cannot poſſibly be aſcertained. It is true, indeed, tumors of the Omentum are more eaſily perceived by the firſt touch, becauſe that part lies immediately under the peritonæum, whereas the meſentery is ſituated deeper: but the larger tumors of the meſentery riſe to the peritonæum, and even the epigaſtric muſcles are, ſometimes, ſo united with it, that, a ſuppuration happening, theſe tumors diſcharge their ſordid contents through the navel, or ſome other part.

But this difficulty of aſcertaining the diagnoſtic ſigns of theſe diſorders, by no means produces any perplexity in the method of cure; ſince, in all tumors of the ſame ſpecies poſſeſſing the inferior parts of the abdomen, the ſame meaſures are to be taken; which, however, are not ſo ſucceſsful in the Omentum which is not furniſhed with ſo commodious outlets for the matter of theſe tumors, as the other parts are. *River. Prax. Med. Lib.* 13. *Cap.* 5.

ONION, *cepa*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the liliaceous kind, and compoſed of ſix leaves; in the center of it there ſtand a piſtil which finally becomes a roundiſh fruit, divided into three cells, and containing roundiſh ſeeds. To this it is to be added, that the flowers are placed in ſpherical heads, and that the leaves, as well as ſtalks, are tubular.

Onions are much eaten, and it would be well if they were yet more ſo; they attenuate tough humors, cleanſe the ſtomach, and excite appetite, and in ſome degree promote the menſes. but they are apt to breed flatulences, and, if eaten too largely, to affect the head and diſturb the ſleep afterwards. An Onion, boiled to perfect ſoftneſs, is recommended by many as a cataplaſm for ripening peſtilential buboes. A freſh cut Onion, rubbed on the part till it becomes red and itch, is ſaid to be a cure for baldneſs. A mixture of equal parts of juice of Onions and ſpirit of wine is eſteemed a cure for deafneſs, a few drops being put at times into the ears: an Onion cut in two, and macerated an hour in the ſame ſpirit, is a good application for the head ach. A cataplaſm of roaſted Onions and butter is an excellent application for the piles.

The three ſorts of Onions, propagated for the ſake of their roots for winter uſe, are the Straſburgh Onion, the red Spaniſh Onion, and the white. Theſe are to be propagated by ſowing their ſeeds in the latter end of February, in a dry and ſomewhat ſandy ſoil, yet rich; in about a month's time the plants will appear, and, in a fortnight after that, they will be forward enough for hoeing, which muſt be done with a very ſmall hoe, cutting up all the weeds, and leaving the Onions two inches aſunder; this ſhould be done in a dry ſeaſon, and the ground will then be clear from weeds for a month: at the end of this time, they muſt be hoed again, and cut to three inches a-part; and, a month after this, to four inches; at which diſtance they will thrive well, and grow very large. Toward the latter end of July, the Onions will have arrived at their full growth, which is known by their leaves hanging down and ſhrivelling; and they muſt at this time be pulled up, and ſpread on a dry place, and turned every day, to prevent their ſtriking freſh roots; in a fortnight's time they will be dry enough to houſe, and ſhould be wiped clean, and ſpread thin in an upper loſt, or garret.

The differences between theſe ſpecies are not eſſential, they often degenerating into one another; and even the large Portugal Onion, after a few years, with us, will loſe itſelf ſo far, that no one would imagine it came of that race. *Miller's Gard. Dict.*

Welſh ONIONS, a ſort of Onions propagated by gardeners, for the uſe of the table in ſpring; they never make any bulb, and are therefore only to be eaten green with ſallads. They are propagated by ſowing their ſeeds towards the end of July in beds of a dry but rich ſoil; and, in three weeks after ſowing, they will appear above ground: they muſt be kept carefully cleared from weeds. About October all their leaves die away which has occaſioned ſome to think all the plantation loſt, and to dig up the ground for ſome other uſe; but, if they are ſuffered to ſtand, they will ſhoot up again very ſtrong in January, and from that time will grow very vigorouſly, and reſiſt all weathers, and will be fit to draw for young Onions in March, and are extremely green and fine, and more valued at market at that ſeaſon than any other kind; but they are much ſtronger than any other Onions, and have very much of the taſte of garlic.

Counterfeit OPAL. To imitate this gem in natural cryſtal, uſe the following method: take yellow orpiment and white arſenic, of each two ounces; crude antimony and ſal armoniac, of each one ounce; powder all theſe, and mix them well together; put this powder into a large crucible, and lay upon it ſmall fragments of cryſtal, and, upon theſe, other larger pieces of cryſtal; fill up the crucible with theſe, and lute on to it another crucible inverted, with a hole at the bottom as big as a ſmall pea; when the lute is dry, ſet the veſſel in a quantity of charcoal in a large chimney, covering them up with coals, to the middle of the upper crucible; ſo long as the materials fume out at the hole, keep up a ſtrong fire; when that is over, let the fire go out of itſelf, and then unlute the crucible; the greateſt part of the cryſtal will be found tinged to the colours of various gems; not only the Opal, which will be very fair and beautiful, but the topaz and ruby colour will be ſeen in others. *Neri's Art of Glaſs.*

OOST, in huſbandry, a name given by the people who manure hops, for the kiln in which they dry them after they are picked from the ſtalks. This is a ſquare room, built up of brick, or ſtone, ten feet wide, more or leſs, and having a door on one ſide. In the midſt of this room is a fire-place, about thirteen inches wide, and as much high; and in length, reaching from the mouth ſo nearly to the back part of the kiln, that a man has juſt room to go round it. This fire place is called a herſe, and the fire is let out into the room by ſeveral holes in the ſides, in the ſame manner as in malt kilns. Five feet above this, is laid the floor on which the hops are to be laid to dry, and this muſt have a wall round it, at four feet high, to keep the hops from falling out. At one ſide of the upper bed muſt be made a window by which to puſh out the hops, as they are dried, into a room prepared for them. The beds muſt be made of laths an inch ſquare, placed at a quarter of an inch diſtance from one another, and ſupported by beams underneath. The hops are to be poured on this bed with a baſket, till the whole is covered half a yard thick with them; when this is done, lay them even with a rake, and let a fire be made in the fire-place below. Some recommend a wood fire, but experience ſhews nothing does ſo well as charcoal; let the fire be kept at the mouth of the furnace, for the air will be carried all the way through; and thus let the hops lie, never ſtirring them till they are thoroughly dry; when they rattle under the rake, and the inner ſtalks are brittle, they are ſufficiently dried, and are to be puſhed out, and a freſh parcel laid in the Ooſt in their place. Some people dry their hops in a common malt kiln, ſpreading them on a hair cloth about ſix inches thick, and now and then turning them till they are all thoroughly dried, then laying them in a heap, till they are to be put in the bags. But both these ways are liable to some inconveniencies; the Oost generally overdries the under ones, by the time that the upper ones are dry enough; and the hair cloth, and the turning in the other way, breaks and shatters them, and spills many of the seeds.

OPHIO'GLOSSUM, *adder's-tongue*, in botany, a genus of plants, no part of the fructification of which is visible, except the fruit. This is an oblong, double, or distichous capsule, divided by a great number of transverse articulations into many cells, each of which, when mature, opens transversly, and is found to contain a great number of small seeds of a subovate figure.

This is a spring plant, and is only to be found in April and May. It is not uncommon in wet meadows, and is easily distinguished among the other spring plants by its spike, or tongue.

It is esteemed one of the best vulnerary herbs this nation produces, but it is more in use among the common people than in the shops. They give its juice internally, and use the herb bruised, or an ointment prepared from it, with lard, or May butter, externally at the same time. *Dale's Pharmac.*

OPODE'LDOC, the name of a plaister said to be invented by Mindererus, though often mentioned by Paracelsus.

There is a famous popular ointment, which goes by the name of Opodeldoc, which is said to be thus prepared:

Take of the roots of marsh-mallows, comfrey, gentian, long-birthwort, angelica, of each one ounce and an half; of the herbs sanicle, ladies-mantle, mouse-ear, colts foot, snakewood, periwinkle, bruised, of each half an handful; of the leaves of rosemary, sage, and lavender, of each one handful and a half; flower of rosemary, sage, and lavender, of each one handful; juniper-berries, two ounces; cumin-seeds, one ounce; camphire and castor powdered, of each one ounce and an half; and, of spirit of wine, three pints and an half.

Put all into a glass cucurbit, well luted, and digest for ten hours in balneo mariæ, that is, in hot water, but not to boil; then strain; and, the spirit of wine being sufficiently impregnated with the ingredients, then add one pound of Castile soap shaved thin; then digest in the same manner as before, until the soap is dissolved.

In order to succeed in this process, the juncture must be carefully luted with two or three doubles of paper, daubed over with the whites of eggs, and tied about with thread; when the luting is dried, digest in balneo mariæ for ten hours, the matrass being fixed in the middle of the kettle, with a layer of straw under it to keep it at the distance of two inches from the bottom: for the first eight hours, the water must be kept so hot about it, that you can scarce hold your finger therein; and the two other hours augment the heat, but not so much as to make the water boil.

After the spirit of wine is thoroughly impregnated with the tincture of the roots, herbs, leaves, and powders, cool it gently; and, straining it through a linen cloth, pour it again into the matrass, with one pound of Castile soap shaved thin; then fit the vessel of rencounter to the matrass; lute the junctures, and digest as before, till the soap is intirely mixed with the spirit, and the whole reduced to an ointment; then take out the matrass, and suffer it to cool.

If the doses and other directions are duly observed, it will be the consistence of an unguent, neither too thick nor thin; and the method of trying, if it is truly prepared, is, to rub some of it on your hand, which it will immediately penetrate, leaving only a greenish stain; though the natural colour of the ointment is brown.

It is excellent in strains, relaxations of the sinews in horses, as well as human kind; also, in all pains, numbness, weakness in the joints, or other parts, being well rubbed in.

A succedaneum for this celebrated preparation may be made in the following manner:

Take, of Castile soap, two ounces; of rectified spirits of wine, four ounces; and, of camphire, two drachms: and mix them well together.

OPO'SSUM, or POSSUM, in zoology, the name of a very remarkable American animal, described by various authors, under the names of maritacaca, carigoi, ropoza, carigueya, jupatuma, tlaquatzin, sarigoi, and semivulpa.

It is a creature of the size of a large cat. Its head is shaped like that of the fox; its nose sharp, and its upper jaw longer than the under; its teeth are small, but like those of the fox, and it has two long ones, like the hare, in the front of the mouth; its eyes are very beautiful, small, round, and vivid; its ears long, smooth, and very soft, placed erect, like those of the fox, and very thin and transparent. It has black whiskers, like those of a cat; and has other hairs of the same kind on the other parts of its face, and over its eyes; its tail is round, and a foot long, and is of great service to it, as it uses it to twist round the branches of trees, hanging itself to them by that means. The tail is hairy near the insertion, but naked all the other parts, and is partly black, and partly of a brownish white; the hinder feet are considerably longer than the fore ones, and each has five toes; they much resemble hands, and the nails are white and crooked, the hinder one being, as in the monkey kind, the longest. Its head, and legs, as Hernandez observes, something resemble those of the badger. It has a broad, longitudinal black streak, on the face; it is of a blackish colour, with a mixture of a brown and grey on the back and sides, and has somewhat of a faint yellowish cast on the belly. *Ray's Syn. Quad.*

ORA'NGE-*dew*, a sort of dew which falls, in the spring time, from the leaves of Orange and lemon trees, and is extremely fine and subtile. Mr. De la Hire, observing this, placed some pieces of glass under the leaves to receive it, and, having thus procured some large drops of it, was desirous of finding out what it was. He soon found that it was not a merely aqueous fluid, because it did not evaporate in the air; and that it was not a resin, because it readily and perfectly mixed with water: it was natural here to suppose it a liquid gum, but neither did this, on examination, prove to be the case; for, being laid on paper, it did not dry as the other liquid gums do. Its answering to none of these characters, and its being of the consistence of honey, and of a sweet sugar-like-taste, gave a suspicion of its being a kind of manna; and whatever in the other trials had proved it not a resin, a gum, &c. all equally tends to prove that it is this substance.

O'RCHARD (*Dict.*) — In planting of an Orchard, great care should be had to the nature of the soil, that such trees as are adapted to grow upon the ground intended to be planted, may be chosen, otherwise there can be little hopes of their succeeding; and it is for want of rightly observing this method, that we see, in many countries, Orchards planted which never arrive to any tolerable degree of perfection, their trees starving; and their bodies either covered with moss, or the bark cracks and divides; both which are evident signs of the weakness of the trees; whereas, if instead of apples the Orchard had been planted with pears, cherries, or any other sort of fruit to which the soil had been adapted, the trees might have grown very well, and produced great quantities of fruit.

As to the position of the Orchard (if you are at full liberty to chuse) a rising ground, open to the south-east, is to be preferred; but I would by no means advise to plant upon the side of an hill, where the declivity is very great; for in such places the great rains commonly wash down the better part of the ground, whereby the trees would be deprived of proper nourishment: but, where the rise is gentle, it is of great advantage to the trees, by admitting the sun and air between them, better than it can upon an intire level; which is an exceeding benefit to the fruit, by dissipating fogs, and drying up the damps, which, when detained amongst the trees, mix with the air, and render it rancid: if it be defended from the west, north, and east-winds, it will also render this situation still more advantageous; for it is chiefly from these quarters that fruit-trees receive the greatest injury: therefore, if the place be not naturally defended from these by rising hills (which is always to be preferred) then you should plant large growing timber-trees at some distance from the Orchard, to answer this purpose.

You should also have a great regard to the distance of planting the trees, which is what few people have rightly considered; for, if you plant them too close, they will be liable to blights; and the air, being hereby pent in amongst them, will cause the fruit to be ill-tasted, having a great quantity of damp vapours from the perspiration of the trees, and the exhalations from the earth mixed with it, which will be imbibed by the fruit, and render their juices crude and unwholesome.

Wherefore, I cannot but recommend the method which has been lately practised by some particular gentlemen with very great success; and that is, to plant the trees fourscore feet asunder, but not in regular rows. The ground between the trees they plough and sow with wheat and other crops, in the same manner as if it were clear from trees; and they observe their crops to be full as good as those quite exposed, except just under each tree, when they are grown large, and afford a great shade; and, by thus ploughing and tilling the ground, the trees are rendered more vigorous and healthy, scarcely ever having any moss, or other marks of poverty, and will abide much longer, and produce better fruit.

If the ground in which you intend to plant an Orchard has been pasture for some years, then you should plough in the green sward the spring before you plant the trees: and, if you will permit it to lie a summer fallow, it will greatly mend it, provided you stir it two or three times, to rot the sward of grass, and prevent weeds growing thereon.

At Michaelmas you should plough it pretty deep, in order to make it loose for the roots of the trees, which should be planted thereon in October, provided the soil be dry; but, if it be moist, the beginning of March will be a better season.

When you have finished planting the trees, you should provide some stakes to support them, otherwise the wind will blow them out of the ground; which will do them much injury, especially if they have been planted some time; for, the ground at that season being warm, and for the most part moist, the trees will very soon push out a great number of young fibres; which, if broken off by their being displaced, will greatly retard the growth of them.

In the spring following, if the season should prove dry, you should cut a quantity of green turf, which must be laid upon the surface of the ground about their roots, turning the grass downward; which will prevent the sun and wind from drying the

the ground, whereby a great expence of watering will be faved: and, after the firft year, they will be out of danger, provided they have taken well.

Whenever you plough the ground between thefe trees, you muft be careful not to go too deep among their roots, left you fhould cut them off, which would greatly damage the trees: but, if you do it cautioufly, the ftirring of the furface of the ground will be of great benefit to them; though you fhould obferve never to fow too near the trees, nor fuffer any great rooting weeds to grow about them, which would exhauft the goodnefs of the foil, and ftarve them.

If, after the turf which was laid round the trees be rooted, you dig it in gently about the roots, it will greatly encourage them.

There are fome perfons who plant many forts of fruit together in the fame Orchard, mixing the trees alternately: but this is a method which fhould always be avoided; for hereby there will be a very great difference in the growth of the trees, which will not only render them unfightly, but alfo the fruit upon the lower trees ill tafted, by the tall ones overfhadowing them; fo that, if you are determined to plant feveral forts of fruit on the fame fpot, you fhould obferve to place the largeft-growing trees backwards, and fo proceed to thofe of lefs growth, continuing the fame method quite through the whole plantation; whereby it will appear at a diftance in a regular flope, and the fun and air will more equally pafs through the whole Orchard, that every tree may have an equal benefit therefrom.

The foil of your Orchard fhould alfo be mended once in two or three years with dung, or other manure, which will alfo be abfolutely neceffary for the crops fown between: fo that where perfons are not inclinable to help their Orchard, where the expence of manure is pretty great; yet, as there is a crop expected from the ground befides the fruit, they will the more readily be at the charge upon that account.

In making choice of trees for an Orchard, you fhould always obferve to procure them from a foil nearly a kin to that where they are to be planted, or rather poorer; for, if you have them from a very rich foil, and that wherein you plant them is but indifferent, they will not thrive well, efpecially for four or five years after planting; fo that it is a very wrong practice to make the nurfery, where young trees are raifed, very rich, when the trees are defigned for a middling or poor foil. The trees fhould alfo be young and thriving; for, whatever fome perfons may advife to the contrary, yet it has always been obferved, that though large trees may grow, and produce fruit, after being removed, they never make fo good trees, nor are fo long-lived, as thofe which are planted while young.

Thefe trees, after they are planted out, will require no other pruning but only to cut out dead branches, or fuch as crofs each other, fo as to render their heads confufed and unfightly: the too often pruning them, or fhortening their branches, is very injurious; efpecially to cherries and ftone fruit, which will gum prodigioufly, and decay in fuch places where they are cut: and the apples and pears, which are not of fo nice a nature, will produce a greater quantity of lateral branches, which will fill the heads of the trees with weak fhoots, whenever their branches are thus fhortened; and many times the fruit is hereby cut off, which, on many forts of fruit-trees, is firft produced at the extremity of their fhoot.

It may, perhaps, feem ftrange to fome perfons, that I fhould recommend the allowing fo much diftance to the trees in an Orchard, becaufe a fmall piece of ground will admit of very few trees, when planted in this method: but they will pleafe to obferve, that, when the trees are grown up, they will produce a great deal more fruit, than twice the number, when planted clofe, and will be vaftly better tafted; the trees, when placed at a large diftance, being never fo much in danger of blighting as in clofe plantations, as hath been obferved in Herefordfhire, the great county for Orchards, where they find, that when Orchards are fo planted or fituated, that the air is pent up amongft the trees, the vapours which arife from the damp of the ground, and the perfpiration of the trees, collect the heat of the fun, and reflect it in fteams fo as to caufe what they call a fire blaft, which is the moft hurtful to their fruit; and this is moft frequent where the Orchards are open to the fouth fun.

But, as Orchards fhould never be planted, unlefs where large quantities of fruit are defired, fo it will be the fame thing to allow twice or three times the quantity of ground; fince there may be a crop of grain of any fort upon the fame place (as was before faid) fo that there is no lofs of ground: and, for a family only, it is hardly worth while to plant an Orchard; fince a kitchen garden well planted with efpaliers will afford more fruit than can be eaten while good, efpecially if the kitchen garden be proportioned to the largenefs of the family: and, if cyder be required, there may be a large avenue of apple-trees extended crofs a neighbouring field, which will render it pleafant, and produce a great quantity of fruit; or there may be fome fingle rows of trees planted to furround the fields, &c. which will fully anfwer the fame purpofe, and be lefs liable to the fire blafts before-mentioned. *Miller's Gard. Dict.*

O'RCHIS, *male fatyrion.* — This Orchis which is the common fatyrion of the fhops, has two oval roots, about as big as a fmall olive, of a whitifh colour, full of a flimy juice, which, contrary to moft other plants, have feveral white fibres growing above them; from thefe fprings a fingle fucculent ftalk, encompaffed with three fhining, fmooth, lily-like leaves fpotted with black. The flowers grow on the tops of the ftalks in a long fpike or thyrfus, of a purple colour; each flower being of an irregular form, confifting of fix leaves, fomewhat refembling a galea, with a fmall piece of ear ftanding erect on each fide, and a broad labella fpotted with deeper fpots. The feeds are very fmall, included in a triangular long capfula; it grows in moift meadows, and flowers in April. The roots only are ufed.

They are accounted a provocative and a ftimulus to venery, and a ftrengthener of the genital parts, and help conception, and for thefe purpofes are a chief ingredient in the electuarium diafatyrium: outwardly applied in form of a cataplafm, they diffolve hard tumors and fwellings.

The only officinal preparation is the aforefaid electuary. *Miller's Bot. Off.*

ORCHIS, *female fatyrion.* — This is a lower and fomewhat leffer plant than the former, having no fpots on the leaves; the fpike of the flowers is lefs, and not fo beautiful, of a purplifh colour, having the labella ftriped with green ftripes; it grows in the like places with the former, and flowers fomewhat later. The root is much alike, and is fuppofed to have the fame virtues.

Though thefe plants are ufed in the fhops for the fatyrion, yet they are not the fatyrion of Diofcorides and the ancients; that being, as is plainly proved by Parkinfon, and other fkilful botanifts, our common tulip, which much better anfwers the defcription of Diofcorides, than any of the Orchifes. *Miller's Bot. Off.*

ORE (*Dict.*)—The Ores of the richer metals, as gold and filver, ufually contain a confiderable portion of fulphur, and Alonfo Barba tells us, that the moft expert mineralifts in Peru always efteem abundance of fulphur a fign of a rich Ore in the neighbourhood. Among the richeft Ores of the mountain of Potofi, there are fuch quantities of native brimftone, that the cavities in the mines are often filled with a blue flame, on only bringing a lighted candle into them fo as to touch their fides. It has been wondered at, that, where there is abundance of fulphur in thefe mines, there fhould be no vitriol found, that being only a metal diffolved by means of fulphur; but this objection ceafes, when we confider the denfe and compact nature of thefe two metals, which renders them not foluble by means of fulphur, as the others are. Wherever there is ftore of fulphur, or of pyrites, or other ftones which contain fulphur in the mines of copper and iron, great ftore of vitriols are always found there alfo, being formed by the corrofion of the Ores of thofe metals by fulphur, which renders them foluble in water, from which they again concrete in form of falts. Chemiftry is able to imitate the operations of nature on this occafion feveral ways; for copper, or iron, being formed in thin plates, and either rubbed over with the acid fpirit of fulphur, or calcined with powder of common fulphur, become foluble in water, and afford cryftals of true vitriol, wholly analogous to the natural ones; and either blue or green, as iron, or copper, are the metals employed; but, thefe proceffes not being able to produce cryftals of falt, or vitriol, from either filver, or gold, it is not wonderful that nature is not able to form them by the fame means.

The general formation of fulphur from the Ores of metals, yet lying in the bowels of the earth, is, probably, after this manner: an acid, faline, fulphureous, fteam, or vapour, fuch as common fulphur is eafily reduced to, by heat not greater than that within the bowels of the earth, infinuating itfelf either through the pores of ftones, or through their cracks, which are always frequent about the veins of metals, penetrates into the bed of Ore, fuppofe of copper. The vapour is continually fupplied with frefh quantities from below; and, as it blends itfelf with the metal, corrodes it, as the fume of brimftone will do the fame copper in plates. The metal, thus corroded, being foluble in water, as we find by experience, it is neceffary, that the Ore muft, under the fame management, be fo too; and, in this cafe, the water, which is continually pervading all the ftrata of the earth, wafhes off the diffolved metal; and wherever it happens to be ftayed in fmall quantities afterwards, whether within the vein of the metal, or at a diftance from it, it cryftallifes the falt it contains, and common blue vitriol is produced, if the metal in the vein be iron. The fame procefs is obferved, and the event is the fame in all refpects, when copper is the metal corroded, except that the vitriol, inftead of blue, is green; this plainly accounts for the obfervation of the workers in copper mines, that vitriol and brimftone are ufually found together, the one being a natural confequence of the other. Sulphur is, indeed, often found where there is no vitriol, but vitriol is very feldom found without fulphur; it being not a diftinct principle, but a genuine production of fulphur. *Philof. Tranf.* N°. 104.

OREOSELI'NUM, *mountain parfley*, in botany, a genus of plants, whofe characters are:

It hath a rofe-fhaped unbellated flower, confifting of feveral leaves, placed in a circular order, refting on the empalement, which afterwards becomes as fruit, compofed of two feeds, which are oval, plain, large-ftreaked and bordered, and fometimes caft off their cover: to thefe notes muft be added, that the leaves are like parfley.

Thefe

These plants are propagated by feeds, which fhould be fown in autumn, as foon as poffible after they are ripe; for, if they are kept out of the ground until the fpring, they feldom grow. Thefe feeds fhould be fown in the places where they are defigned to remain; for, as they have downright carroty roots, they do not well bear tranfplanting. They require a moift light foil, and they are beft in a fhady fituation. The beft method is, to fow the feeds in drills, which fhould be made about eighteen inches afunder, and about half an inch deep. In the fpring, when the plants come up, they fhould be carefully cleared of weeds; and, where the plants are too clofe, they fhould be thinned, leaving them about fix or feven inches a-part, that they may have room to grow.

In two years after the feeds are fown, the plants (if they have thriven well) will be ftrong enough to produce their flower ftems, when they will begin to fhoot up in April, and their flowers appear in June; but their feeds will not ripen till the end of Auguft or September. Thefe plants will continue fome years, and will annually produce feeds; fo that the ground fhould be carefully dug between the plants every fpring, and conftantly kept clean from weeds, which is all the culture the plants will require.

O'RGANO, in the Italian mufic, is ufed to fignify the thorough bafs. It is ufually fcored with figures over the notes, for the harpfichord, bafs viol, and lute.

O'RGUES (*Dict.*)—Orgues are preferable to herfes, or portcullifes, becaufe thefe may be either broke by a petard, or they may be ftopped in their falling down; but a petard is ufelefs againft an Orgue; for, if it break one or two of the pieces, they immediately fall down again, and fill up the vacancy; or, if they ftop one or two of the pieces from falling, it is no hindrance to the reft; for, being all feparate, they have no dependence upon one another.

ORI'GANUM, *wild marjoram*, in botany, a genus of plants, whofe characters are:

The calyx is long, fimple, tubulous, and clofely feated among foliaceous fcales; in this is fituated the flower, having an erect, roundifh, bifid galea, or creft, and a beard divided into three parts, the middle one being hollow like a fpoon. The flowers are collected into fquamous fpikes, refembling thofe of the mufcari; and fometimes form a fort of umbella, fhooting forth one on each fide of the fcales.

This Origanum, or wild marjoram, is a foot, or more, high, having many hairy, brown, brittle ftalks, with two broad, round-pointed leaves, bigger than marjoram, fet at a joint on very fhort foot-ftalks, and of a brownifh green colour. The flowers grow on the tops of the ftalks, being fmall, labiated, and galeated, of a purple colour, among long heads, compofed of a great number of green fcales. The roots are woody and fibrous. It grows in hedges and thickets, and flowers in July. The tops and leaves are ufed.

This Origanum, though not fo ftrong as the Origanum Creticum, yet is very good for obftructions of the breaft, liver, and womb; helps the jaundice, fhortnefs of breath, and ftoppage of the menfes; comforts the head and nerves. The diftilled oil helps the tooth-ach, being put upon lint into the aching tooth. *Miller's Bot. Off.*

The wild marjoram is acrid, aromatic, deterfive, and gives a very faint tincture of red to the blue paper; which makes us conjecture, that this plant is filled with a volatile, aromatic, and oily falt, not entirely deftitute of acid; whereas, in the artificial volatile falt, the acid of the fal ammoniac has been detained by the falt of tartar.

Befides, the wild marjoram contains abundance of terreftrial parts. It is diuretic, diaphoretic, good to make one fpit, and provoke the terms. A tea of it may be ufed in an afthma, violent coughs, indigeftion, and pleurify. It is ufed in the wafhings for the feet, and femicubiums for the vapours, green-ficknefs, and palfy. Take wild marjoram dried at the fire, and wrap it warm in a linen cloth, and cover the head well with it, for a rheum and rheumatifm in the neck, commonly called torticolis. *Martyn's Tournefort.*

ORNI'THIÆ, a name given by the ancients to certain winds, which ufually blow in fpring, at the time when the birds of paffage came over to them. Pliny fays, that thefe winds blew from the weft, and that, by fome, the Etefian winds are called by this name. Others fuppofe that they blew from the north, or north-weft.

ORNITHOGA'LUM, *ftar of Bethlehem*, in botany, a genus of plants, whofe characters are:

It hath a lily flower, compofed of fix petals, or leaves, ranged circularly, whofe center is poffeffed by the pointal, which afwards turns to a roundifh fruit, which is divided into three cells, and filled with roundifh feeds; to which muft be added, it hath a bulbous or tuberofe root, in which it differs from fpiderwort.

Thefe plants are propagated by off-fets, which their roots do commonly produce in great plenty. The beft time to tranfplant their roots is in July or Auguft, when their leaves are decayed; for, if they are removed late in autumn, their fibres will be fhot out, when they will be very apt to fuffer, if difturbed. They fhould have a light fandy foil; but it muft not be overdunged, which would caufe their roots to decay. They may be intermixed with other bulbous-rooted flowers in the borders of the pleafure garden, where they will afford an agreeable variety, and continue in flower a long time. Their roots need not be tranfplanted oftener than every other year; for, if they are taken up every year, they will not increafe fo faft; but, when they are fuffered to remain too long unremoved, they will have fo many off-fets about them as to weaken their blowing roots. Thefe may alfo be propagated from feeds, which fhould be fown and managed as moft other bulbous-rooted flowers, and will produce their flowers in three or four years after fowing.

ORNITHOPO'DIUM, *bird's foot*, in botany, a genus of plants, whofe characters are thefe:

The leaves are conjugated, in a feries of feveral pairs, and end in an odd one. The pod is hooked, jointed, and undulated, or waved; containing, within each joint, one round feed. The pods grow many together from the fame origin, in fuch a manner as to refemble a bird's-foot.

It grows in fandy and gravelly places, and flowers in fummer. The herb, which is of ufe in medicine, breaks and expels the ftone in the kidnies and bladder, and is effectual in an hernia.

OROBA'NCHE, *broom-rape*, in botany, a genus of plants, whofe characters are:

The root is fquamous, and the plant appears as if it were bare of leaves. The end of the pedicle opens into a multifid calyx; the flower is monopetalous, anomalous, bilabiated (the galea being hollow, and the beard trifid) collected into fpikes, and embracing an oblong ovary, furnifhed with a long tube unicapfular, bivalve, opening, when ripe, into two valves, and pregnant with very minute feeds.

It frequently grows to the roots of genifta, or broom; whence it is called rapum-geniftæ, or broom-rape; it is found alfo among corn. The herb preferved, or its fyrup, is of an excellent ufe in fplenetic and hypochondriac diforders; and an ointment prepared of the fame, with fwine's fat, is good for hard and fcirrhous tumors.

It grows in gravelly and dry places, and flowers in June and July. The herb, dried and pulverifed, is a prefent remedy for the cholic. *Dale.*

OROBOI'DES, a name given by Hippocrates, and other authors, to a furfuraceous fediment in the urine of perfons who have the jaundice: it is ufually of a reddifh brown colour; and is not peculiar to that difeafe, but is found in fome others.

ORO'BUS, *bitter vetch*, in botany, a genus of plants, whofe characters are:

It hath a papilionaceous flower, confifting of the ftandard, the keil, and the wings; out of whofe empalement rifes the pointal wrapped up in the membrane, which afterwards becomes a round pod, full of oval-fhaped feeds: to which muft be added, that two leaves joined together grow upon a rib that ends in a point.

OROBUS, is alfo the name of a plant, called wood peafe.

This plant grows in woody and bufhy places, flowers in April, and the feed is ripe in May. The tubera of the root tafte much like liquorice, and the Scottifh Highlanders make ufe of them in the fame diforders of the thorax, for which liquorice is proper. They call the plant karemyle, and ufe thofe tubera, tempered with water, to enable them to fupport hunger and thirf. the longer; for which purpofe, they find them very ferviceable, for, by their fweet and vifcid fubftance, they correct and mitigate, and even fix and reftrain, the acid and acrimonious humour in the ftomach; and, by that means, are a remedy againft hunger and thirft. If this plant, therefore, be not the fame with what Theophraftus calls fythica (which is generally thought by the learned to be liquorice) it is certainly very much like it, being leguminous, filiquous, and of the fame qualities. And it feems very probable, that the tubera of this plant were the food with which the Britons fuftained themfelves for fome days, when they were preffed by the enemy; as it is related by Dion, in the life of the emperor Severus. For this plant, fays Dr. Sibbald in his introduction to the Natural Hiftory of Scotland, has the virtues of liquorice; and its tubera by our Highlanders, who, to this very day, retain the manners, and way of living, of the ancient Scots, are ftill applied to the fame ufes; but, as for liquorice, I know not, that it grows any where in the whole Ifland without cultivation. *Raii Hift. Plant.*

ORPE'LLO, a preparation of brafs ufed in the glafs trade, and prepared in this manner: cut plates of brafs into fmall pieces, and place them in a luted crucible, in a ftrong fire, but not fo violent as to melt it. Let it ftand in this manner for four days, in which time it will be well calcined; when cold, powder and fift it, and finally grind it on a porphyry. This will be a black powder; fpread this on tiles, which place on burning coals in the leer, near the hole, for four days; take off the afhes that may fall into it, and finally powder and fift it fine for ufe. It is known to be nicely prepared, when, on mixing with the melted metal in the glafs furnace, it makes it fwell and boil.

The colour it gives is a very elegant fky colour, and a fea-green, or a mixed colour between them, according to the quantity and degree of calcination. *Neri's Art of Glafs.*

ORVIETA'NUM (*Dict.*) — The antidotum Orvietanum is thus prepared:

Take

Take of old theriaca, and dried vipers, with their hearts and livers, each four ounces; of the root of viper's-grass, carline-thistle, masterwort, angelica, bistort, the smaller birthwort, contrayerva, white dittany, galangals, gentian, costus, and the true acorus; of the seeds of Macedonian parsley, of the leaves of sage, rosemary, goats-rue, carduus benedictus, and dittany of Crete; of bay and juniper-berries, each one ounce; of cinnamon, cloves, and mace, each half an ounce; and, of the best honey despumated, eight pounds; make into an antidote.

Reduce all the ingredients into a common powder; despumate the honey, and boil it to the consistence of a thick syrup. Suffer it to become half-cold, and then, by means of a spatula, carefully mix with it the theriaca and the powder, in order to make an electuary, to be kept, for use, in a close-stopped vessel.

This electuary, or antidote, is highly esteemed, as good against the plague, the small-pox, and the bites of poisonous animals. It also corroborates the brain, the heart, and the stomach. The dose is, from one scruple, to a drachm and an half.

ORYCTO'GRAPHY, is that part of natural history wherein fossils are described. *Wolfm. Disc. Prælim. Logic.*

ORYCTO'LOGY, is that part of physics which treats of fossils, or it is the science of fossils. Under this head comes the doctrine of salts, sulphurs, stones, gems, and metals. *Wolfm. Disc. Prælim. Logic.*

ORY'ZA. See RICE in the Dictionary.

OS *aureum, the golden mouth*, in natural history, a name given to a species of cochleæ of the lunar kind, or of that genus which have a round mouth. This, in the Os aureum, is of a fine yellow.

Os *calcis*, in anatomy, a bone of the foot; see the article FOOT, in the Dictionary.

Os *calcis luxated*. It sometimes happens, that the Os calcis, and no other bone of the foot, is displaced or luxated by some external force; and this happens sometimes toward the external, sometimes toward the internal side of the foot. When this accident happens, it is easily discovered by the violent pain it occasions; and by the inequality of the part, that is, there is a cavity plainly observable in one part, and a tumor in the other, on the place. The reduction of this dislocation is very easy. The patient is to be placed on a bed, and, while two assistants extend the limb in the opposite directions, the surgeon replaces the dislocated bone with his fingers, and the pressure of the palm of his hand, and then there is no more than a proper bandage and rest required to the cure. *Heister's Surg.*

Os *humeri*, in anatomy, a bone of the arm. See ARM in the Dictionary.

Os *humeri fractured*. Fractures of the Os humeri are least dangerous when near its middle, and much worse when near its upper or lower head. It sometimes happens, that the fractured ends of these bones keep their places, but much more frequently they are found slipped one over another, by which means the fractured limb is made shorter than the sound one: sometimes also, though much more rarely, it happens, that the dividends of the bone recede from one another, by reason of the weight of the arm, and by that means the fractured limb becomes longer than the sound one. In fractures of this bone, where the ends of the divided bone have slipped one over another, as is usually the case, there is required both force and skill to reduce them, especially if the patient has tense nerves and larger muscles, as is usually the case in strong men. To extend the arm on this occasion, the patient must be seated on a high stool, and an assistant must lay hold of his arm firmly above the fracture, keeping his elbow gently bent; then the lower part of the arm, beneath the fracture, is in like manner to be taken hold of, and the arm is to be gently extended forward, by endeavouring to remove easily each part from the other, in a right line. The surgeon is then to take hold of the fractured part of the arm, and with both his hands reduce the fractured bones into their proper places, while the arm is kept in a proper state of extension by the assistants; and, when they are replaced, the limb is to be rolled up with the proper bandages. *Heister's Surg.*

Os *innominatum*. See INNOMINATA *Ossa*, in the Dictionary.

Os *innominatum fractured*. A fracture of this bone very seldom happens, but, when it does, it is readily discovered by the injury and symptoms in the neighbouring parts, and is the more particularly dangerous, when the patient discharges a brown bloody matter. In restoring this bone, the patient must lie down on his sound side; the bone must be replaced with the hands, covered with compresses, dipped in spirit of wine, and kept on by the spica bandage. Afterwards bleeding, with cooling and relaxing medicines, must be used and a thin diet observed. *Heister's Surg.*

Os *sacrum*. See SACRUM *Os*, in the Dictionary.

Os *sacrum fractured*. When this bone is found to be fractured, the fragments are to be reduced into their proper places with the fingers, and, if any part of it be depressed inwards, a finger dipped into oil or butter, and with the nail close cut off, must be introduced up the anus in order to thrust the depressed fragment into its proper place, to which it is to be directed externally by the other hand. This being performed, a sticking plaister is to be applied, and compresses dipped in spirit of wine over it, to be kept on by the T bandage; or the plaisters may be let alone, and only the compress and bandage applied. The patient must keep his bed a fortnight, lying on his sides; or, if he will needs sit up, it must be on a chair without a bottom, that the bones may not be displaced by touching the seat. *Heister's Surgery.*

OSMUNDA, *Osmund royal*, in botany, a genus of plants, whose characters are:

It produces no flowers, but bears its fruit in clusters.

This is the biggest of our English ferns, sending forth several large-branched leaves, whose long broad pinnulæ are not at all indented about the edges, like the other ferns; they are of a light colour; among these arise several stalks, which have the like leaves growing on them on their lower parts, but towards the tops they are full of round, slender, seed-bearing, curled heads, an inch or more long when ripe, of a brown colour, covered with small dusty seed. These appear in June, and ripen in July. The root consists of a great number of small, long, round parts, matted together, blackish on the outside, and green within, covered over with small fibres. It grows in marshy, boggy places, particularly in a bog, at the backside of Woolwich, near the Warren.

The roots, the only part used, are accounted good for obstructions of the liver and spleen, and particularly esteemed for the rickets in children, as, also, for ruptures, wounds, and bruises. *Miller's Bot. Off.*

OSTEO'LOGY (*Dict.*) — There are properly two kinds of Osteology, one of which is to be learned from bones dried and prepared by boiling, and the other from the bones of a dead subject, as they are naturally connected with each other. Both these methods are very necessary for the practice of physic, and for the exact knowledge of the human body. By examining dry bones, however, we can only learn their exterior forms, their situation, and the connection which they may have with one another; but, when we consider them as joined together in a dead body, we are in a condition to observe many other things, in regard to them, very useful in physic; because their connections with one another, by cartilages and ligaments, and by the diversity of articulation, are sometimes very different in the dry from what we see them in the fresh bones. There are, for instance, in dry bones, certain cavities which appear to be cotyloide; because they are divested of their cartilages; but, in fresh bones, they are found to be glenoide, their cavities being filled with cartilages. And, on the other hand, some cavities appear to be glenoide in the skeleton, which are cotyloide in the body, their cavities being augmented by cartilaginous supercilia.

The exterior form and qualities of bones are much better demonstrated also from fresh subjects, than from prepared bones; because they lose a great many things in boiling, such as the cartilaginous bodies, the periosteum, the mucilaginous substance found between them, and the marrow contained in their cavities; all which may be shewn in a fresh body, but cannot be seen in a skeleton. *Riolan. Enchiridion Anatomicum.*

OSTEOSPE'RMUM, *hard-seeded chrysanthemum*, in botany, a genus of plants whose characters are:

The flower hath an hemispherical empalement, which is single, and cut into many segments; the flower is composed of several hermaphrodite flowers in the disk, which are tubulous, and cut at the brim into five parts: these are surrounded by several female flowers, which are radiated, each having a long narrow tongue, which is quinquefid: the hemaphrodite flowers have each five slender short stamina; these are barren: the female flowers have each a globular pointal, which afterwards becomes one single hard seed.

These plants are propagated by cuttings, which may be planted in any of the summer months, upon a bed of light earth, and should be watered and shaded until they have taken root. These may remain in the beds till they have gotten very good roots, when they must be taken up, and planted in pots: for, if they are suffered to stand long, they will make strong vigorous shoots, and will be difficult to transplant afterwards; during the summer season the pots should be frequently removed, to prevent the plants from rooting through, the holes in the bottoms of the pots, into the ground, which they are very apt to do when they continue long undisturbed, and then they shoot very luxuriantly, and, on their being removed, these shoots, and sometimes the whole plants, will decay.

OS'TREA, *the oister*, in natural history, the name of a very large genus of shells, the characters of which are these:

It is a bivalve shell, of a coarse external structure, and dirty appearance; each shell being composed of a great number of laminæ not nicely closed down upon one another. It is in some species smooth, in others striated, tuberose, or prickly; usually flat, but sometimes globose, plicated, and wrinkled into sinuses; the lower shell being always deeper than the other. Aldrovand supposes this genus of shell fish obtained the name Ostreum, from the Greek ὀστέον, a bone, as they are of a bony hardness.

Most authors have confounded the two genera of oisters and chamæ together, though there is an obvious and an invariable distinction. The oister is rough, and has a sort of beak; and, notwithstanding the roughness of both shells, it always ſhuts very evenly and firmly: add to this, that one of its ſhells is flat, the other convex; and is thus abſolutely diſtinguiſhed from the chamæ. *Hiſt. Nat. Eclair.*

Oiſters, in their growth, become faſtened to every ſolid ſubſtance which they happen to come into contact with; and rocks, ſmall ſtones, wood, ſea-plants, and a thouſand other things are found at times with Oiſters adhereing to them, whoſe ſhells have fitted themſelves to the form of the thing itſelf, and left their natural ſhape. The people who fiſh for, and trade in Oiſters, pretend to diſtinguiſh two kinds; one of which is fecund and will breed; the other which is barren. They ſay, they diſtinguiſh theſe by a little black fringe, which always ſurrounds the good breeding Oiſters.

The way to make Oiſters green is, to put them into ſmall pits where the water is about three feet deep, and where the ſun has great power; in theſe they become green in three or four days.

OSY'RIS, *poets caſia*, in botany, a genus of plants whoſe characters are:

It is male and female in different plants: the empalement of the flower is of one leaf, which is divided into three acute ſegments; the flower hath no petals; but thoſe on the male plants, have three ſhort ſtamina; and thoſe on the female have a roundiſh pointal, which afterwards changes to a globular berry, having a ſingle ſeed.

OTHO'NNA, *African ragwort*, in botany, a genus of plants whoſe characters are:

It hath a compound flower, conſiſting of many florets and half florets, incloſed in one common empalement: the florets are hermaphrodite; theſe are tubulous, and indented at the brim; the half florets are female; theſe are ſtretched out on one ſide with a narrow ſegment, like a tongue, beyond the empalement: the hermaphrodite flowers have each five ſmall ſtamina: the female flowers have an oblong pointal, which afterward turns to a ſingle oblong ſeed covered with a down.

O'TTER, in zoology, the name of an amphibious animal, ſmaller than the beaver, and has a longer and more ſlender body. Its tail is alſo longer than that of the beaver, and is all over covered with hair, and its legs are very ſhort in proportion to the ſize of its body. The feet have all five toes each, which are naturally expanded, and are connected by a membrane like the toes of web-footed fowl; and are all ſo equally diſtant, that there is no diſtinction of any in the place of the great toe in other animals. The head and face exactly reſemble the beaver, and the ears are ſmall, and placed under the eyes, near the upper jaw, as in the beaver. The hair is ſhort, and of a cheſnut brown, but paler under the belly. The tail has ſhorter hair than that of the body, but longer than that of the legs. *Ray's Syn. Quad.*

OV'EN, or *Aſſaying* OVEN; ſee *Aſſaying* FURNACE.

O'VIS, *the ſheep*. See the article SHEEP.

OU'TLICKER, or OUTLIGGER, in a ſhip, a ſmall piece of timber, three or four yards long, as occaſion ſerves, made faſt to the top of the poop, and ſtanding right out a-ſtern: at the outmoſt end of it is a hole, into which the ſtanding part of the ſheet is received, and made faſt through the block of the ſheet; and then again received through another block, which is ſeized to this Outlicker, hard by the end of it. This is ſeldom uſed in men of war, or in great ſhips; and, whenever it is made uſe of, it is becauſe the mizen maſt is placed ſo far aft, that there is not room enough within board to hale the ſheet flat.

OWL *Pigeon*, the name of a peculiar ſpecies of pigeon, called, by Moore, the columba bubo nominata. It is a ſmall and ſhort-bodied pigeon. It has a ſhort round head, and has a ſeries of feathers that ſeparate and open two ways upon the breaſt: but its moſt remarkable character is its beak, the upper chop of which is bent, and hooked over like an Owl's: this is the occaſion of its name: it is of various colours, as white, blue, or black, but is always of only one colour, never pied.

OU'ZELL, or *brook* OUZELL, in zoology, an Engliſh name for the rollus aquaticus, more uſually called the water rail.

OUZELL, or *ring* OUZELL, an Engliſh name for a bird of the merula or blackbird kind, remarkable for a white ring about its neck, and thence called by authors merula torquata; it is more commonly called, in Engliſh, the ring amzell. *Ray's Ornithology.*

OX, *bos*, a well known, and a very ſerviceable animal, in many reſpects; but his nature depends wholly on that of the bull and cow, from which he is bred. Derbyſhire and Lancaſhire are ſaid to have the beſt Oxen in England. Wales, and the iſland of Angleſea, afford a kind that are very valuable to the farmers, as they will fatten upon middling land; and the Scotch Oxen are yet hardier than theſe. The long-legged ſhort-horned cow, of the Dutch breed, is the beſt for milk; but then this kind needs to be very carefully kept. This ſort of cow will often yield two gallons of milk at a time.

When theſe creatures are intended to breed, the better the land is, the larger ſort of beaſts are to be choſen, and the greater will be the profit. But, of whatever ſort the breed is, the bull ſhould always be of the ſame country with the cow, otherwiſe it never ſucceeds ſo well. The bull ſhould be choſen of a ſharp quick countenance, his forehead broad and curled, his eyes black and large, his horns long, his neck fleſhy, his belly long and large, and his hair ſmooth and like velvet; his breaſt ſhould be large, his back ſtraight and flat, his buttocks ſquare, his thighs round, his legs ſtraight, and his joints ſhort. This ſort of bull is the beſt for breed, and makes the beſt Oxen for draught as well as for fattening.

The cow ought to have a broad forehead, black eyes, great clean horns, the neck long and thin, the belly large and deep, the thighs thick, the legs round, and the joints ſhort; a white large and deep udder with four teats, and large feet. The ſize muſt be proportioned to the goodneſs of the land. The largeſt cows, in general, give the greateſt quantity of milk; and it is always a good rule to take the cattle from a worſe ground than that on which they are to be kept; for, if from a better, they are apt to degenerate. The beſt time of a cow's life, for breeding of calves, is from three years old till twelve: the black cows are uſually choſen to breed out of.

The largeſt Oxen are to be choſen for work, and for feeding, but then it muſt be where there is land rich enough to maintain them. When they are to draw, care muſt be taken to match them well, both for height and ſtrength; for, if one be ſtronger than the other, the weakeſt will ſoon be deſtroyed. They muſt never be driven beyond their natural pace, for the beating them throws them into ſurfeits, and many other diſeaſes.

The time of putting Oxen to work is at three years old; they muſt be worked gently the firſt year, eſpecially in hot weather, and fed with a large quantity of hay: this will enable them to bear their labour better than graſs; and they ſhould be always kept in a middle ſtate, neither too fat nor too lean. They may be worked till they are ten or twelve years old, and then ſold.

It is obſerved, that meat and fair treatment ſucceed much better with this animal than blows. The beſt way to break a young one to the yoke, is to put him to it with an old tame Ox of about his own height and ſtrength. If he prove unruly after this, he muſt be kept hungry, and made to feed out of the driver's hand. Oxen are much more profitable to keep than horſes, there being no loſs in them; an old wrought Ox fattening as well as a young one, and being as good meat. Their keeping alſo is cheaper, for they eat no oats: their harneſs and their ſhoes alſo are conſiderably cheaper, and they are not ſo ſubject to diſeaſes. They muſt always indeed have good graſs and good hay, and they are not ſo ſerviceable as horſes, when there is much working in carts, and where the ways are good; but for winter plowing, where the ground is heavy, an Ox will do as much work as a horſe.

Every farmer who can keep two teams, would do well to have one of them of horſes, and the other of oxen; it is much better to yoke them together by the necks and breaſts, than by the horns as ſome do; and, where a man keeps an Ox team, he ſhould raiſe two Oxen and two cow calves every year to keep up his ſtock; for it is better for a farmer, in all neceſſary things, to be a ſeller than a buyer. Chalky land ſpoils the feet of Oxen more than any other. *Mortimer's Huſbandry.*

OX-*eye*, in the ſea language, a name given by the ſeamen to thoſe dreadful ſtorms that are ſometimes met with on the coaſt of Guinea; for at firſt it appears in the form of an Ox's eye, and not much bigger; but it deſcends with ſuch celerity, that in a very little ſpace of time, and often before they can prepare themſelves for it, it ſeems to them to overſpread the whole hemiſphere, and at the ſame time forces the air with ſo much violence, that the ſhips are ſometimes ſcattered ſeveral ways, ſome directly contrary, and ſometimes are ſunk downright.

OX-*fly*, in natural hiſtory, a ſpecies of two-winged fly, bred from a fly-worm, hatched under the ſkin of Oxen, from the egg of the parent fly lodged there.

This fly, cloſely examined, appears to be of the ſecond claſs, and to have a mouth without teeth or lips, and its mouth very ſmall. The antennæ are very ſhort, rounded at their ends, and of a gloſſy hue. The reticular eyes are of a deep cheſnut colour.

The female, has, in the under and hinder part of his body, a cylindric tube, which ſhe can thruſt out at pleaſure, and which is the inſtrument with which ſhe pierces the ſkin of the animal, to depoſit her egg. *Reaumur, Hiſt. Inſ.*

OX-*gang*, or OXENGATE, (*Dict.*)—In Scotland this term ſignifies a portion of arable land, containing 13 acres.

O'XYS, *wood ſorrel*, in botany, a genus of plants, whoſe characters are:

It hath a bell-ſhaped flower, conſiſting of one leaf, having its brim wide expanded, and cut into ſeveral diviſions: the pointal, which riſes from the flower cup, becomes an oblong, membranaceous fruit, divided into five ſeminal cells, opening outward from the baſe to the top, and incloſing ſeeds which ſtart from their lodges, by reaſon of the elaſtic force of the membrane which involves them.

OY'STER. See OSTREA.

OYSTER-*worm*, in natural hiſtory, a name given by writers to a kind of ſmall worm found in Oyſters, which ſhines in the dark, in the manner of the glow-worm; but with an univerſal light, and not in a peculiar part only, like this animal.

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PACHODECARHO'MBIS *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ.

* The word is derived from the Greek παχὺς, thick, δέκα, ten, and ῥόμβος, a rhombus, and expreſſes a thick rhomboidal body, compoſed of ten planes.

The characters of this genus are, that the ſelenitæ of it conſiſt of ten planes; but as the top and bottom in the leptodecarhombes, or moſt common kind of the ſelenitæ, are broader and larger planes than any of the reſt, the great thickneſs of this genus, on the contrary, makes it four longer in all the bodies of it, meeting in an obtuſe angle from its ſides, its largeſt planes. *Hill's Hiſt. of Foſſ.*

PA'DDLE, in glaſs-making, the name of an inſtrument with which the workman ſtirs about the ſand and aſhes in the calcar. *Neri's Art of Glaſs.*

PÆDARTHRO'CACES, in ſurgery, is a diſeaſe of the bones, raiſing them into tumors near the joints, and differing from the ſpina ventoſa, in that it is not attended either with violent pains, or eroſions of the bone and adjacent parts. The word is derived from the Greek παῖς, a child, ἄρθρον a joint, and κακὸν, an evil, ſignifying, that it is a diſorder of the joints, to which children are principally ſubject; which is the caſe, becauſe the bones of children, being ſofter than thoſe of adults, are therefore the more eaſily diſtended by humours, and more frequently raiſed into tumors: theſe are hard in this caſe, and the adjacent ſoft parts are not inflated, and are free from redneſs, inflammation, and pain. It is, however, to be obſerved, that this diſorder, though at firſt very different from the ſpina ventoſa, is ſometimes known to degenerate into that diſorder. *Heiſter's Surgery.*

PÆO'NIA, *the peony*, in botany, the name of a genus of plants, whoſe characters are:

It hath a flower compoſed of ſeveral leaves, which are placed orbicularly, and expand in form of a roſe; out of whoſe empalement riſes the pointal, which afterwards becomes a fruit, in which ſeveral little horns, bent downward, are gathered, as it were, into a little head, covered with down, opening lengthwiſe, containing many globulous ſeeds.

They are propagated by parting their roots, which multiply very faſt. The beſt ſeaſon for tranſplanting them, is, towards the latter end of Auguſt, or the beginning of September; for, if they are removed after their roots have ſhot out new fibres, they ſeldom flower ſtrong the ſucceeding ſummer.

In parting of theſe roots, you ſhould always obſerve to preſerve a bud upon the crown of each off-ſet, otherwiſe they will come to nothing; nor ſhould you divide the roots too ſmall, eſpecially if you have regard to their blowing the following year; for, when their off-ſets are weak, they many times do not flower the ſucceeding ſummer, or, at leaſt, produce but one flower upon each root: but, where you would multiply them in quantities, you may divide them as ſmall as you pleaſe, provided there be a bud to each off-ſet; but then they ſhould be planted in a nurſery bed, for a ſeaſon or two, to get ſtrength, before they are placed in the flower garden.

The ſingle ſorts may be propagated from ſeeds, which they generally produce in large quantities, where the flowers are permitted to remain; which ſhould be ſown in the middle of Auguſt upon a bed of light freſh earth, covering them over about half an inch thick with the ſame light earth; the ſpring following the plants will come up, when they ſhould be carefully cleared from weeds, and, in very dry weather, refreſhed with water, which will greatly forward their growth. In this bed they ſhould remain two years before they are tranſplanted, obſerving in autumn, when the leaves are decayed, to ſpread ſome freſh rich earth over the beds about an inch thick, and conſtantly to keep them clear from weeds. *Miller's Gard. Dict.*

The roots, flowers, and ſeeds, are cephalic, and counted good againſt the epilepſy, apoplexy, and all kinds of convulſions, and nervous affections, both in young and old; as alſo in hyſteric caſes, the obſtructions of the menſes, and the retention of the lochia. The root and ſeed are hung about children's necks, to prevent convulſions in breeding their teeth. *Miller's Bot. Off.*

PAI'NTING *in oil.*— The art of Painting in oil was unknown to the ancients; and it was a Flemiſh Painter, one John van Eyck, or John de Bruges, who firſt diſcovered, and put it in practice, in the beginning of the fourteenth century: till him, all painters wrought in freſco, or in water-colours.

This was an invention of the utmoſt advantage to the art; ſince, by means hereof, the colours of a Painting are preſerved much longer and better, and receive a luſtre and ſweetneſs which the antients could never attain to, what varniſh ſoever they made uſe of to cover their pieces.

The whole ſecret only conſiſts in grinding the colours with nut-oil or linſeed-oil: but it muſt be owned, the manner of working is very different from that in freſco, or in water; by reaſon the oil does not dry near ſo faſt; which gives the painter an opportunity of touching and retouching all the parts of his figures, as often as he pleaſes: which, in the other kinds, is a thing impracticable.

The figures too are here capable of more force and boldneſs, inaſmuch as the black becomes blacker, when ground with oil than with water; beſides that, all the colours, mixing better together, make the colouring ſweeter, more delicate and agreeable, and give an union and tenderneſs to the whole work, inimitable in any of the other manners.

Painting in oil is performed on walls, on wood, canvas, ſtones, and all ſorts of metals.

To paint on a wall.— When well dry, they give it two or three waſhes with boiling oil, till the plaiſter remain quite greaſy, and will imbibe no more. Over this they apply deficcative or drying colours, viz. white chalk, red oker, or other chalks beaten pretty ſtiff. This layer being well dry, they ſketch out, and deſign their ſubject; and at laſt paint it over; mixing a little varniſh with their colours, to ſave the varniſhing afterwards.

Others, to fortify their wall better againſt moiſture, cover it with a plaiſter of lime, marble-duſt, or a cement made of beaten tiles ſoaked with linſeed-oil; and at laſt prepare a compoſition of Greek pitch, maſtich, and thick varniſh boiled together, which they apply hot over the former plaiſter: when dry, they lay on the colours as before.

Others, in fine, make their plaiſter with lime-mortar, tile-cement, and ſand; and, this dry, apply another of lime, cement, and iron ſcum; which, being well beaten and incorporated with whites of eggs and linſeed oil, makes an excellent plaiſter. When dry, the colours are applied as before.

To paint on wood.— They uſually give their ground a layer of white tempered with ſize, or they apply the oil abovementioned; the reſt as in Painting on walls.

To paint on cloth, or canvas.—The canvas being ſtretched on a frame, they give it a layer of ſize, or paſte-water. When dry, they go over it with a pumice-ſtone, to ſmooth off the knots. By means of the ſize the little threads and hairs are all laid cloſe on the cloth, and the little holes ſtopped up, ſo as no colour can paſs through.

When the cloth is dry, they lay on oker, which is a natural earth, and bears a body; ſometimes mixing with it a little white lead, to make it dry the ſooner. When dry, they go over it with the pumice-ſtone, to make it ſmooth.

After this, they ſometimes add a ſecond layer compoſed of white lead, and a little charcoal black, to render the ground of an aſh-colour; obſerving in each manner to lay on as little colour as poſſible; that the cloth may not break, and that the colours, when they come to be painted over, may preſerve the better.

In ſome Paintings of Titian and Paolo Veroneſe, we find they made their ground with water, and painted over it with oil; which contributed much to the vivacity and freſhneſs of their works: for the water ground, by imbibing the oil of the colours, leaves them the more beautiful; the oil itſelf taking away a deal of their vivacity.

As little oil therefore is to be uſed as poſſible, if it be deſired to have the colours keep freſh: for this reaſon ſome mix them with oil of aſpic, which evaporates immediately, yet ſerves to make them manageable with the pencil.

To paint on ſtones or metals, it is not neceſſary to apply ſize, as on cloth; it ſuffices to add a ſlight layer of colours, before you draw your deſign; nor even is this done, on ſtones, where it is deſired the ground ſhould appear, as on certain marbles of extraordinary colours.

PA'LATE (*Dict.*)— The Palate is that arch and cavity of the mouth ſurrounded anteriorly by the alveolary edge and teeth of of the upper jaw, and reaching from thence to the great opening of the pharynx. This arch is partly solid and immoveable, and partly soft and moveable. The solid portion is that which is bounded by the teeth, being formed by the two ossa maxillaria, and two ossa palati. The soft portion lies behind the other, and runs backward like a veil fixed to the edge of the ossa palati, being formed partly by the common membrane of the whole arch, and partly by several muscular fasciculi, &c.

The membrane that covers all this cavity, is like that which lines the superior and middle portions of the pharynx. It is very thick set with small glands, the orifices of which are not so sensible as in the pharynx, and especially in the rugæ of the superior portion thereof, where Heister observed a considerable orifice, and a canal proportioned to that orifice, which he could easily inflate with air. This is certainly the best way of beginning these kinds of inquiries, especially if the pipe be held at first only very near the part, without endeavouring to force it in. To immerge the parts in clear water, is likewise a very good way to discover small orifices by the help of a microscope. Small ducts, of the same kind with what I have now mentioned, may be supposed to lie along the middle line, or raphe, of the arch of the Palate, and along the alveolary edge, because of some small tubercles, or points, which appear there.

This membrane, together with that of the posterior nares, forms, by an uninterrupted continuation, the anterior and posterior surfaces of the soft portion, or septum palati; so that the muscular fasciculi of this portion lie in the duplicature of a glandulous membrane. The muscles composed of these fasciculi shall be presently described.

The septum, which may likewise be called velum, or valvula palati, terminates below by a loose floating edge, representing an arch, situated transversly above the basis or root of the tongue. The highest portion, or top of this arch, sustains a small, soft, and irregularly conical glandulous body, fixed by its basis to the arch, and its apex hanging down without adhering to any thing, which is called uvula.

On each side of the uvula, there are two muscular half arches, called columnæ septi palati. They are all joined to the uvula by their upper extremities, and disposed in such a manner, as that the lower extremities of the two, which lie on the same side, are at a little distance from each other, and so, as that one half arch is anterior, the other posterior, an oblong triangular space being left between them, the apex of which is turned toward the basis of the uvula.

The two half arches on one side, by joining the like half arches on the other side, form the entire arch of the edge of the septum. The posterior half arches run by their upper extremities, more directly towards the uvula than the anterior. The anterior half arches have a continuation with the sides of the basis of the tongue, and the posterior with the sides of the pharynx. At the lower part of the space left between the lateral half arches on the same side, two glands are situated, termed amygdalæ.

The half arches are principally made up of several flat fleshy portions, almost in the same manner with the body of the septum. The membrane which covers them is thinner than the other parts of it towards the Palate, pharynx, and tongue. Each portion is a distinct muscle, the greatest part of which terminates in one extremity, in the substance of the septum, and of the half arches; and, by the other extremity, in parts different from these.

Ulcers of the PALATE.— These ulcers are of so malignant a nature, that, sometimes, they not only consume the soft parts, but corrode the bones, and extend themselves even to the nose. The voice of the patient becomes not only altered and broken, but whatever he drinks is immediately discharged by the nose with very great uneasiness. These ulcers proceed from a scorbutic acrimony, or a venereal infection in the blood; and, if the cause is not speedily removed, not only the Palate, but, likewise, the nose, will be in a miserable manner destroyed.

The first intention of cure, therefore, must be either to alleviate, or entirely remove, the acrimony of the blood, or the venereal malignity, by proper internal medicines. If the Palate is not yet perforated or consumed by the caries, let it be cleansed with frequent gargarisms, ointments, and injections. For this purpose, first, make a decoction of agrimony, St. John's-wort, ladies-mantle, and the like vulnerary herbs; then mix it with honey of roses, or, if more powerful detergents are necessary, with ungentum Ægyptiacum, or fuscum. The honey that swims a-top of the Ægyptiacum, and, also, Fallopius's alum-water, are excellent detergents, even when the caries has affected the bones. As often as the ulcer is thus cleansed, it will not be improper, soon after, to apply to the ulcerated part with lint, or a pencil, honey of roses, oil of myrrh, per deliquium, elixir proprietatis, or Peruvian balsam.

If the caries has already seized the bones, the morbid part may be separated from the sound, by the remedies already recommended, especially if the part be carefully anointed with the oil of cloves, or with honey of roses acidulated with spirit of vitriol, the internal medicines being constantly continued. But, when these do not succeed, the actual cautery ought to be gently applied to the morbid bone, after having carefully cleansed the ulcer with dry lint, and secured the tongue from injury, by covering it with wet linen cloths, and applying the speculum oris. After the cauterization is completed, continue the application of balsamic remedies, till the bone is again covered with flesh, and the ulcer entirely cured. But those perforations, which penetrate through the Palate to the nose, can never again be naturally closed.

PALE, in heraldry (*Dict.*)—*Plate* XLIV. *fig.* 8, in the Dictionary, represents one of the honourable ordinaries called Pale.

PALLISADOES, or PALISADOES, in fortification.—*Plate* XXXI. *fig.* 11, in the Dictionary, represents a row of Pallisadoes. See PALISADE, in the Dictionary.

PALIU'RUS, *Christ's thorn*, in botany, a genus of plants, whose characters are:

It has long and very sharp spines, disposed in regular order. The calyx is monophyllous and pentaphylloidal; the flower rosaceous, pentapetalous, and furnished with five stamina. The ovary in the bottom of the calyx becomes a fruit, resembling a bonnet, or target, and surrounding another almost globular and tricapsular fruit, containing, in each capsula or cell, one round seed.

The leaves and root of the Paliurus are astringent, stop a looseness, and digest and cure tubercles; and the fruit is so powerfully inciding, as to diminish the stone in the bladder, and promote excretions from the breast and lungs. The seeds bruised are commended against the cough, and the physicians of Montpelier prescribe their use in disorders from sand and gravel. *Raii, Hist. Plant.*

PA'LMA, the *palm-tree*, in botany, a genus of plants, whose characters are:

It hath a single unbranched stalk: the leaves are disposed in a circular form on the top, which, when they wither, or fall off with age, new ones always arise out of the middle of the remaining ones; among which, certain sheaths or plain twigs break forth, opening from the bottom to the top, very full of flowers, and clusters of embryo's.

These plants may be easily produced from the seeds, provided they are fresh; which should be sown in pots filled with light rich earth, and plunged into an hot-bed of tanner's bark; which should be kept in a moderate temper, and the earth frequently refreshed with water.

When the plants are come up, they should be each planted into a separate small pot filled with the same light rich earth, and plunged into an hot bed again, observing to refresh them with water, as also to let them have air in proportion to the warmth of the season, and the bed in which they are placed. During the summer time they should remain in the same hot bed; but in August you should let them have a great share of air to harden them against the approach of winter; for, if they are too much forced, they will be so tender as not to be preserved through the winter without much difficulty, especially if you have not the conveniency of a bark stove to keep them in.

The beginning of October you must remove the plants into the stove, placing them where they may have a great share of heat, these being somewhat tenderer, while young, than after they have acquired some strength: though indeed they may be sometimes preserved alive in a cooler situation, yet their progress would be so much retarded, as not to recover their vigour the succeeding summer. Nor is it worth the trouble of raising these plants from seeds, where a person has not the conveniency of a good stove to forward their growth; for, where this is wanting, they will not grow to any tolerable size in eight or ten years.

Whenever these plants are removed, which should be done once a year, you must be very careful not to cut or injure their large roots, which is very hurtful to them; but you should clear off all the small fibres which are inclinable to mouldiness; for, if these are left on, they will in time decay, and hinder the fresh fibres from coming out, which will greatly retard the growth of the plants.

The soil in which these plants should be placed, must be composed in the following manner, viz. a third part of light fresh earth taken from a pasture ground; a third part sea sand; and the other part rotten dung, or tanner's bark: these should be carefully mixed, and laid in an heap three or four months at least before it is used; but should be often turned over, to prevent the growth of weeds, and to sweeten the earth.

You should also observe to allow them pots proportionable to the sizes of the plants; but you must never let them be too large, which is of worse consequence than if they are too small. During the summer season they should be frequently refreshed with water; but you must be careful not to give it in too great quantities; and in winter they must be now and then refreshed, especially if they are placed in a warm stove; otherwise they will require very little water at that season.

These plants are most of them very slow growers, even in their native countries, notwithstanding they arrive to a great magnitude; for it has been often observed by several of the old inhabitants of those countries, that the plants of some of these kinds have not advanced two feet in height in twenty years; so that, when they are brought into these countries, it cannot

cannot be expected they should advance very fast, especially where there is not due care taken to preserve them warm in winter: but, however slow of growth these plants are in their native countries, yet they may be with us greatly forwarded, by placing the pots into an hot-bed of tanner's bark; which should be renewed as often as necessary, and the plants always preserved therein both winter and summer, observing to shift them into larger pots as they advance in growth, as also to supply them with water: in which management I have had several of them come on very fast; for I observe the roots of these plants are very apt to root into the bark, if these pots remain a considerable time without shifting, where they meet with a gentle warmth; and the moisture arising from the fermentation of the bark doth preserve their fibres plump and vigorous. *Miller's Gard. Dict.*

PA'NCREAS (*Dict.*)— The Pancreas, by means of its glandular structure, secretes from the cœliac arteries an humour into one common duct, which terminates in the duodenum, into which it discharges all the quantity of lymph secreted.

This pancreatic juice is almost insipid, or but gently saline, limpid, continually secreted in large quantities, by the motion, pressure, warmth, and contiguity of the heart; but it is most copiously discharged, when, during digestion, the stomach is turgid. It is neither acid nor alcaline, but bears a great resemblance to the saliva, not only with respect to its origin, but also with respect to its qualities, and the vessels subservient to its generation. In those who are alive, this juice is mixed and incorporated with the bile; and, being lodged in the same common duct, produces no marks of any intestine motion, but is equally mixed with it, or is discharged alone, and by itself, into the empty intestines. Hence, the uses of the pancreatic juice, when mixed and incorporated with the chyle, the fæces, the bile, and the mucus, are to dilute the thick parts of the fluids, to produce a due mixture of them, to render the chyle capable of mixing with the blood, to fit it for its passage through the lacteals, to correct the acrimonious parts of the fluids, to correct the viscidity and bitterness, and to change the colour of the bile, and to mix it intimately with the blood to serve as a proper menstruum or vehicle, so to change the tastes, smells, and qualities of aliments, as that they assume nearly the same nature; and, lastly, to go and return, and consequently answer all these ends, with the utmost expedition. *Boerhaav. Instit.*

Practical authors furnish us with some instances of abscesses in the Pancreas, which, however, were not discovered till after the death of the patients: but such abscesses may be, in a great measure, guessed at, from the symptoms of the patients, some of which are the same with those accompanying a scirrhus of the Pancreas; but to these signs may be added a slow fever, the almost inseparable concomitant of internal abscesses, long-protracted watchings, short sleeps, and, after them, weariness, faintings, and cold sweats.

If the patient has a tumor under the region of the stomach, that is indolent, and it is attended with an obstinate costiveness, we may be sure there is a scirrhus of the Pancreas; especially if any of the causes of a scirrhus have preceded.

The pancreatic juice dilutes the fæces, and perhaps stimulates the intestines, in some measure, to an expulsion of their contents; therefore, when there is a defect of this, the patient must be costive.

When a person has a cancer in the Pancreas, when fasting, he will feel a great weight under the stomach; after eating he is in extreme pain, but more so, if he vomits; he will have a diarrhœa, and then fall into an atrophy, and die.

A copious use of cherries, perfectly ripe, is very much recommended in a scirrhus of the Pancreas; and they are preferable to currants, which, have something acrimonious in them, and are prejudicial to hysterical women.

PANGO'NIA †, in natural history, the name of a genus of crystal.

† The word is derived from the Greek πᾶς, numerous, and γωνία, an angle or bending, and expresses a crystal, composed of many angles.

The bodies of this genus are single-pointed, or imperfect crystals, composed of dodecangular or twelve planed columns, terminated by twelve planed pyramids, and the whole body, therefore, made up of twenty-four planes.

PANIO'NIA, Πανιώνια, in antiquity, a festival in honour of Neptune, celebrated by a concourse of people from all the cities of Ionia.

One thing is remarkable in this festival, that if the bull offered in sacrifice happened to bellow, it was accounted an omen of the divine favour; because that sound was thought to be acceptable to Neptune. *Potter, Archæol. Græc.*

PA'RALLAX (*Dict.*)— PARALLAX *of declination*, is an arch of a circle of declination S I, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increases or diminishes the declination of a star.

PARALLAX *of right ascension and declension*, is an arch of the equator D *d*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increases the ascension, and diminishes the descension.

PARALLAX *of longitude*, is an arch of the ecliptic T *t*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increases or diminishes the longitude.

PARALLAX *of latitude*, is an arch of a circle of latitude S *l*, *Plate* XXXIII. *fig.* 5, whereby the Parallax of altitude increases or diminishes the latitude.

PARIETA'RIA, *pellitory of the wall*, in botany, a genus of plants, whose characters are:

The flower is male, tetrapetaloidal, stellated, furnished with four stamina, and with testiculi, having a small apex in the center, without an ovary. The flower is female, consisting of a foliaceous, trifoliated calyx, in whose center is a conoidal ovary, furnished with a fimbriated tube in another place of the plant. The floscules and ovaries are closely collected in thick nodes to the stalks.

It is cooling, opening, and cleansing, abounding in nitro-sulphureous salt, and is accounted very good for the stone, gravel, stoppage and heat of urine; and for these purposes the juice, or decoction, is given in draughts, or in clysters; some commend the same for coughs. *Miller's Bot. Off.*

By the chemical analysis, pellitory yields a great deal of oil, a great deal of fixed salt and earth, and several liquors, of which some are acrid, and the rest acid: as for the volatile salt, one obtains none that is concrete from this plant, but it yields an urinous spirit.

PARKINSO'NIA, in botany, a genus of plants, whose characters are:

It hath a polypetalous, anomalous flower, consisting of five dissimilar leaves, from whose cup arises the pointal, which afterwards becomes a rough-jointed point; each knot or joint containing one kidney-shaped seed.

This plant was discovered by father Plumier, in America, who gave it this name, in honour to the name of Mr. John Parkinson, who published an Universal History of Plants, in England, in the year 1640.

It is very common in the Spanish West-Indies; but, of late years, it has been introduced into the English settlements in America, for the beauty and sweetness of its flowers. This, in the countries where it grows, naturally rises to be a tree of twenty feet high, or more; and bears long slender branches of yellow flowers, which hang down after the same manner as the laburnum. *Miller's Gard. Dict.*

PARNA'SSIA, *grass of Parnassus*, in botany, a genus of plants, whose characters are:

The leaves are roundish, and disposed in a circle; the calyx pentaphylloidal; the flower rosaceous, one on a stalk, consisting of greater and smaller fimbriated petals. The ovary becomes a small conoidal fruit, opening into three or four keel-shaped cells, full of minute seeds.

It grows in putrid and marshy places, and flowers in August: the parts used in medicine are the root, herb, and seed.

The juice of the leaves, and decoction of the root, are most approved medicines for the eyes. The seed is a powerful provocative of urine, and stops a looseness and vomiting. Dioscorides. It strengthens the liver, and frees it from obstructions. Chab. It is vulnerary and astringent, and is said to be effectual in stopping hæmorrhages. *Hist. Plant. adscript. Boerhaav.*

PA'RROT, the English name for a well known genus of birds.

PA'RSNEP, *pastinacha*, in botany, the name of a well known root.

The Parsnep is to be propagated by sowing their seeds in February or March, in a rich mellow soil, which must be deep dug, that the roots may be able to run deep without hindrance.

It is a common practice to sow carrots, at the same time, upon the same ground with the Parsneps; and, if the carrots are designed to be drawn young, there is no harm in it. The Parsneps, when they are grown up a little, must be thinned to a foot distance, and carefully kept clear of weeds. They are finest tasted, just at the season when the leaves are decayed; and such as are desirous to eat them in spring should have them taken up in autumn, and preserved in sand. When the seeds are to be saved, some very strong and fine plants should be left for it at four feet distance; and towards the end of August, or in the beginning of September, the seeds will be ripe: they must then be carefully gathered, and dried on a coarse cloth. They should always be sown the spring following, for they do not keep well. *Miller's Gard. Dict.*

The common wild Parsnep is frequent by road sides, and in dry pastures; it flowers in autumn, and ripens its seed soon after. The seeds deserve to be brought into use in medicine, much more than they are at present. They are warm and carminative, though not so violently hot as the caraway seeds and others which we commonly use on these occasions. They dispel flatuses, and are in great esteem among the country people, for curing the cholic. They also are diuretic and aperient, and gently promote the menses.

PARTI'TION, in husbandry. The Partitions in land sown with wheat by the drill, for the horse-hoeing husbandry, are different, according as the wheat is sown, in double, treble, or quadruple rows. The double row has but one Partition, and this is best to be used in cases where the land is suspected to be full of the seed of weeds, which must be taken out with the hand-hoe. This Partition should be twelve or fourteen inches wide. Whole fields drilled in these rows may be hand-hoed at the expence of four shillings an acre; and, when there is but one foot in fix, the price of that work ought to be proportionable.

The common width of the two Partitions, when the wheat is fown in treble rows, is fix or eight inches. Care is to be taken in this particular; for, if they are planted clofer, they will ftarve one another before the intervals are hoed to give them a frefh fupply of nourifhment; and, if they are planted too far afunder, the two outer rows will thrive well, but the middle row will be ftarved, and look worfe and weaker, becaufe of its being alfo a greater diftance from the hoed intervals. In quadruple rows the Partitions are beft to be feven inches wide each; at this diftance the plants will thrive fufficiently, and, if they are fet nearer, the whole will be worfe; and, if farther off, the outer rows will thrive, but the two inner ones will be ftarved, by reafon of their diftance from their plowed intervals.

PA'RTRIDGE, *perdix*, in ornithology.— The Partridge is a timorous and fimple bird, and is fo valuable at the table, that there are a great many ways of taking it invented by the fportfmen, all of which fucceed from the folly and fear of the animal.

The places that Partridges moft delight in, are corn fields, efpecially while the corn grows; for that is a fafe retreat, where they remain undifturbed, and under which they ufually breed. They frequent the fame fields after the corn is cut down, and that with another intent; for they then feed on the corn that has fallen from the ears, and find a fufficient fhelter for them under covert of the ftalks, efpecially thofe of wheat ftubble. When the wheat ftubble is much trodden by men or beafts, they retire to the barley ftubble, and will there hide themfelves in coveys of twenty or thirty. When the winter comes on, and the ftubble fields are trodden down or plowed up, they then retire to the upland meadows, where they lodge in the high grafs, and among the rufhes; fometimes they refort to the low coppice woods, efpecially if there be corn lands near them.

Red-legged PARTRIDGE, a very delicate and valuable bird, called cutumo by the Italians.

It is diftinguifhed from the common Partridge by the rednefs of its beak and legs. It is of a greyifh afh-colour on the back; its throat is white near the head, but has a fmall black fpot on each fide at the angle of the bill, and this white fpace is furrounded by a black line; its breaft is of a yellowifh brown, and its wings are variegated with black, yellowifh, and white. It is not found in England, but is fometimes fhot in the iflands of Guernfey and Jerfey. *Ray's Ornithology.*

PA'RTY-*china*, a name given by the Englifh merchants and others to a fort of porcelain or China ware, which is elegantly painted on the outfide with fome bright colour, and blotted or variegated with round or fquare fpots of a different tinge. The manner in which the Chinefe do this is a very fimple and eafy one, and may be imitated in our own potteries with great eafe. They prepare as many pieces of paper as they intend to have fpots on the veffel, and cut them exactly into the fhape of thofe fpots: they wet thefe, and then fpread them fmoothly on the places where the fpots are to be. When this is done, they cover the veffel with the brown and gold, or any other varnifh, and then take off the papers: in the places which they covered no varnifh has come, fo that they are fo many regular white fpaces. Thefe they cover with fome other colour, laying it on carefully with a pencil: when this is done, they varnifh over the whole veffel with the common varnifh, and bake it. In fome veffels they lay on only plain blue, or plain black, in the fpaces defigned for fpots; and, after the firft baking, they cover thefe with gold, and make them fo many figures of fquares, triangles, or globes in pure gold. *Obferv. fur les Coutumes de l'Afie.*

PA'SSION (*Dict.*)— Dr. Cheyne confiders the Paffions as either fpiritual or animal:— fpiritual Paffions he defines to be thofe fentiments produced in the foul by external objects, either fpiritual ones immediately, or material ones by the meditation of the organs of the body.

Animal Paffions he defines to be thofe effects produced by fpirits or bodies, immediately on the body.

Hence, as outward objects may be confidered either as goods or evils; the moft natural divifion of the Paffions, whether fpiritual or animal, as they regard thofe objects, is into pleafurable and painful.

And, in this fenfe, all the Paffions may be reduced to love and hatred; of which joy and forrow, hope and fear, are only fo many modifications or complexions, according to the various appearances, pofitions, &c. of the object.

In effect, all the Paffions may not only be reduced to two, viz. love and hatred; but, perhaps, to one, love; and even that may be all refolved into felf-love; and this into a principle of felf-prefervation, or neceffary invincible defire of pleafure, or happinefs.— The reft are only rivulets from this fource, or fpecial applications of this principle to particular occafions. Thus, the defire of any thing, under the appearance of its goodnefs, fuitablenefs, or neceffity to our happinefs, conftitutes the Paffion of love: the defire of efchewing or avoiding any thing, apprehended to be mifchievous, hurtful, or deftructive, conftitutes hatred or averfion: the defire of a good, which appears at the fame time probable, and in our power, conftitutes hope; but, if the good appear improbable, difficult, or impoffible, it conftitutes fear or defpair: the unexpected gratification of defire is joy: the defire of happinefs to another under pain, or fuffering, is compaffion; and the defire of another's punifhment, revenge, or malice, &c.

The fingle defire of happinefs, then, is the fpring or motive of all our Paffions; as thofe are of all our actions. Some wife and reafonable motive, or end of action, fays Dr. Morgan, is certainly neceffary to all wife and reafonable action; to act without a motive would be the fame thing as not to act at all, that is, fuch an action could anfwer no farther or better end than not acting; and confequently the action, as well as the agent, would be fo far infignificant and ufelefs. He who fhould have no object at all of his love or averfion, hope or fear, joy or grief, muft be fimply and purely indifferent to all action; and confequently muft either be in a ftate of perfect reft and inaction, or in a ftate equivalent thereto; wherein the action of fuch a being could be of no more fignificancy, than the uncertain fluctuation of an atom, or the quivering of a feather in the air.

The natural, or occafional caufe of all the Paffions, Malebranche makes to be the motion of the animal fpirits, which are diffufed through the body to produce and preferve a difpofition therein fuitable to the object perceived; to the end, that the body and mind may mutually affift each other on this occafion; it being the order of the Creator, that our wills be followed by motions of the body proper to execute them; and that the motions of the body mechanically excited in us by the view of external objects, be accompanied with a Paffion of the foul which inclines to will or nill what appears ferviceable or noxious to the body.

It is a continual impreffion of the will of the Creator, that unites us thus intimately to a piece of matter, and occafions this reciprocation of motions and fenfations; were this impreffion of the Creator's will fufpended a moment, we fhould be delivered from all dependence, all Paffions, &c. For what people ufually imagine of a neceffary connection between the motions of the fpirits and blood, and the emotions of the foul, is inconceivable.

Certain little parts of the bile, fay they, move with fome violence among the fibres of the brain: therefore the foul muft neceffarily be agitated with fome Paffion, and this Paffion muft be anger, rather than love. What relation can we conceive between the faults of an enemy, a Paffion of contempt or hatred, and a bodily motion of the parts of the blood ftriking againft certain parts of the brain? How can the union or alliance of two things fo different as fpirit and matter be effected, but by the omnipotent will of the author of nature?

It is a point, about which, the divines and philofophers can never agree, whether this relation and connection of thoughts of the mind and motions of the body be the gift of nature, or the punifhment of the firft fin; and whether the Paffions be the inftitution of nature, or the corruption thereof? Indeed, confidering the good and wife purpofes the Paffions ferve, and that abfolute neceffity they are of, it is furprifing it fhould ever be doubted, that they are effential to human nature.

PASTES, in the glafs-trade, a fort of compofitions of the glafs kind, made from calcined cryftal, lead, and metallic preparations, to imitate the feveral natural gems. Thefe are no way inferior to the native ftones, when carefully made and well polifhed, in brightnefs or tranfparency, but want their hardnefs.

The general rules to be obferved in the making them are thefe: 1. That all the veffels in which they are made are firmly luted, and the lute left to dry before they are put into the fire. 2. That fuch veffels are chofen for the work as will bear the fire well. 3. That the powders be prepared on the porphyry ftone, not in a metal mortar, which would communicate a tinge to them. 4. That the juft proportion in the quantities of the feveral ingredients be nicely obferved. 5. That the materials be well mixed; and, if not fufficiently baked the firft time, to be committed to the fire again, without breaking the pot; for, if this be not obferved, they will be full of blifters and air bladders. 6. That a fmall vacuity be always left at the top of the pot, to give room to the fwelling of the ingredients. *Neri's Art of Glafs.*

To make a Pafte of extreme hardnefs, and capable of all the colours of the gems, with great luftre and beauty, take, of prepared cryftal, ten pounds; falt of polverine, fix pounds; fulphur of lead, two pounds; mix all thefe well together into a fine powder, make the whole, with common water, into a hard Pafte, and make of this Pafte fmall cakes, of about three ounces weight each, within them, in their middle; dry thefe in the fun, and afterwards calcine them in the ftraighteft part of a potter's furnace; after this, powder them, and levigate them to a perfect finenefs on a porphyry, and fet this powder in pots in a glafs furnace to purify for three days; then caft the whole into water, and afterwards return it into the furnace, where let it ftand fifteen days; in which time all foulnefs and blifters will difappear, and the Pafte will greatly refemble the natural jewels. To give this the colour of the emerald, add to it brafs, thrice calcined: for a fea green, brafs brass simply calcined to a redness: for a sapphire, add zaffer, with manganese: and, for a topaz, manganese and tartar. All the gems are thus imitated in this, by the same way of working as the making the coloured glasses; and this is so hard, that they very much approach to the natural gems. *Neri's Art of Glass.*

The colours, in all the counterfeit gems made of the several Pastes, may be made deeper or lighter, according to the works for which the stones are designed; and it is a necessary general rule, that small stones for rings, &c. require a deeper colour, and large ones a paler. Besides the colours made from manganese, verdigrease, and zaffer, which are the ingredients commonly used, there are other very fine ones, which care and skill may prepare: very fine red may be made from gold, and not much inferior to that from iron; a very fine green from brass or copper, and a sky colour from silver; and a much finer one from the common small garnets of Bohemia, which are of little value. The gems also afford glorious colours, like their own. *Neri's Art of Glass.*

The fine blue from silver is, probably, only from the small quantity of copper used in the alloy.

A very singular and excellent way of making the Paste to imitate the coloured gems, is this: take a quantity of saccharum saturni, or sugar of lead, made with vinegar, in the common way; set it in sand, in a glass body well luted from the neck downwards; leave the mouth of the glass open, and continue the fire twenty-four hours; then take out the salt, and, if it be not red, but yellowish, powder it fine and return it into the vessel, and keep it in the sand-heat twenty-four hours more, till it becomes as red as cinnabar. The fire must not be made so strong as to melt it, for, then, all the process is spoiled. Pour distilled vinegar on this calcined salt, and separate the solution from the dregs; let the decanted liquor stand six days in an earthen vessel, to give time to the finer sediment to subside; filtre this liquor, and evaporate it in a glass body, and there will remain a most pure salt of lead; dry this well, then dissolve it in fair water; let the solution stand six days in a glazed pan; let it subside; then filtre the clear solution, and evaporate to a yet more pure white and sweet salt; repeat this operation three times; put the now perfectly pure salt into a glass vessel, set it in a sand heat for several days, and it will be calcined to a fine impalpable powder, of a lively red. This is called the sulphur of lead. *Neri's Art of Glass.*

Take all the ingredients as in the common composition of the Pastes of the several colours, only, instead of red-lead, use this powder, and the produce will well reward the trouble of the operation, as experience has often proved.

PASTURE.—Pasture ground is of two sorts: the one is low meadow land, which is often overflowed; and the other is upland, which lies high and dry. The first of these will produce a much greater quantity of hay than the latter, and will not require manuring or dressing so often: but then the hay produced on the upland is much preferable to the other; as is also the meat which is fed in the upland more valued than that which is fatted in rich meadows: though the latter will make the fatter and larger cattle, as is seen by those which are brought from the low rich lands in Lincolnshire. But where people are nice in their meat, they will give a much larger price for such as hath been fed on the downs, or in short upland Pasture, than for the other, which is much larger. Besides this, dry Pastures have an advantage over the meadows, that they may be fed all the winter, and are not so subject to poach in wet weather; nor will there be so many bad weeds produced; which are great advantages, and do, in a great measure, recompense for the smallness of the crop.

I have already mentioned the advantages of meadow land, or such as is capable of being overflowed with water, and given directions for draining and improving low Pasture land, under the article LAND; therefore shall not repeat that here, but just mention some methods for improving of upland Pasture.

The first improvement of upland Pasture is, by fencing it, and dividing it into small fields of four, five, six, eight, or ten acres each, planting timber trees in the hedge-rows, which will screen the grass from the drying pinching winds of March, which prevent the grass from growing in large open lands; so that, if April proves a dry month, the land produces very little hay; whereas in the sheltered fields the grass will begin to grow early in March, and will cover the ground, and prevent the sun from parching the roots of the grass, whereby it will keep growing, so as to afford a tolerable crop, if the spring should prove dry. But, in fencing of land, it must be observed, as was before directed, not to make the inclosures too small, especially where the hedge-rows are planted with trees; because, when the trees are advanced to a considerable height, they will spread over the land; and, where they are close, will render the grass sour; so that, instead of being an advantage, it will greatly injure the Pasture.

The next improvement of upland Pasture is, to make the turf good, where, either from the badness of the soil, or for want of proper care, the grass hath been destroyed by rushes, bushes, or mole-hills. Where the surface of the land is clayey and cold, it may be improved by paring it off, and burning it in the manner before directed: but, if it is an hot sandy land, then chalk, lime, marl, or clay, are very proper manures to lay upon it: but this should be laid in pretty good quantities otherwise it will be of little service to the land.

If the ground is over-run with bushes or rushes, it will be a great advantage to the land to grub them up towards the latter part of the summer; and after they are dried, to burn them, and spread the ashes over the ground just before the autumnal rains; at which time the surface of the land should be levelled, and sown with grass seed, which will come up in a short time, and make good grass the following spring. So, also, when the land is full of mole-hills, these should be pared off, and either burnt for the ashes, or spread immediately on the ground, when they are pared off, observing to sow the bare patches with grass seed, just as the autumnal rains begin.

Where the land has been thus managed, it will be of great service to roll the turf, in the months of February and March, with an heavy wood roller; always observing to do it in moist weather, that the roll may make an impression: this will render the surface level, and make it much easier to mow the grass, than when the ground lies in hills; and will also cause the turf to thicken, so as to have what the people usually term a good bottom. The grass, likewise, will be the sweeter for this husbandry, and it will be a great help to destroy bad weeds.

Another improvement of upland Pastures is, the feeding of them: for, where this is not practised, the land must be manured at least every third year; and where a farmer hath much arable land in his possession, he will not care to part with his manure to the Pasture. Therefore every farmer should endeavour to proportion his Pasture to his arable land, especially where manure is scarce, otherwise he will soon find his error; for the Pasture is the foundation of all the profit which may arise from the arable land.

Whenever the upland Pastures are mended by manure, there should be a regard had to the nature of the soil, and a proper sort of manure applied: as, for instance, all hot sandy land should have a cold manure; neat's dung and swine's dung are very proper for such lands; but, for cold lands, horse dung, ashes, and other warm manures, are proper. And, when these are applied, it should be done in autumn, before the rains have soaked the ground, and rendered it too soft to cart on; and it should be carefully spread, breaking all the clods as small as possible, and then harrowed with bushes, to let it down to the roots of the grass. When the manure is laid on at this season, the rains in winter will wash down the salts, so that the following spring the grass will receive the advantage of it.

There should also be great care had to the destroying of weeds in the Pasture every spring and autumn: for, where this is not practised, the weeds will ripen their seeds, which will spread over the ground, and thereby fill it with such a crop of weeds as will soon overbear the grass, and destroy it; and it will be very difficult to root them out, after they have gotten such possession; especially ragwort, and such other weeds as have down adhering to their seeds.

These upland Pastures seldom degenerate the grass which is sown on them, if the land is tolerably good: whereas the low meadows, which are overflowed in winter, in a few years turn to an harsh rushy grass, though the upland will continue a fine sweet grass for many years without renewing.

There is no part of husbandry, of which the farmers are in general more ignorant than that of the Pasture: most of them suppose, that when old Pasture is plowed up, it can never be brought to have a good sward again: so, their common method of managing their land, after plowing, is, to sow, with their crop of barley, some grass seeds, as they call them; that is, either the red clover, which they intend to stand two years after the corn is taken off the ground, or rye grass, mixed with trefoil: but as all these are, at most, but biennial plants, whose roots decay soon after their seeds are perfected; so, the ground, having no crop upon it, is again plowed for corn: and this is the constant round which the lands are employed in, by the better sort of farmers; for I never have met with one of them, who had the least notion of laying down their land to grass for any longer continuance; therefore, the seeds which they usually sow, are the best adapted for this purpose.

But, whatever may have been the practice of these people, I hope to prove, that it is possible to lay down land, which has been in tillage, with grass, in such a manner, as that the sward shall be as good, if not better, than any natural grass, and of as long duration. But this is never to be expected, in the common method of sowing a crop of corn with the grass seeds: for, wherever this has been practised, if the corn has succeeded well, the grass has been very poor and weak; so that, if the land has not been very good, the grass has scarcely been worth saving: for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwise; for the ground cannot nourish two crops: and, if there were no deficiency in the land, yet the corn, being the first, and most vigorous of growth, will keep the grass from making any considerable progress; so that the plants will be extremely weak, and but very thin, many of them, which came up in the spring, being destroyed by the corn; for, wherever there are roots of corn,

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it cannot be expected there should be any grass. Therefore, the grass must be thin, and, if the land is not in good heart, to supply the grass with nourishment, that the roots may branch out after the corn is gone, there cannot be any considerable crop of clover: and, as their roots are biennial, many of the strongest plants will perish soon after they are cut; and the weak plants, which had made but little progress before, will be the principal part of the crop for the succeeding year: which is many times not worth standing.

Therefore, when ground is laid down for grass, there should be no crop of any kind sown with the feeds; and the land should be well plowed, and cleaned from weeds; otherwise the weeds will come up the first, and grow so strong, as to overbear the grass, and, if they are not pulled up, will intirely spoil it. The best season to sow the grass feeds upon dry land is, about the middle of September, or sooner, if there is an appearance of rain: for, the ground being then warm, if there happen some good showers of rain after the feed is sown, the grass will soon make its appearance, and get sufficient rooting in the ground before winter; so will not be in danger of having the roots turned out of the ground by the frost, especially if the ground is well rolled before the frost comes on, which will press it down, and fix the earth close to the roots. Where this hath not been practised, the frost has often loosened the ground so much, as to let in the air to the roots of the grass, and done it great damage; and this has been brought as an objection to the autumnal sowing of grass: but it will be found to have no weight, if the above direction is practised: nor is there any hazard of sowing the grass at this season, but that of dry weather, after the feeds are sown; for, if the grass comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the sward will be closely joined at bottom, and a good crop of hay may be expected the same summer. But, where the ground cannot be prepared for sowing at that season, it may be performed the middle or latter end of March, according to the season's being early or late; for, in backward springs, and in cold land, I have often sowed the grass in the middle of April, with success: but there is danger, in sowing late, of dry weather, and especially if the land is light and dry; for I have seen, many times, the whole surface of the ground removed by strong winds at that season; so that the feeds have been driven in heaps to one side of the field. Therefore, whenever the feeds are sown late in the spring, it will be proper to roll the ground well soon after the feeds are sown, to settle the surface, and prevent its being removed.

The sorts of feeds which are the best for this purpose, are, the best sort of upland hay feeds, taken from the cleanest Pastures, where there are no bad weeds: if this feed is sifted to clean it from rubbish, three bushels will be sufficient to sow an acre of land. The other sort is the trifolium pratense album, which is commonly known by the names of white Dutch clover, or white honey-suckle grass. Eight pounds of this feed will be enough for one acre of land. The grass feed should be sown first, and then the Dutch clover feed may be afterwards sown: but they should not be mixed together; because the clover feeds, being the heaviest, will fall to the bottom, and consequently the ground will be unequally sown.

When the feeds are come up, if the land should produce many weeds, these should be drawn out before they grow so tall as to overbear the grass: for, where this has been neglected, the weeds have taken such possession of the ground, as to keep down the grass, and starve it; and, when these weeds have been suffered to remain until they have shed their feeds, the land has been so plentifully stocked with them, as intirely to destroy the grass: therefore it is one of the principal parts of husbandry, never to suffer weeds to grow on the land.

If the ground is rolled two or three times, at proper distances after the grass is up, it will press down the grass, and cause it to make a thicker bottom: for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, so, by pressing down of the stalks, the roots will mat so closely together, as to form a sward so thick as to cover the whole surface of the ground, and form a green carpet; and will better resist the drought. For, if we do but examine the common Pastures in summer, in most of which there are patches of this white honey-suckle grass growing naturally, we shall find these patches to be the only verdure remaining in the fields. And this, the farmers in general acknowledge, is the sweetest feed for all sorts of cattle; yet never had any notion of propagating it by feeds: nor has this been long practised in England; for, till within a few years, that some curious persons imported the feed from Brabant, where it had been long cultivated, there was not any of the feeds saved in England; though now there are several persons who save the feeds here, which succeed full as well as any of the foreign feeds which are imported.

As the white clover is an abiding plant, so it is certainly the very best sort to sow, where Pastures are laid down to remain: for as the hay feeds which are taken from the best Pastures, will be composed of various sorts of grass; some of which may be but annual, and others biennial; so, when those go off, there will be many and large patches of ground left bare and naked, if there is not a sufficient quantity of the white clover, to spread over and cover the land. Therefore, a good sward can never be expected, where this is not sown: for, in most of the natural Pastures, we find this plant makes no small share of the sward; and it is equally good for wet and dry land, growing naturally upon gravel and clay, in most parts of England: which is a plain indication how easily this plant may be cultivated, to great advantage, in most sorts of land throughout this kingdom.

Therefore, the true cause why the land which has been in tillage, is not brought to a good turf again, in the usual method of husbandry, is, from the farmers not distinguishing which grasses are annual from those which are perennial: for, if annual or biennial grasses are sown, these will of course soon decay; so that, unless where some of their feeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occasioned the general failure of increasing the Pasture in many parts of England, where it is now much more valuable than any arable land.

After the ground has been sown in the manner before directed, and brought to a good sward, the way to preserve it good is, by constantly rolling the ground with an heavy roller, every spring and autumn, as hath been before directed. This piece of husbandry is rarely practised by farmers: but those who do, find their account in it; for it is of great benefit to the grass. Another thing should also be carefully performed; which is, to cut up docks, dandelion, knapweed, and all such bad weeds, by their roots every spring and autumn: this will increase the quantity of good grass, and preserve the Pastures in beauty. Dressing of these Pastures every third year is also a good piece of husbandry; for otherwise it cannot be expected the ground should continue to produce good crops. Besides this, it will be necessary to change the seasons of mowing, and not to mow the same ground every year; but to mow one season, and feed the next: for, where the ground is every year mown, it must be constantly dressed, as are most of the grass grounds near London, otherwise the ground will be soon exhausted. *Miller's Gard. Dict.*

Pasture *of plants.* See the article FOOD *of plants.*

PATE'LLA *(Dict.)—Fracture of the* Patella. The Patella, or knee pan, is much more subject to a transverse fracture than to one in any other direction. The longitudinal fracture of this bone happens more rarely, but, when it does, is much more easily cured; because the fragments of the bone, in this case, generally keep in their right places, but, when the bone is broken, not only transversly, but into several pieces, the case is yet more difficult and dangerous. The cure of this fracture must be attempted in this manner: in a longitudinal or perpendicular fracture, the patient must be laid upon his back, and, extending the foot, the surgeon must replace the fragments on both sides with the pressure of his hands, binding them up carefully with the uniting bandage; which must be applied in this case in the same manner with that used in large wounds in the belly or forehead. But when the Patella is broken transversely, or into several pieces, the patient being laid in the same posture, and extending his foot as before, the surgeon is with great care to endeavour, with the palms of both hands, assisted by his fingers and thumbs, to bring together and replace the fragments in their natural situation; and, when that is done, they must be retained firmly together, by means of a plaister made in form of a half-moon, or properly perforated, and then the foot and leg are to be bound up, and placed so that they cannot be easily moved: but, to prevent the bone from being displaced again, the patient must not use his leg, till after the ninth or tenth week. *Heister's Surgery.*

Patella *luxated.* The Patella is most usually luxated either on the internal or external side of the joint, though physicians give accounts of its being sometimes luxated both above and below it. Whenever the knee itself is perfectly luxated, the Patella can scarce avoid being displaced at the same time, because of its strong connection to the thigh and to the tibia.

The reduction of a luxated Patella is usually no great difficulty.

The patient is to be laid flat on his back on a table or bed, or upon an even floor, so that his leg may be pulled out straight by an assistant; when this is sufficiently extended, the surgeon must grasp the Patella with his fingers, and afterwards, by the assistance of his hand, press it strongly into its proper place. This may be also possibly affected, while the patient stands upright: when this is done, there remains nothing but carefully to bind up the part, and let the patient rest for some days; sometimes gently bending and extending his leg in the mean while, that it may not become stiff. *Heister's Surgery.*

Patella, *the limpit,* in natural history, the name of a genus of shell-fish, the characters of which are these: it is an univalve shell, of a gibbose shape, always fixed in its natural state to a rock or to some other hard body, and having its apex or summit sometimes sharp-pointed, sometimes obtuse, sometimes straight, sometimes crooked, sometimes whole, and sometimes perforated. There are several species of each of these kinds.

PATELLA, in the hiſtory of inſects, a name given by Liſter, and ſome others, to a certain little huſk or ſhell found on the bark of the cherry, plum, and roſe-trees, and ſome others, containing an animal within, and uſeful in colouring. Theſe Patella are of a globular form, except when they adhere to the tree, and are of a ſhining cheſnut colour in moſt kinds. The huſk itſelf ſtrikes a very fine crimſon colour on paper, and within it is found a white maggot of no value: this, in time, hatches into a very ſmall but beautiful bee. The whole ſize of this bee is not more than that of half the body of an ant. They have the ſting of bees, and the three ſpots placed in a triangle on the forehead, which are ſuppoſed to be eyes. They are black, and have a large round whitiſh or pale yellow ſpot upon the back. The upper pair of wings are ſhaded and ſpotted, but the under pair are clear.

The ſhells or huſks deſerve a trial, to find whether the colour they yield might not be brought to uſe; it is to be obſerved, that the deepeſt-coloured huſks afford the fineſt and deepeſt purple: they muſt be alſo uſed, while the creature contained in them is in the maggot form; for, when it is changed into the bee ſtate, the ſhell is dry and colourleſs. Dr. Liſter, who firſt obſerved theſe Patella, went ſo far on the comparing them with the common kermes, as to declare that they were of the ſame nature with that production; but his hiſtory of their being the workmanſhip of a bee, to preſerve her young maggot in, is not agreeable to the true hiſtory of the kermes; for that is an inſect of a very peculiar kind. This author has been too juſtly cenſured for his precipitancy in judging of things, and perhaps has fallen into an error by means of it here.

It is very poſſible that theſe Patella may be the ſame ſort of animal with the kermes, but then it produces its young within this ſhell or huſk, which is no other than the ſkin of the body of the mother animal; but as there are many flies, whoſe worms or maggots are lodged in the bodies of other animals, it may be, that this little bee here deſcribed may love to lay its egg in the body of the proper inſect here deſcribed, and the maggot hatched from that egg may eat up the proper progeny, and, undergoing its own natural changes there, iſſue at length in form of the bee. This may have been the caſe in ſome few which Dr. Liſter examined, and he may have been miſled by this to ſuppoſe it the natural change of the inſect. *Philoſ. Tranſact.* N°. 72.

PATER *patratus*, among the Romans, the firſt and principal perſon of the college of heralds, which formed a kind of board or council to examine the differences that aroſe between neighbouring ſtates, and endeavour amicably to accommodate the ſame. *Danet in voc.*

PAVIA, *the ſcarlet-flowering horſe-cheſnut*, in botany, a genus of plants, whoſe characters are:

The leaves are like thoſe of the horſe-cheſnut, and conjugated; but ſo diſpoſed, as to have every conſequent order croſs the preceding. The end of the pedicle becomes a long tubulous red calyx, of the ſame colour with the flower, with a margin divided into ſix ſegments. Within the calyx grows an anomalous pentapetalous flower, ſo diſpoſed, as, with its five petals, to reſemble a monopetalous bilabiated flower; for the two upper petals, in conjunction, form a kind of galea; the two lateral ones, the jaws, and the under one, the beard. The flower incloſes eight ſtamina, each furniſhed with its apex, and the flowers are diſpoſed in ſpikes. The ovary in the bottom of the calyx, ſhooting forth a long, cylindrical, red tube, becomes a tricapſular, tricoccous fruit, containing globular ſeed.

PEACH, *perſica*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the roſaceous kind, being compoſed of many petals, arranged in a circular form. The piſtil ariſes from the cup, and finally becomes a fleſhy fruit of a roundiſh figure, ſulcated lengthwiſe, and containing a ſtone rough and full of irregular holes, containing an oblong kernel.

The curious in fruits account twenty-eight ſorts of Peaches, but many of them ſeem very trifling diſtinctions. The fineneſs of this fruit, in general, depends on the firmneſs of the pulp, the delicacy of the flavour, and the thinneſs of the ſkin. A fine Peach ſhould be of a fine deep red next the ſun, and of a pale whitiſh hue next the wall; and the pulp ſhould be of a yellowiſh caſt, and very juicy; and the ſtone ſhould be ſmall, though the fruit in general be large.

The varieties of the Peach are produced, like thoſe of the fine flowers, by ſowing the ſeeds; and, though many raiſed this way will be of little value, as is alſo the caſe in flowers, yet probably among a parcel of ſtones, ſaved from the finer kinds of Peaches, there would be ſome new kinds produced; which, as they were raiſed here, would be eaſily kept up in their perfection; which is not to be expected of thoſe brought from other countries.

The beſt method of ſaving the ſtones is, to let ſome of the fineſt Peaches of the beſt kinds hang till they drop of themſelves from the tree, and, then, the ſtones ſhould be immediately planted on a bed of light rich earth, planting them four inches deep in the earth, and at about ſix inches aſunder. The beds ſhould be covered, to preſerve them in winter; and in ſpring, when the trees come up, they muſt be cleared of weeds, and well watered. The next ſpring they ſhould be carefully taken up, and planted in the nurſery at greater diſtances; and, after two or three years ſtanding here, they may be removed to the places where they are to remain; or they may at that time, when the condition of their fruit is known, be grafted on other ſtocks, which is the common way now uſed to propagate theſe trees.

The common method of propagating the Peach is, by grafting. In order to this, ſome good ſtocks ſhould be provided, which ſhould be of the muſcle, or a white pear plum. When theſe ſtocks are two or three years old, they will be ſtrong enough to bud; and the common ſeaſon for doing this is about Midſummer. The buds ſhoulds be choſen from a healthy tree, which produces a great deal of fruit: they muſt be taken from the trees either in a cloudy day, or elſe in the morning or evening, when the ſun has not much power: they ſhould then be inoculated on the ſtalks as ſoon as poſſible, and the ſtalks treated with the uſual care afterwards. See INOCULATION.

When theſe are to be tranſplanted where they are to remain, the moſt proper ſoil for them is a light rich paſture land, taken up with the turf, and rotted together, before it is to be uſed; and the borders to be made with this cannot be too wide, and ought to be raiſed five or ſix inches above the level of the ground; or, if the ſoil be moiſt, more than that. They muſt be tranſplanted in autumn, as ſoon as the leaves are fallen off; and ſhould never be ſet at leſs than fourteen feet diſtance from one another. The heads of the trees are then to be raiſed up againſt the walls, to keep the roots from being moved by the winds; and they ſhould be watered at times, with a noſe on the watering pot, and the water ſprinkled all over them. In the middle of May the new ſhoots are to be nailed to the wall, training them horizontally; and the foreright ſhoots are to be rubbed off: in October, the new branches ſhould be pruned, ſhortening them according to the ſtrength of the tree; if ſtrong, they may be left eight inches long; if weak, they ſhould only be left five; and the ſame care is to be taken of them for the ſucceeding years.

There are two general rules always to be obſerved in the pruning of Peach and nectarine trees, which are, 1. Always to have enough bearing wood. 2. Not to lay in the branches too cloſe to one another. All Peach-trees produce their fruit from the young wood, either of the ſame, or, at the moſt, of the former year's ſhoot; for this reaſon the branches are to be ſo pruned, as to encourage them to throw out new ſhoots in every part of the tree: and this is to be done in May, when, by pinching, or ſtopping the ſtrong ſhoots, there may be new wood forced out in any part of the tree. This is the method of the ſummer pruning; the winter pruning is uſually done in February or March, but is much better done at Michaelmas, as ſoon as their leaves begin to fall; and the wounds will then have time to heal before the ſevere froſts come on.

In pruning of theſe trees it muſt always be obſerved alſo, that it is beſt done under a wood bud, not a bloſſom bud; which may be diſtinguiſhed by the wood buds being leſs turgid, and longer, and narrower than the bloſſom bud; for, if the ſhoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the ſhoots to the wall, they ſhould be placed at as equal diſtances as poſſible, and ſo far apart that the leaves may have room; and they muſt always be trained as horizontally as poſſible, that the lower part of the tree may be well wooded, which it will not be, if the branches are ſuffered to run upright. *Miller's Gard. Dict.*

PEACH-*colour*, the pale red colour of the bloſſoms of the Peach-tree.

To give this beautiful colour to glaſs, add, at different times, and in ſmall quantities, the powder of prepared manganeſe to the maſs, for the making of lattimo, or milk-white glaſs, while in fuſion. This alone gives the Peach colour; but the metal muſt be immediately worked when of a right tinge, for the colour is very apt to go off. *Neri's Art of Glaſs.* See the article LATTIMO.

PEAR, *pyrus*, in botany. All the ſorts of Pears, propagated in gardens, are produced by budding, or grafting them upon ſtocks of their own kind, which are commonly called tree-ſtocks, or elſe upon the quince or white-thorn ſtocks; but the laſt are now generally diſuſed, the fruit produced this way being apt to be dry and mealy. The quince ſtocks are, however, in great eſteem for the trees deſigned for dwarfs or for walls; becauſe they do not let the ſhoots grow ſo faſt and luxuriant. But there are objections againſt even theſe, which are of ſome conſequence; for there are many kinds of Pear which will not do upon them, but will die, or become weak and good for nothing after three or four years; and the hard-breaking Pears are rendered very unpleaſant by being grafted on theſe ſtocks, while the buttery or melting ones are meliorated by them. And it is to be added, that no ſort of Pear will thrive upon a quince ſtock in a poor or gravelly ſoil.

PEAR-*trees* planted either againſt walls, or in eſpaliers, muſt not be placed nearer to one another than twenty feet. Pear-trees commonly produce their bloſſom buds firſt, at the extremity of their laſt year's ſhoots; the common way of pruning is very prejudicial, therefore, as it takes off the part which ſhould bear the fruit, and occaſions new ſhoots from the ſame branch, which will over-fill the tree with wood, the trees should always be carefully looked over in summer, and all the foreright shoots taken off, by which means the fruit will not be overshaded, and the trees will need but little winter pruning. The several sorts of summer Pears all ripen best in espaliers, but the winter Pears require a south-east or south-west, or else an east wall. *Miller's Gard. Dict.*

It is said that crabs and wild Pears, such as grow in the wildest and most barren clefts, and on hills, may make the richest, strongest, most pleasant and lasting wines that England yields. See *Phil. Trans.* N°. 477.

PEARCH. See PERCA.

PEARCH-*glue*, in mechanics, the name of a kind of glue, of a remarkable strength and purity, for the manufacture of which we are beholden to the Laplanders, from whom Scheffer has described it. They take a number of large Pearches, and, slitting them open, they carefully pick away the flesh with a knife, so as to leave the skin pure. They put a number of these skins into a vessel of warm water, which they expose to the sun, and by that means keep it in a continual moderate heat for several days; when the scales become loose by this maceration, they take out the skins and rub them clean off. The soft and clean skin remains then alone, and feels as soft as a wetted bladder. These clean skins they throw into a small quantity of fresh water, and boil them gently over the fire, stirring the whole together, and towards the end beating it forcibly with little sticks. The skins by this means at length wholly dissolve in the water, and the whole becomes a thick transparent liquor; which, when boiled as long as the thickness of it will permit, without burning, they pour it out on a flat stone, and, as it cools, they cut it into cakes exactly resembling our glue, but that they want the coarse reddish colour it has, and have no disagreeable smell. When they would use this, they dissolve it in more water, exactly as we do our glue. The bows of this people give us a very great proof of the strength of this sort of glue; they are made of two pieces fastened together with it, and though put to the most forcible trials, as these people are very strong, and use them in shooting bears, rain-deer, &c. yet the glue part is never known to start. *Scheff. Hist. Lap.*

PEARL *colour*, in glass. This beautiful colour is given to glass in the following manner: put tartar calcined to a whiteness into putrified crystal, while in fusion, at several times, in small quantities, mixing it well every time, till the glass is become of the desired colour, and, when it is, work it quick as can be, for it is a colour that is quickly gone. *Neri's Art of Glass.*

PEASE, *pisa*, in botany.—We have several sorts of Pease cultivated for use in the gardens about London and elsewhere; and, as many people are desirous of having them very early, it is a common practice to raise them on hot-beds. The method of doing this is, to sow the Pease under warm hedges or walls. In the middle of October, when the plants are come up, their stalks are to be kept earthed up, and thus they are to remain till the beginning of January, or even till February, covering them against the severe frosts with Pease haulm, or other light covering. In January or February, there must be made a moderate hot-bed; the dung must be laid about two feet thick, and carefully beat down, and covered about six inches deep with light fresh earth; and, when the frames have been set on about four days, the plants must be planted in the earth, at a about a foot distance, in rows, and placed in each row at about two inches one from another. They must be watered and shaded till they have taken root, and then they must have as much air as may be; and, when they begin to fruit, they should be watered more frequently than before, which will occasion their producing a larger quantity of fruit.

The common dwarf-Pea is the sort always used on this occasion, as all the rest ramble too much in their stalks.

The first sort of Pea to be sown to succeed those on the hot-beds is the hot spur; of which the gardeners reckon three or four sorts, which differ very little from each other; but that called the master's hot-spur is usually preferred to the rest. These are to be sown in October, as those intended for the hot-bed, and treated every way in the same manner; but in spring these are subject to be destroyed by slugs and other vermin; the best method of destroying which is, to slake a little lime, and throw over the earth among the plants. For fear of this crop miscarrying by the severity of the weather, it is always proper to sow two others after this, at the distance of a fortnight each; and after this there should be no others sowed till the end of January; and after these there should be others at the beginning and end of February. To succeed these, which will supply the table with early Pease, the Spanish morotto, which is a large Pea, and a very plentiful bearer, should be sowed in rows on a clear plat of ground; the rows should be two feet and a half distant, and the Pease dropped at an inch or two asunder: these must be all very carefully covered two inches deep with earth, and the rooks, mice, &c. prevented from getting at them. A fortnight after this another spot should be sowed with this or some other large Pea, and this continued every fortnight till the latter end of May. *Miller's Gard. Dict.*

Field PEASE. The common white Pea succeeds best in a light land, somewhat rich: the time of sowing them is in the middle of April. Three bushels are the common allowance for an acre; and they kill the weeds the land is subject to, better than any other crop. In Staffordshire they sow the garden rouncivals in fields, and they grow and yield very well, though they are left trailing upon the ground without any support of sticks.

The white and rouncival Pease are only to be sown with a broad cast, and harrowed in; but the common grey Pea, which is more frequently sown in fields than either of them, must be sown under furrow, and delights most in a cold wet clay. These are to be sown in February; and the common quantity of seed is two bushels to an acre. The blue Pea is the best kind for light sandy land, and is to be early sown; all Pease love land manured with lime or with marle. In Suffolk they plow up their lays in the beginning of March, and, turning the turf well, they have a cross stick set with iron pegs, which they strike down with their feet: these pegs make holes at equal distance; into which they have boys and girls following to put the Pease singly, till all the land is set. As soon as this crop is cut, they plow the land across, and, harrowing it well, they plow it again, and sow it about Michaelmas with wheat, and the next year with barley, then with oats; after which the land requires new improvement. *Mortimer's Husbandry.*

PEBBLES, *calculi*, in natural history, the name of a genus of fossils, distinguished from the flints and homochroa, by their having a variety of colours.

In all the strata of pebbles there are constantly found some which are broken, and whose pieces lie very near one another; but, as bodies of such hardness could not be broken without some considerable violence, their present situation seems to imply, that they have suffered that great violence in or near the places where they now lie. Besides these, there are others also found which have as plainly had pieces broken off from them, though those pieces are no where to be found; whence it seems equally plain, that, whatever has been the cause of their fracture, they have been brought broken, as we find them, from some other place, or else that the pieces broken from them must, at some time or other, have been carried from this place to some other distant one.

Several of these broken Pebbles have their edges and corners so sharp and even, that it seems evident they never can have been tossed about or removed since the breaking; and others have their sides and corners so rounded, blunted, and worn away, that they seem to have been roughly moved and rolled about among other hard bodies, and that too either with great violence, or for a very long continuance; since such hard bodies could not have been reduced to the condition we now see them in without long friction.

It may be supposed by some, that these stones never were broken, but have been naturally formed of this shape; but it will be easily seen by any one who accurately surveys their veins or coats that surround the nucleus, like the annual circles of a tree, that they must have been originally intire; and this will be the more plain, if they are compared with a stone broken by art. Such pebbles as are found in strata, that lie near the surface of the earth, are much more brittle than those which lie in deeper strata.

The more clear and transparent the sand is, which is found among Pebbles, the more beautiful the Pebbles are generally observed to be.

The use of these stones, and their disposition in the earth, is a subject of great admiration; and may serve as one of the numerous proofs of an over-ruling providence in the disposal of all natural bodies. The surface of the earth is composed of vegetable mould, made up of different earth mixed with the putrid remains of animal and vegetable bodies; and is of the proper texture and compages for conducting the moisture to the roots of trees and plants: and under this are laid the sands and Pebbles which are a sort of drain to carry off the redundant moisture deeper into the earth, where it may be ready to supply the place of what is constantly rising in exhalations; and lest the strata of sand should be too thick, it is common to find thin ones of clay between, which serve to put some stop to the descent of the moisture, and keep it from passing off too soon; and lest these thin strata of clay should yield and give way, and by their softness, when wetted, give leave to the particles of sand to blend themselves with, and even force their way through them, there are found in many places thin coats of a poor iron ore placed regularly above and below the clay; and by that means, no tonly strengthening and supporting the clay, but effectually keeping the sand from making its way into it. *Phil. Trans.* N°. 483.

PECTEN, in natural history, the name of a genus of shell-fish, the characters of which are these:

It is a bivalve shell, shutting close in all parts, of a flatted shape, striated in the manner of a comb, and often auriculated, sometimes only semi-auriculated, and in some species not auriculated at all. There are also some few species which are elate, not flat as the others.

This shell-fish is one of the spinners of the sea, having a power of of spinning or forming threads like the muscle; but they are much shorter and coarser, even than those of that fish: so that they can never be wrought into any sort of work, in the manner of the longer and finer threads of the pinna marina. The use of these threads which the Pecten or scallop spins, is to fix the creature to any other body that is near, whether it be a stone a piece of coral, or another shell. All these threads proceed, as in the muscle, from one common trunk; they make their way out of the shells in those Pectens which have only one ear, a little below that ear; in the others probably they issue out on both sides. It is an evident proof, that the fish has a power of fixing itself at pleasure to any solid body, by means of these threads, that after storms the scallops are often found tossed upon rocks, where there were none the day before; and yet these are fixed by their threads, as well as those which had remained ever so long in their place. They form their threads in the very same manner with the muscle, only their organ which serves for spinning is shorter, and has a wider hollow, whence the threads are necessarily thicker and shorter.

PEDILU'VIUM.—This word signifies no more than a bath for the feet, which may be prepared of the same ingredients with other baths; and, as it requires a less apparatus, is for that reason frequently used as a succedaneum to them; for a bath for the feet may either consist of pure light water alone, or, in order to correct the qualities of heavy and hard waters, a lixivium, or bran of wheat, or chamomile-flowers, may be added; or such waters may be mixed with milk. But, though baths for the feet are only immediately applied to the inferior parts and extremities of the body, yet their virtues and efficacy diffuse themselves further, and alleviate violent disorders in remote and distant parts of the body; for, whilst the feet are cherished with such a warm liquor, the nervous, tendinous, and muscular fibres, by the intertexture of which they are formed, are relaxed and unbended; the pores and ducts, before constricted, are enlarged; the blood has access to the parts; and the return of the humours from them is rendered free and uninterrupted. By this means, the impetus of the blood on other parts is diverted; and, to the surprising relief of the patient, derived to the inferior parts. Besides, baths for the feet, by their temperate heat, act upon the blood and humours, which, during their use, pass through the vessels of the feet, render them more thin and diluted, and by that means qualify them for passing more expeditiously through all the various ducts and parts of the body. Hence it is, that, if pretty hot baths for the feet are used, they increase the pulse, and excite a sweat over all the body. Besides, the consent of the feet, as being nervous and tendinous parts of an exquisite sensation, is so great with all the other nervous parts of the body, especially those of the abdomen, that, if the feet are only rendered thoroughly cold, a cholic is forthwith produced, the patient becomes costive, the skin is rendered rough, perspiration is intercepted, and the salutary evacuations from the uterus, and hæmorrhoidal veins, stopped. For this reason, it is not to be doubted, but when the feet are fomented, and their spasmodic stricture removed by means of a tepid bath, the salutary effect must, also, be propagated to those remote parts of the body, with which they have so near and immediate a consent.

Baths for the feet are certainly highly expedient for the purposes of derivation, in those diseases which arise from congestions of the humours to the head and breast, produced by spasms of the inferior parts, and especially of the hypochondria. Among this kind, besides lethargic diseases, we may reckon almost all disorders of the head, such as madness, melancholy cephalæas, hemicranias, the clavus hystericus, vertigos, tooth-achs, pains of the ears, a gutta rosacea, inflammations, and defluxions of saline humours on the eyes, immoderate hæmorrhages from the nose, and long watchings. Of this kind are, also, some disorders which affect the breast, such as convulsive asthmas, dyspnœas arising from a plethora, palpitations of the heart, dry coughs, and spittings of blood. Besides, baths for the feet, in consequence of their singular efficacy in relaxing spasms, are highly beneficial in spasmodic and convulsive disorders, in pains, cardialgias, cholics, especially of the hæmorrhoidal kind; gripes produced by the stone, and inflations of the stomach, accompanied with an uneasiness of the præcordia. Besides, baths for the feet promote the salutary excretions by perspiration, urine and stool, together with those made from the uterus, and hæmorrhoidal veins, by procuring a free circulation of the blood, attenuating the humours, and solliciting them to the emunctories of the body. Baths for the feet, also, remove and prevent very terrible disorders of the head and breast especially those which return at certain periods; and I myself, says Hoffman, have known the daily use of these baths for the feet remove the most terrible and obstinate cephalalgias. Some, also, in intermittent fevers, advise the use of these baths, though not on the days of remission. And this piece of practice is productive of very salutary effects, as is obvious from Obs. 144. Decad. 2. An. 6. Miscell. Nat. Curios. where we have an account of a quartan fever cured by means of foot-baths. And *Kozak de Salib. Sect.* 12. *cap.* 10.

But it is to be observed, that baths for the feet produce far more happy effects, if, before they are used, the quantity of blood is lessened by venesection in the feet; if they are used about bed-time, and the feet not exposed to the cold after them, but kept duly warm, till the patient gets to bed; by which means the perspiration, all over the body, is increased. But baths for the feet must not be used about the time the menses are about to flow, or already present, because, by diverting the course of the blood from the uterus and solliciting it to the inferior parts, this salutary discharge is either stopped or prevented. On the contrary, baths for the feet, used some days before the stated period for the menstrual discharge, excellently promote it, especially if, at the same time the pilulæ Becheri, or temperate emmenagogues, are used. We must, also, carefully abstain from astringent, aluminous, and sulphureous baths, in order to prevent a sweating of the feet, discuss oedematous tumors, cure ulcers, or remove arthritic pains, since, by means of such astringent, aluminous, and sulphureous baths, the virulent matter is repelled to the internal and more noble parts. And because the common hot spring in the Caroline baths, commonly called Der Prudel, is possessed of an highly repellent quality; so bathing in it ought to be very cautiously used in all disorders affecting the surface of the body, and more especially in gouty and arthritic pains. *Hoffman.*

PE'LICAN, in the Linnæan system of zoology, makes a distinct genus of birds of the order of the anseres, or goose kind; the characteristic of which is to have a beak of a depressed form, with a hooked point, and furnished with a large bag or purse beneath. *Linnæi System. Nat.*

PE'LLACK, the name of a young spout whale, often found in Zealand; where they run into creeks, and so entangle themselves among the rocks, that they are cast on shore, or easily taken. *Phil. Transf.* N°. 473.

PEN'DULUM (*Dict.*)—Soon after the invention of Pendulum-clocks (justly ascribed to the celebrated Mr. Huygens) it was found, that they were liable to considerable inequalities in their motion; which were imagined to arise from the Pendulum, in its vibrations, describing an arc of a circle; and, consequently, that the larger vibrations must be slower than the shorter ones. In order to remedy this imperfection, the same Mr. Huygens wrote a treatise, called Horologium oscillatorium (a piece of geometry, which does honour to the last century) in which he demonstrates, from the properties of the cycloid, that the vibrations of a Pendulum, moving in a cycloid, would be performed in equal times, even though the vibrations were unequal. Pendulums therefore were made to vibrate in a cycloid; but great inequalities were still observed in the motion of clocks.

We do not read of any attempts, after this, to regulate the motion of clocks, till the year 1726, when Mr. George Graham delivered into the Royal Society a paper, which is published in the Phil. Transf. N°. 392, in which he says, that, it having been apprehended, that the inequalities in the motion of clocks arose from a change of length in the Pendulum, by the influences of heat and cold, he, about the year 1715, made several trials, in order to discover, whether there was any considerable difference of expansion between brass, steel, iron, silver, &c. when exposed to the same degrees of heat; conceiving, that it would not be very difficult, by making use of two sorts of metals differing considerably in their degrees of expansion and contraction, to remedy, in great measure, the irregularities, to which common Pendulums are subject. He says also, that, from the experiments he then made, he found their differences so small, as gave him no hopes of succeeding that way, which made him leave off prosecuting this affair any more at that time: that, some time after, having observed an extraordinary degree of expansion, by heat, in quicksilver, he thought of a proper manner of applying a column of it to the Pendulum of a clock, in order to prevent the inequalities arising from its different lengths by the effects of heat and cold; which succeeded accordingly, and is what is now called Mr. Graham's quicksilver Pendulum. Mr. Graham, in the same paper, takes notice, that, though the Pendulum of a clock was to remain invariable, yet there would still be some irregularities in the motion of the clock, arising from the friction of the different parts of the clock-work, and from the different degrees of foulness.

In the year 1725, Mr. John Harrison, of Barrow, in Lincolnshire, made several experiments upon wires of different metals, in order to find their different degrees of expansion and contraction: for he thought, that, by a proper combination of wires of two different metals, differing considerably in their expansion and contraction, he might be enabled to keep the center of oscillation of a Pendulum always at the same distance from the point of suspension. In consequence of these experiments, he made a Pendulum, consisting of one steel wire, at the end of which is the bob or weight, and, on each side of this wire, four wires alternately brass and steel, so disposed and contrived, as to raise the Pendulum the same quantity as it is lengthened by heat, and to let down the Pendulum in the same proportion as it is raised by cold. He made also a drawing of a clock, in which the wheels are disposed in in a different manner from those then in use; which drawing I have seen, signed by himself in the year 1725. Two of these clocks with Pendulums, as described above, were finished in the year 1726. In these clocks Mr. Harrison has made a particular sort of pallets, so as to be almost intirely free from friction; for, though he had thus happily succeeded in his contrivance to prevent the inequalities in the motion of the clock, arising from the different lengths of the Pendulum by the effects of heat and cold, yet he found there were considerable errors still remaining, occasioned by the friction of the pallets, as in the common way. He has also suspended the Pendulum upon the wall of the house, intirely independent of the clock and clock-case: for he had observed considerable alterations in the going of the clock, when the Pendulum is suspended as in the common manner. His Pendulum vibrates in an arc of about 15 degrees, with a bob of about three pounds, between cycloidal checks, which he himself found were necessary, though he had never heard of M. Huygens's book, till after he had made them. He has also disposed the force of his Pendulum-wheel upon the Pendulum, by his sort of pallets, in such a manner, that the vibrations of the Pendulum will not be affected by the different resistance of the air. Upon the whole, this clock is made in such a manner, as to be almost intirely free from friction; in consequence of which he uses no oil, and therefore there is no necessity ever to clean the clock. When he settled in London, he sent for one of these clocks from the country, and set it up in his house in Orange-street, in the year 1739, where it has stood ever since, and in all that time has never varied above one minute from the truth. He can depend upon it to a second in a month.

About the year 1729, Mr. Harrison made his first machine for measuring time at sea, in which he has likewise applied this combination of wires of brass and steel, to prevent any alterations by heat and cold. In the year 1726, he went on board one of his majesty's ships of war with this machine to Lisbon, and returned, where this machine was seen by every curious and ingenious person, who were pleased to go to his house. Since that time, he has made two more of these machines or clocks for keeping time at sea, in both which he has likewise this provision, to prevent the effects of heat and cold.

Mr. John Shelton, who was the principal person employed by Mr. Graham in the making of astronomical clocks, informs me, that Mr. Graham, in the year 1737, made a Pendulum consisting of three bars, viz. one of steel, between two of brass; and that the steel bar acted upon a lever, so as to raise the Pendulum, when lengthened by heat, and to let it down, when shortened by cold. This lever, which is very strong, rests upon a roller; which roller is made moveable, so as to adjust the arms of the lever to their true proportion. The whole was made to be as free from friction, as possible, in such a construction. Mr. Graham made observations, by transits of the fixed stars, of the motion of the clock with this sort of Pendulum, and from the experience of several years (during which the clock was kept constantly going) he found, that the clock was liable to sudden starts and jerks in its motion. Of this he informed Dr. Bradley, Mr. Bliss, and several other gentlemen.

I have been informed, that one Mr. Frotheringham, a quaker, of Lincolnshire, caused a Pendulum to be made, consisting of two bars, one of brass, and the other of steel, fastened together by screws, with levers to raise or let down the bob; and that these levers were placed above the bob.

In the History of the Royal Academy of Sciences at Paris, for the year 1741, there is a memoir of M. Cassini, in which he describes several sorts of Pendulums for clocks, compounded of bars of brass and steel, and applies a lever to raise or let down the bob of the Pendulum, by the expansion or contraction of the bar of brass. He has also given us, in the same memoir, a problem for finding the proportion, which the two arms of the lever should have, to answer the intended purpose; and also a demonstration of it.

In June, 1752, Mr. John Ellicott gave in to the Royal Society a paper, containing the description of a Pendulum, consisting of two bars, one of brass, and the other of iron, fastened together by screws, with two levers in the bob of the Pendulum, so contrived, as to raise and let down the bob, by the expansion and contraction of the brass bar; and also to adjust the arms of the levers to their true proportion. He says, that he first thought of these methods of applying bars of brass and iron to prevent the irregularities of a clock, arising from the different lengths of the Pendulum, by the effects of heat and cold, in the year 1732; and that he put this his thought in execution in the year 1738.

He has also given us in the same paper another construction of a Pendulum to prevent the effects of heat and cold, consisting of two bars, one of brass, and the other of iron; the brass bar acting upon a lever, at the end of which is fastened the Pendulum; the whole so constructed and contrived, as to raise the Pendulum, when it is lengthened by heat, and to let it down, when shortened by cold. *Short, in the Philos. Trans. Vol.* 47.

Mr. Ellicott's contrivances for remedying these defects in clocks are given us by that ingenious gentleman himself in the following manner:

About the year 1732, an experiment, which I made, in order to satisfy some gentlemen, that the rod of a Pendulum was liable to be considerably influenced by moderate degrees of heat and cold, led me to consider, that, as metals differ from each other in their density, it was highly probable they might likewise differ from each other in their expansion; and that this difference of the expansions of two metals might be so applied, as in a great measure to remove those irregularities in the motion of a clock, which arise from the effect of heat and cold upon the length of a Pendulum. With this view, not long afterwards I contrived the Pendulum now described by *plate* XXXIII. *fig.* 6.

In which *a b* represents a bar of brass, made quite fast at the upper part by pins, and held contiguous, at several equal distances, by the screws 1, 2, &c. to the rod of the Pendulum, which is a bar of iron; and, so far as the brass bar reaches, is filed of the same size and shape, and consequently does not appear in the figure; but, a little below the end of the brass bar, the iron is left broader, as at *d d*, for the conveniency of fixing the work to it, and is made of a sufficient length to pass quite thro' the ball of the Pendulum to *c*. The holes, 1, 2, &c. in the brass, through which the shanks of the screws pass into the iron rod of the Pendulum, are filed, as in the drawing, of a length sufficient to suffer the brass to contract and dilate freely by heat and cold under the heads of the screws. *e e e e* Represents the ball of the Pendulum: *f f*, two strong pieces of steel, or levers, whose inner centers, or pivots, turn in two holes drilled in the broad part of the Pendulum-rod, and their outer ones in a strong bridge, or cock, screwed upon the same part of the rod, but omitted in the draught; because, when put on, it covers this mechanism. *g g*, are two screws entering at the edge, and reaching into the cavity near the center of the ball. The ends of these screws next the center are turned into the form represented in the drawing, which, pressing with the weight of the ball against the longer arms of the levers, cause the shorter arms to press against the end of the brass bar at 6. Things being in this situation, let us suppose, that the rod of the Pendulum, and the brass annexed to it, grow longer by heat; and that the brass lengthens more than the iron of the same length: then the brass, by its excess of dilatation, will press the short ends of the levers downwards at *b*, and at the same time necessarily lift up the ball, which rests upon the long ends of the same levers at *f f*, to any proportion necessary: and, provided the ends of the screws do press upon the levers at a proper distance from the centers, the said ball will be always kept at the point of suspension, notwithstanding any alteration the rod of the Pendulum may be liable to from heat or cold. What this distance ought to be, may very nearly be determined, if the difference of the expansion between the brass and iron bars is known; for the proportion the shorter arms of the levers ought to bear to the longer ones will always be, as the excess of the expansion of the brass is to the whole expansion of the iron, as may be thus easily demonstrated. *Fig.* 7. Let the line *a b*, drawn perpendicular to the line *e f*, represent a bar of iron; the line *c d* a bar of brass; the pricked line *b g*, the expansion of the iron bar, and *d b* the expansion of the brass bar by the same degree of heat: let the line *g i* be parallel to *e f*, then will *i b* represent the difference of the expansion of the two metals: through the points *b*, *g*, draw a right line cutting the line *e f*, as in *k*; to represent one of the levers turning upon its center at *g*, *b* the point where the brass bar acts upon the shorter end of the lever, and *k* the point where the screw acts upon the longer end of the lever, which being the place where it intersects the line *e f*, it is evident the ball of the Pendulum will be as much raised by the lever, as it would have been depressed by the expansion of the iron; but the triangle *i b g* is similar to the triangle *b g k*; and therefore, as *i b*, the excess of the expansion of the brass, is to *b g*, the whole expansion of the iron, so will *b g*, the shorter arm of the lever, be to *g k*, the longer arm of the lever. *Q. e d.*

At *c*, *fig.* 6. is placed a strong double spring, whose ends, pressing against the under edge of the ball, hinder it from bending the brass bar by its forcible action thereon at the point *b*, which, when the ball is of a considerable weight, it might otherwise be very liable to do.

The description here given is exactly agreeable to the original contrivance; and the only alteration I have since made in it, consists in placing the screws *g g* within the ball of the Pendulum, as represented in *fig.* 9.

But, as the success of this contrivance depended intirely upon the supposition, that metals were expanded differently by the same degree of heat, before I attempted to put it in execution, I thought proper to inquire what experiments had already been made upon this subject, when Mr. John Eames put into my hands Mr. Graham's account of his quicksilver Pendulum (as it is now commonly called) published in the Philosophical Transactions, N°. 392, which account I found to be introduced by the following paragraph:

'Whereas several, who have been curious in measuring of time, have taken notice, that the vibrations of a Pendulum are slower in summer than in winter; and have very justly supposed this alteration has proceeded from a change of length in the Pendulum itself, by the influences of heat and cold upon it, in the different seasons of the year; with a view therefore of correcting, in some degree, this defect of the Pendulum, I made several trials, about the year 1715, to discover whether there

there was any considerable difference of expansion between brass, steel, iron, copper, silver, &c. when exposed to the same degrees of heat, as nearly as I could determine; conceiving it would not be very difficult, by making use of two sort of metals differing considerably in their degrees of expansion and contraction, to remedy, in great measure, the irregularities, to which common Pendulums are subject. But although it is easily discoverable, that all these metals suffer a sensible alteration of their dimensions by heat and cold; yet I found their differences in quantity, from one another, were so small, as gave me no hopes of succeeding this way, and made me leave off prosecuting this affair any farther at that time.'

The reading this paragraph proved at that time sufficient to make me lay aside all thoughts of succeeding in a contrivance founded upon principles, which a gentleman of so great abilities, and known accuracy in making experiments, had, after trial, judged to be insufficient. And it was not till about the latter end of the year 1734, that I again resumed them on the following occasion. A gentleman, desirous to make some experiments concerning the expansion of metals, employed me to make him an instrument like one invented by Mr. Muschenbroek for that purpose, which he calls a pyrometer. Upon looking over Mr. Muschenbroek's experiments, I not only found the difference between the expansion of some of the metals much greater than I expected, but, as I thought (if they were to be depended upon) sufficient to answer my former purpose. This led me to consider the structure of the instrument, which Mr. Muschenbroek made use of in his trials, and, upon examination, I thought it liable to some objections, which I imagined would make the result of experiments made by his instrument very uncertain. I therefore endeavoured to contrive one of a different construction, that might be more to be depended upon. See PYROMETER. Having made a great variety of experiments with this instrument upon bars of different metals, as nearly of the same dimensions as possible, I found, upon a medium, their several expansions by the same degree of heat to be as follows:

Gold	silver	brass	copper	iron	steel	lead
73	103	95	89	60	56	149.

And, as I found so great a difference between the expansion of brass and iron, I immediately determined to make a Pendulum after the manner above described, composed of those two metals, and likewise ordered a clock to be made, with the utmost care and exactness; and, as I then apprehended, with some considerable improvements, with which I intended to make the experiments. These were both finished in the beginning of the year 1738; and, having no reason to doubt of success, I shewed the Pendulum to the late Mr. Machin, and gave him a drawing and description of it, in order to its being communicated to the Royal Society; but objections were made to it, of which the only one, that appeared to have any weight, was, that it had been found by experiment, that two bars of different metals, screwed together, so as to be in contact with each other, would not expand regularly and smoothly, but by jerks. In order to examine into the force of this objection, I directed two bars of equal dimensions to be made, one of brass, the other of iron, of about two feet in length, fastened together after the same manner, as the two rods of the Pendulum, which I intended to place so, that, by acting very near the center of an index of a considerable length, even the smallest alteration in the bars would be made sensible, and by the motion of the index I should be able to form a judgment, whether the rods moved regularly and freely, or not: but, before this was put into execution, I contrived, by fastening the two bars to the back plate of a clock, not only to make them answer the end above proposed, but, at the same time, to lengthen or shorten a Pendulum of a common construction, in such a manner, as sufficiently to correct the irregularities arising from the influence of cold or heat upon it. The manner of applying them is described by *fig.* 8.

In which, *a a a a* represents the back plate of the clock, *b b b*, a triangular piece of brass, screwed by two screws, through the slits *c c*, to the plate, yet so that it may be drawn backwards or forwards by means of the screw at *d*. *e f* Is a brass bar, about two feet in length, made fast at the bottom, by a screw and two pins at *f*, to an iron one of equal dimensions, to which it is likewise screwed by the screws 1, 2, 3, &c. after the same manner as the rod of the Pendulum already described. The iron bar is fastened at the upper end to the triangular piece of brass, nearly under that part of the brass bar marked *e*. *g h* Is a strong brass or iron lever, moveable upon a center at *g*, and supported by the upper end of the brass bar; *i i* is the cock, on which, in a common clock, the Pendulum is hung; *k k*, part of the rod of the Pendulum, whose spring, passing through a fine slit in the cock *i i*, is fastened to a stud riveted into the lever at *l*. The slit in the cock must be made so close, as to prevent the spring from having any lateral motion in it.

From this description it is evident, that, if the brass bar expands more than the iron one, it will raise up the lever, and, consequently, the Pendulum, which is fastened to it; and, as the length of the Pendulum is only from the center of oscillation to the under part of the slit, through which the spring passes, the Pendulum will be thereby shortened; and, by making the point of the brass bar to act upon a proper part of the lever (to which it is capable of being adjusted by means of the screw *d*) the Pendulum may be shortened to whatever degree shall be necessary.

To prevent the Pendulum from bending the bars, which it would be liable to do, if the ball of the Pendulum was of any considerable weight, the end of the lever, farthest from its center of motion, is hooked to the end of a chain, which is wound about and fastened to a small pulley at *m*. Upon the same arbor, to which this pulley is fixed, is fastened another pulley, of a much larger diameter, to which is hung, by a silk line, the weight or counterpoise *n*. By means of this counterpoise, any part of the weight of the Pendulum, that shall be desired, may be taken off from pressing against the brass bar. And if, upon the end of the arbor, to which the pullies are fixed, an index be placed, so as to point to a graduated circle, the least motion of the lever will not only be easily perceived, but also whether that motion is uniform and regular, or not. And, upon having, some time after, made a clock with this contrivance added to it, I had the pleasure to find the index not only to move very sensibly, but very regularly, and never, that I could perceive, by jerks. And I doubt not, but, when the point of bearing of the brass bar upon the lever is once well adjusted, it will be found to lengthen or shorten the Pendulum to as great a degree of exactness, as any other method whatsoever. But, as I have not as yet thought of any other method of adjusting it, except from actual trial in different seasons of the year, I must prefer the Pendulum to this method, which, from the great ease, as well as exactness, with which it is capable of being adjusted, will, I think, appear to have much the advantage over any other contrivance yet made use of for this purpose.

The method I take for adjusting the longer arms of the levers of the Pendulum to the shorter ones is described in *fig.* 9. To a strong post, fixed to the wall, is fastened a small shelf, supported by two brackets *a b*. In the middle of this shelf is fastened a wire, by the screw *e*; to the end of which the Pendulum is to be hung. Below this shelf, at the distance of about forty inches, is placed the index *c d*, turning freely upon a center: the length of the index is fifty inches. At the distance of half an inch, upon a part of the index produced beyond the center, is placed a steel pin; and in the back of the Pendulum, as near the center of oscillation as may be, is drilled an hole to receive this pin; when the Pendulum is hung upon the wire against the post, and the wire is screwed higher or lower by the screw *e*, till the pin resting against the upper part of the hole (which is filed into a proper shape for that purpose) keeps the index nearly in an horizontal position. Below the bottom of the Pendulum is placed a second index *f g*, exactly like the former, except that it is kept in an horizontal position, by the screw *k* bearing against the end of the iron rod. When the experiment is to be made, the Pendulum is first put into a box, and gradually heated by a large fire, to a considerable degree, being often turned, that every part may be equally exposed to the fire. And having continued shut up in the box for some time after it is removed from the fire, that the two rods may be heated as uniformly to the same degree as possible, the Pendulum is hung upon the wire, and the two indexes made to stand nearly in an horizontal position. The two graduated plates *h i* are then slid upon a wire, till the divisions in each marked *o* are pointed to by the indexes. As the Pendulum cools, the lower index will be seen gradually to descend; but, if the ends of the two screws, in the ball of the Pendulum, act upon proper parts of the levers, the upper index will continue in the same place. If the ends of the screws are either too far off, or too near the centers of the levers, the index will either rise or descend; and, by comparing the number of divisions it has varied, with those which the lower index has varied, a near estimate may be made, how much the screws require to be altered; and, in a very few trials, they may be easily adjusted to a very great exactness. In order to make an actual trial, how far this contrivance of the Pendulum will answer the end proposed, it is necessary, that the clock, to which the Pendulum is fitted, be made with great exactness, and intirely to be depended on: for otherwise the experiments will be very uncertain, as I found in the clock I first made use of.

I have already observed, that, in order to render this clock as perfect as possible, I made it, in several respects, different from the common ones, in hopes of removing some imperfections I apprehended they were liable to. But as, in this attempt, I fell into an error, which it was a considerable time before I discovered, my making the trial was thereby greatly retarded. And, in order to prevent others from falling into the like mistake, I shall beg leave to give some short account of it.

In a common clock the Pendulum is usually hung by a spring to a cock on the back plate of the clock, whilst the wheel and pallets, by which the Pendulum is kept in motion, are placed in the middle of the frame; and the Pendulum is moved by a piece of steel (called the crutch) riveted to one end of the arbor, to which the pallets are fastened. This disposition of the pieces I apprehended liable to some considerable objections: to remedy which, I contrived to fix the pallets to the upper part of the Pendulum itself, above the center of motion; and, in order to make the Pendulum vibrate as freely as possible, it

was

was made to turn upon two fteel points, and was hung in the middle of the frame, exactly under the fwing-wheel, and fo as to vibrate in the fame plane with it. By this means I was in hopes, that it would have moved with much greater freedom and regularity, than when hung after the common method; and, upon trial, it was found to move with fo great freedom, that a Pendulum of above twenty pounds weight, when hung in its place without the clockwork, and made to vibrate thro' an arch of two degrees, was found to make above 1200 vibrations, before it had loft half a degree, and was obferved to have a fenfible motion above twenty hours afterwards; and the clock, when firft put together, was kept going, for feveral days, by a weight of only eleven ounces, hung to the end of a fingle line. But it was not long, before I difcovered, that this great freedom made it liable to be confiderably affected by the leaft motion.

A remarkable inftance of this was publifhed in the Philofophical Tranfactions, N°. 453. But the greateft objection to this method was, the points being fubject to wear; and I found, that the leaft alteration in them would occafion the clock to vary much more, than (without having made the trial) I could have imagined. To remedy this inconvenience, I made the Pendulum to move upon edges, like thofe, on which the beam of a pair of fcales turns (a method I had good reafon to believe had been made ufe of with fuccefs;) but I found thefe likewife liable to wear, though not in fo fhort a time as the points; fo that, after much time fpent in making feveral experiments, in order to remedy this inconvenience, I found myfelf obliged to lay this method wholly afide, and to hang the Pendulum upon a fpring, as ufual.

In making this alteration, I obferved one circumftance, which I think deferves to be taken notice of. Before I made any alteration in the work, I took particular notice to what height the Pendulum required to be raifed, before the pallets would efcape from the wheel. I next obferved the number of degrees of each vibration of the Pendulum, when moved by the clockwork; and then, the clockwork being removed, the Pendulum was made to defcribe an arch of two degrees; and particular notice was likewife taken, in what fpace of time it had loft half a degree each vibration. Having then made the neceffary alterations for hanging the Pendulum by a fpring, and particular care being taken that the pallets fhould efcape off from the wheel exactly at the fame angle as before, the Pendulum being hung by its fpring, and made to vibrate through an arch of two degrees, it was obferved to lofe half a degree in about half the time it did when turning upon edges. But, upon being fet a-going by the clock-work, the Pendulum was found to defcribe an arch of near two degrees more than before: for, when it turned upon the edges, it defcribed an arch of only three degrees; whereas, now it was hung by the fpring, it vibrated near five degrees; which was very different from what I expected. This alteration being made, I foon found, that the clock went very regular; and, after a fufficient trial, was fully fatisfied the Pendulum would anfwer my expectations. *Philof. Tranf.* Vol. 47.

Mr. Poleni feems to think, that, if a long Pendulum were made to fwing in the place of the meridian, and another of equal length in a plane perpendicular to the meridian, fome difference might be found in their vibrations from the centrifugal force arifing from the earth's rotation about its axis. See *Philof. Tranf.* N°. 468.

PENE'LOPE, in zoology, the name ufed by the authors for the bird commonly known in England by the name of the widgeon; alfo, called in fome places the whewer; and by the Germans the fchmey.

PE'NGUIN, in zoology, a name given by failors of different nations to two different fpecies of water fowl, both web-footed, and both wanting the hinder toe.

The Penguin of the Englifh is the bird more commonly known by the name of the goifugel.

It grows to the fize of a common tame goofe, and is black on its back, or upper part, and white on the belly. Its wings are very fmall, and by no means fit for flying. Its beak is fomewhat broad and long, compreffed on the fides and back, and has towards the extremity feveral furrows, feven or eight on the upper fide, and about ten on the under; and the lower chap fwells into a protuberance downwards. Its head has two white lines reaching from the beak to the eyes. Its tail is very fhort, and it has no hinder toe.

PE'NNY-*earth*, in agriculture, a term ufed by the farmers for a hard loamy, or fandy earth, with a very large quantity of fea fhells intermixed in it; fome of which being round and flat, and in fome meafure refembling pieces of money, have occafioned the earth's being called by this name. It is an earth not eafily dug, but is ufually undermined with pickaxes, and then falls in large lumps; which, with the frofts, break to pieces, and leave the fhells loofe. It is prepared by breaking and mixing well with water, and then makes very defireable floors. The Jerfey combers comb-pots are alfo made of it, and the fides and roofs of ovens are plaiftered with it; and, being rightly managed, it combines into a flower almoft as ftrong as plaifter of Paris. *Moreton's Northamptonfhire.*

PEN'NYROYAL, *pulegium*, in botany, &c. See PULEGIUM.

The feveral forts of Pennyroyal all propagate themfelves very faft by their trailing branches, which take root at every joint; fo that no more is required in their culture and propagation than to cut off and plant out thefe rooted branches: they fhould be planted at a foot diftance every way, that they may have room to grow. The beft feafon for this is in September, that the plants may be rooted before winter. They love a moift foil, and generally grow very faft. *Miller's Gard. Dict.*

PENTAEDRO'STYLA *, in natural hiftory, the name of a genus of fpars.

* The word is derived from the Greek, *πέντε*, five, *ἕδρα*, a fide, and *στῦλος*, a column.

The bodies of this genus are fpars, in form of pentangular columns, terminated by pentangular pyramids at one end, and irregularly affixed at the other to fome folid body.

PENTAPHYLLO'PDES, *wild tanfey*, in botany, a low plant, which never arifes up to the ftalk, but creeps upon the ground, emitting fibres from the joints, by which it roots in the earth, and fpreads very much; the leaves are made up of feveral pinnæ fet oppofite; each being about an inch long, and not half fo broad, ferrated about the edges, and having feveral fmall pieces among them, like agrimony, covered over with a fhining filver-coloured down: the flowers grow at the joints on long foot-ftalks, of five yellow leaves like cinquefoil. The root is flender, with many fibres of a dark-brown colour. It grows in moift barren places, and where water has ftood, all the winter, flowering in May.

The leaves only are ufed, and are accounted reftringent and vulnerary; good to ftop all kinds of fluxes, and preternatural evacuations; to diffolve coagulated blood, to help thofe who are bruifed by falls: outwardly, it is ufed as a cofmetic, to take off freckles, fun-burn, morphew, as, alfo, in reftringent gargarifms. *Miller's Bot. Off.*

PE'PO, *the pompion, or pumpkin*, the name of a genus of plants, allied to the melon and cucumber kinds: the characters of the genus are thefe:

The flowers confift of one leaf each, fhaped like a bell, wide open at the mouth, and divided into feveral fegments at the end. Of thefe flowers fome are male, or fteril, having no embryo; others are female, or fruitful, having an embryo, which ripens into a large fruit, with fometimes a fmooth, fometimes a rough bark. The figure is fometimes oval, fometimes round, and the bark often very hard, tuberous, and hollow: it is divided into three cells within, and contains flat feeds, furrounded with a fort of ring, and fixed to a fpongy placenta.

All the kinds of pompions are cooling, moiftening, allay fharp humours, and quench thirft.

They are hard to be digefted, weaken the ftomach, and caufe wind and cholic.

Pompions contain much phlegm, a middle quantity of effential, falt and a little oil.

They agree in hot weather with young bilious people; but perfons of a cold and phlegmatic conftitution ought to abftain from them.

They ufually mix the pompions with fome aromatic herbs, fuch as parfley, onions, muftard, pepper, and feveral other fharp and volatile things, fit to attenuate the vifcous phlegm of this fruit in the ftomach.

They preferve pompions with fugar, in order to make them more pleafing to the tafte and more wholefome. In fhort, they rarify their grofs fubftance by boiling them well; and befides, the fugar, wherewith they are mixed, gives them a little fort of pricking quality, that makes them lefs infipid to the tafte, and more eafy of digeftion. Preferved pompions may be ufed in diftempers of the breaft, in order to allay the fharpneffes that are there.

Pompions contain a great many feeds, which are flat, oblong, covered with an hard rind, that is a little woody, whitifh, or greyifh. Under this there is a fmall, fweet, and very pleafant kernel, which contains a great deal of oil, that may be eafily preffed out of it; and is proper to foften the fkin, and make it more fmooth. *Lemery on foods.*

PE'PPER-*water*, a liquor prepared by the curious for examination by the microfcope, as always affording a great number of fmall animals.

The method of preparing it is this: put common black Pepper, grofly powdered, into an open veffel fo as to cover the bottom of it half an inch thick, and put to it rain or river water, till it covers it an inch; fhake or ftir the whole well together at the firft mixture, but never difturb it afterwards: let the veffel be expofed to the air uncovered; and in a few days there will be feen a pellicle or thin fkin fwimming on the furface of the liquor, looking of feveral colours.

PE'RCA, *the pearch.*— The name Perca is of Greek origin, and is derived from the word *περκος*, which fignifies variegated with black or dufky fpots; a character common to moft of the fpecies of this fifh.

The common pearch affords good fport for the angler. The beft time for their biting is, when the fpring is over, and before the heats of fummer come on. At this time they are very greedy, and the angler, with good management, may take, at one ftanding, all that are in the hole, be they ever fo many.

The proper baits are a minow or young frog; but the worm called the brandling, well fcowered, is alfo excellent at all times of the year. When the pearch bites, he should always have a great deal of time allowed him to swallow the bait. The pearch will bite all day long, if the weather be cloudy; but the best time is from eight to ten in the morning, and from three till six in the afternoon. The pearch is very abstemious in winter, and will seldom bite in this season of the year; if he does at all, it is in the middle of the day, at which time indeed all fish bite best at that season.

If the bait be a minow, which is the bait that affords the most diversion to the angler, it must be fastened to the hook alive, by putting the hook through the upper lip, or the back fin; it must be kept at about mid-water, and the float must be a quill and a cork, that the minow alone may not be able to sink it. The line must be of silk, and strong; and the hook armed with a small and fine wire, that, if a pike should take the bait, as is not unfrequently the case, he may be taken. The way to carry the minows or small gudgeons alive for baits, is this: a tin pot is to be provided with holes in the lid, and filled with water, and the fish put into this; the water is to be changed once in a quarter of an hour by the holes, without taking off the lid at any time, except when the bait is to be taken out.

A small casting net, made for these little fish, should be taken out with the pearch tackle, and one or two casts of this will take baits enough for the day, without any farther trouble. When the bait is a frog, the hook is to be fastened to the upper part of the leg. The best place for the fishing of pearch is, in the turn of the water near some gravelly scour. A place of this kind being pitched upon, it should be baited over night with lob-worms chopped to pieces; and in the morning, on going to it, the depth is to be regularly plumbed, and then the hook is to be baited with the worm, or other bait; and, as it drags along, the pearch will soon seize upon it.

PE'RCEPIER, *parsley-piert*, in botany, a genus of plants, whose characters are:

The calyx is quadrifid; the flower is produced in the alæ of the leaves; the seeds are produced single in each seed vessel, which is formed by the calyx.

This is a small low plant, lying generally upon the ground, whose round hairy branches are seldom an hand's-breadth long; they are full of small leaves, set alternately at the joints, a little hairy, narrow at the stalk, and broadest at the ends, cut into three round sections; the flowers are small, and stamineous, growing in clusters at the joints, among the leaves; they consist of four leaves, and are succeeded by small round seeds. The root is full of fibres. It grows in dry places, and in fallow fields, as, also, among corn.

Parsley-piert is not an officinal plant, and is seldom prescribed by physicians; but the vulgar have a great opinion of it as a breaker or bringer away of the stone and gravel, and a provoker of urine; and is given by them for that purpose either in powder, or a decoction of it in white-wine. *Miller's Bot. Off.*

PERETE'RION, a name given by chirurgical writers to the perforating part of the trepan.

PE'RFECT, *perfecti*, in church history, a designation which the followers of Valentius assumed to themselves. *Hoffm. Lex. in voc.*

PERFOLIA'TA, *thorow-wax*, a medicinal plant having a small sticky root, from which spring smooth, and frequently reddish stalks. The leaves are of a bluish-green colour, of an oval shape; smooth, and not indented about the edges; full of nerves, which run obliquely from the center to the circumference of the leaf: they are perforated by the stalk, which runs through them, and is divided towards the top into several branches, at the ends of which grow small umbels of yellow flowers, usually five together upon one stalk, with as many small leaves under each umbel; the three outermost being the largest: each flower is succeeded by two oblong striated seeds. It grows only among the corn, and flowers in June and July. The whole plant is used.

Thorow-wax is reckoned among the vulnerary plants, and is especially serviceable in green-wounds, bruises, ruptures, contusions, as, also, for old ulcers and sores, either given in powder, or the decoction. *Miller's Bot. Off.*

PERI'GRAPHE, a word usually understood to express a careless or inaccurate delineation of any thing: but in Vesalius it is used to express the white-lines or impressions that appear in the musculus rectus of the abdomen.

Fistula of the PE'RINÆUM. — Sometimes, after the operation of lithotomy, or after a puncture of the Perinæum or bladder, or from an abscess in the Perinæum near the urethra, or from a scirrhus in the glandula prostata, or when, by the bad habit of the patient, a wound or ulcer can by no means be healed, but its lips become callous, a fistula is formed, through which the urine is preternaturally discharged with great uneasiness to the patient. These fistulas are sometimes generated in the Perinæum by malignant abscesses, which spread amongst the fat under the skin, to the intestinum rectum and scrotum, the urethra remaining entire; but these cannot be called urinary fistulas, because no urine is discharged by them. The urinary fistulas are often occasioned by the use of tents, or pipes, which have been too long retained in the wound after extracting the stone; or when the Perinæum has been greatly distended, lacerated, or burst, by a large rough stone; or when, by the obstruction of a stone in the urethra, the acrimony of the urine corrodes the adjacent parts, and at last the skin, especially if the patient be of an ill habit of body.

The cure of this fistula varies according to the habit of the patient, and the degree of this disorder. When the fistula is large, and has consumed a great part of the urethra, and the patient is of an ill habit and weak, a cure is not without great difficulty, and very seldom, obtained; and, the more callous, or inveterate, the fistula is grown, the harder is the task to remove it. On the other hand, if the fistula is small, and not much indurated, if the patient is young, and of a good habit, the cure may proceed with ease and expedition. But, if a scirrhus is produced in the prostate glands, before a cure can be effected, the scirrhus must first be removed, which I have learned by experience to be a most difficult task.

There are four methods of treating these fistulas: First, the tent-pipe, or whatever is contained in the wound, which occasioned the fistula, must be immediately removed. Then, the patient must be laid upon the bed, or a seat, in the same position as is required for performing the operation of lithotomy; and the indurated sides of the fistula must be extirpated with great dexterity. After the application of a vulnerary balsam, or powder, the lips of the wound must be brought into contact by an adhering plaister; and over it should be laid a narrow compress on each side of the wound, and the whole must be secured with a tight bandage. After the operation, the patient should be confined to his bed, with his knees tied together, and strictly injoined to abstain from motion, that the lips of the wound may more easily coalesce. For a few days a very little drink must be allowed him, that he may not often be excited to make water. The dressings ought not to be renewed till the second or third day, or as long as the patient can contain his urine. The wound being, by these means, almost conglutinated, the patient may be treated in the same manner, as if he had been cut for the stone; and, if he has youth in his favour, he may begin to walk about gently, and by degrees. Thus, if the fistula is not malignant, he may be restored to his former health. Secondly, another method of cure is, by consuming the indurated or callous lips of the fistula with corrosive medicines; and, after removing the escar with basilicon, or digestive ointment, the wound may be conglutinated by a vulnerary balsam, and adhesive plaister, as before. The most proper corrosives in this case are, the troches of red lead, the lapis causticus, or infernalis, or white precipitate mixed with Arcæus's balsam; or, in a recent fistula, a piece of blistering-plaister, according to Cheselden's method, as we are told by Douglas, in the Appendix to his History of the lateral operation.

It is to be observed, that the cure of these fistulas sometimes advances slowly, especially if the orifice be wide; if the callous parts are not totally extirpated or consumed; and if the patient cannot sufficiently refrain from motion, or observe a proper diet. If from these, or the like causes, the fistula is not removed, but begins to renew its callosity, the operation must be repeated, till the parts appear sound. Thirdly, sometimes these fistulas may be cured, by bringing the lips of the bleeding wound, after the callous part is cut off, into contact with a proper suture of two or more stitches. The dressings may be those before directed; and, as the lips of the wound appear to conglutinate, the threads may be cut and extracted. Fourthly, it may be sometimes necessary, during the cure, to keep a catheter in the bladder and urethra, by which the urine may be discharged, and its course turned from the wound, the conglutination of which it would greatly obstruct. If the orifice of the fistula be too small to admit of those methods, it may be dilated with a sponge-tent, or enlarged by incision.

I shall only mention another way of treating these fistulas, which is called the palliative method. For this purpose is the instrument described by Nuck and Solingen, and proposed by Winslow, which, while the fistula is compressed, and closed by it, prevents the efflux of the urine that way; and thus the disorder, when a perfect cure cannot be obtained, may at least be mitigated. But experience informs us, that this is not to be depended upon, as the urine easily escapes through it, and it is troublesome to the patient. *Heister. Chirurg.*

PERISTERI'TES, *the pigeon stone*, in natural history, a name given by some whimsical people to an odd conformation of a pebble, which they suppose to represent very exactly a pigeon without its wings. It seems to have been a mere lusus naturæ, in the formation of a common pebble.

PERITE'RE, in architecture, a place encompassed round with columns, and with a kind of wings about it. Here the pillars stand without, whereas in the peristyle they stand within.

PE'RIWINKLE, in natural history, the English name of a species of shells, called by authors buccina. See BUCCINUM.

PEROQUE'TTE, in zoology, the name of a small species of the psittacus or parrot kind, with a long tail.

PE'RSIAN *Wheel* (*Dict.*)—A machine better adapted to the use of raising water for the use of lands than that called the Persian wheel given in the Dictionary, under the article WATER *Works*, and will be farther in the Supplement. See WATER *Works*, Dictionary and Supplement.

PE'RSICA, *the peach-tree*. See the article PEACH.

PERSICA *terra*, in natural history, an earth of the ochre kind, known

known in the colour ſhops of London by the name of Indian red.

It is a very fine purple ochre, of a conſiderably compact texture, and great weight; while in the earth it is of a pure blood colour, and it is not to be cut with the ſpade, but is dug with iron crows, and falls in irregular maſſes. It is of a rough duſty ſurface, and full of conſiderably large glittering particles: theſe are white, and of a fine luſtre. It adheres firmly to the tongue, is rough and harſh to the touch, ſtains the hands very deeply, and is of a rough aſtringent taſte, and makes a very violent effervescence with acid menſtruums.

PERSICA'RIA, *ſpotted arſmart*, in botany, a genus of plants, whoſe characters are:

The flowers are diſpoſed in ſpikes, at the top of the ſtalks and branches: the calyx is quadrifid, though ſome take it for a tetrapetaloidal flower: the ſtamina are ſix in number: the ovary, in the center of the calyx, is compreſſed, of an oval or orbicular form, and furniſhed with a bifid fimbriated tube: the ſeed is flat, and ovally acuminated. A membrane ſurrounds the ſtalk, at the riſe of the leaves, and ſmall branches, oppoſite to the leaves.

PERSICARIA *urens*, lake-weed, arſmart, or water-pepper. — This ſpecies of arſmart grows not ſo much branched as the Perſicaria mitis maculoſa; the leaves are long, and proportionably narrower, and more like the leaves of the peach-tree, whence it takes its name Perſicaria; but they are not ſerrated about the edges, and they want the ſpot that is in the leaves of the mild arſmart, and they have a very hot biting taſte, burning the tongue like pepper. The flowers grow in long ſlender looſe ſpikes, of a paler colour than the Perſicaria mitis maculoſa, but containing like ſeed: it grows in like places with that, and flowers about the ſame time.

This has been accounted an extraordinary plant againſt the ſtone, Mr. Boyle having, in his book of the Uſefulneſs of experimental Philoſophy, given to the diſtilled water of this plant a mighty character for its virtues againſt that diſtemper. It is commended, alſo, as very cleanſing, and good for old ſtubborn ulcers.

PE'TIOLE, *petiolum*, among botaniſts, expreſſes that ſtalk which ſupports the leaves of a plant, as the peduncle does the fructifications.

Some uſe the word petiolum to denote the whole middle rib of a leaf of any plant, which is the ſtrongeſt part of it, and runs from the ſtalk by which the leaf adheres to the tree or plant to its extremity, and from which the lateral fibres, or nerves, as they are uſually called, commonly ariſe.

PETASI'TES, *butter-bur*, in botany, a genus of plants, whoſe characters are:

The root is large and perennial; the leaves are grey, large, and orbicular. The calyx is cylindrical, multifid, ſquamous, and contains many floſcules collected into a flower. The flowers are diſpoſed in a thyrſus, and appear before the leaves; and the ovaries are furniſhed with a tube, which has a clavated bifid apex.

The roots of butter-bur are ſudorific, alexipharmic, and good for all kinds of fevers, and malignant, infectious, and peſtilential diſtempers; they are cordial, preventing fainting and ſhortneſs of breath; they likewiſe provoke urine, and are accounted good to deſtroy joint-worms. They are outwardly applied, in the form of a cataplaſm, to peſtilential buboes and plague-trees; a great quantity of them are put into the aqua theriacalis. *Miller's Bot. Off.*

PE'TROL (*Dict.*) — In Broſely, Bently, Pitchford, and other places adjacent in Shropſhire, there lies over moſt of the coal-pits, or mines, a ſtratum or layer, of a blackiſh rock, or ſtone, of ſome thickneſs, which is porous, and contains great quantities of bituminous matter.

This ſtone, being brought to the workhouſe, is ground ſmall by horſe-mills, ſuch as are uſed for grinding flints, to make glaſs of; the powder is thrown into great coppers of water, where, by boiling, the bituminous matter is ſeparated from the ſtony, or gritty, this laſt ſticking to the bottom, the other ſwimming at the top.

This bituminous ſubſtance, being gathered together and evaporated, comes to the conſiſtence of pitch, and with the help of an oil diſtilled from the ſame ſtone, and mixed with the pitch, comes to be thinner, or like tar; the uſes of both which materials, either for ſhipping, or otherwiſe, theſe ſubſtances are ſaid to ſupply, or even to excel. This has been tried on ſeveral boats, and it does not crack, like the ordinary pitch or tar, but always keeps black or ſoft; and therefore is propoſed to hinder the worms from getting into the ſhips pitched with it.

There is, likewiſe, diſtilled from this ſtone an oil, which may be uſed for oil of petre, or turpentine, and has been tried in aches and pains. *Philoſophical Tranſactions.*

PE'TUNTSE, as it is uſually called PETUNSE, one of the two earths, or foſſil ſubſtances, of which the porcelain ware of China is made. The other is named kaolin. See KAOLIN. The Petuntſe is ſprinkled all over with bright glittering particles. It is beat into powder, and afterwards made up into a ſort of bricks, and in that form it is ſent to the places where it is to be wrought. It is of a hard texture, and of a ſomewhat greeniſh colour. Mr. Reaumur, of the Academy of Sciences of Paris, who was extremely induſtrious in ſearching into the nature of porcelain, obtained ſome ſpecimens of the Petuntſe, both in its native ſtate, and in form of the brick, which is given it after it is powdered and reduced to a paſte.

Mr. Reaumur found that the Petuntſe was ſo far from being an earth, as uſually ſuppoſed, that it was truly of the nature of the European flint or pebble, as he eſtabliſhes the character of that body: but, to underſtand this rightly, it is to be obſerved, that this author makes the flints and pebbles a very large claſs of bodies, ſome of which are more, ſome leſs tranſparent; and that this Petuntſe is of the nature of the coarſer, or leſs tranſparent kind, the ſurface of which, when broken, is not ſo ſmooth and poliſhed as that of the ordinary flint. The great character of theſe ſtones for the porcelain manufactures is, however, that they are very eaſily vitrified, without the aſſiſtance of any ſalt, and without the immediate contact of the fire, the operation ſucceeding in a crucible; which is not at all the caſe in regard to the European flint, they very differently melting alone in a crucible, and then only into a whitiſh opake glaſs.

It being certain from hence, that one of the two ingredients of the China ware is eaſily vitrifiable, it follows, from the experiment of the whole mixture, or China ware not being reducible into glaſs in a large fire, that it is a compoſition of a vitrifiable and a not vitrifiable (or at leaſt not eaſily vitrifiable) ſubſtance; and conſequently, that the kaolin is a ſcarce vitrifiable body, and that the reſult of the action of fire, on a mixture of theſe two, is a ſemivitrification; which is what we call the China ware.

If we, therefore, could, in Europe, provide the materials of China, or ſuch as were like them, we might reaſonably hope to ſucceed; and this appears far from improbable. The Petuntſe is eaſily ſupplied by many of our own earths, ſtones, and ſands, as nothing is required in it more than a property of running eaſily into a white glaſs. The kaolin ſeems moſt to be reſembled by our European talcs. *Mem. Acad. Par.* 1727.

PEUCEDA'NUM, *hog's-fennel*, in botany, a genus of plants, whoſe characters are:

The root is perennial, deeply ſunk, and hairy. The leaves are winged, narrow, graſſy, and divided into three parts. The ſeed is flat, almoſt oval, ſlightly ſtriated and marginated.

Hog-fennel is accounted good to clear the lungs of tough viſcid phlegm, and thereby to help old coughs and ſhortneſs of breath; it likewiſe opens obſtructions of the liver and ſpleen, and helps the jaundice; it likewiſe provokes the menſes, and gives eaſe in labour-pains; the juice, ſnuffed up the head, is commended by the ancients, againſt the lethargy, apoplexy, epilepſy, and other diſorders of the head and nerves. *Miller's Bot. Off.*

PE'WIT, in zoology, the Engliſh name of a common bird of the larus, or ſea gull kind, called by ſome authors larus cinereus, and by others cepphus, and, in ſome of the counties of England, the black cap and ſea crow.

It is about the ſize of a pigeon. Its beak is red, its head and throat of a greyiſh black, and its neck, tail, breaſt, and belly white; the middle of its back grey. It has its Engliſh name from its note, which ſeems to expreſs the word Pewit. It is affirmed by many, that the head of this bird is only black at a certain ſeaſon of the year. *Ray's Ornithol.*

PHAGEDE'NIC *Water* (*Dict.*) — This lime-water, to every pint of which twenty or thirty grains of ſublimate have been added, is a great deterger of foul wounds, ulcers, and other ſtuborn diſorders.

PHALA'NGOSIS, in ſurgery, the name of a tumor and relaxation of the eye-lids, which is often ſo great as to deform the eye, and very much impede viſion. Sometimes, the relaxed eye-lid ſubſides or ſinks down, occaſioned either by a palſy of the muſcles which ſuſtain and elevate the eye-lid, or elſe from a relaxation of the cutis above, from various cauſes. Sometimes, alſo, an œdematous or aqueous tumor is formed on the eye-lids, ſo as almoſt entirely to exclude viſion; but this laſt caſe ſhould be well diſtinguiſhed from the other, and may be remedied without much difficulty, by the uſe of internal and topical medicines; ſuch as purges and diuretics, given inwardly, and a compreſs dipped in warm ſpirit of wine and lime-water.

But, in the paralytic or relaxed caſe, the uſe of cordial and nervous medicines muſt be propoſed internally, and outwardly balſam of Peru and Hungary-water are to be employed. If all theſe fail, the remaining method is to extirpate a ſufficient quantity of the relaxed cutis; and then, after healing up the wound, the remainder will be ſufficiently ſhortened. *Heiſter's Surgery.*

PHALE'NÆ, in natural hiſtory, the name by which authors diſtinguiſh thoſe butter-flies which fly by night, and which the French thence call papilions nocturnes, and we vulgarly moths.

All the creatures of this claſs are quiet by day, remaining fixed to the ſtalks or leaves of plants, except only ſome of the males, which are now and then found fluttering about in the woods in ſearch of the females; but, as ſoon as night approaches, they all fly about. This diſpoſition is very remarkably implanted in their nature; for, when kept ſhut up in boxes, they always remain quiet without changing place all day, but as ſoon as the ſun is about ſetting, they always begin to flutter about, and fly

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as much as their prison will permit them. The species of these are more numerous even than those of the day butterflies. The day kinds all have trunks fitted for sucking the juices of flowers for their nourishment, but many of the Phalenæ wholly want them: these, however, have always the beards which serve to defend the trunk from injuries in the day flies, and sometimes, in the place of the trunk within these, there is found a small white protuberance or two. It is certain, therefore, that many of the Phalenæ have no organs of eating, nor take in any food during their whole lives in that winged state. *Reaumur Hist. of Inf.*

PHARMACOCHE'MIA, a term used to express that part of the chemical art which treats of the preparation of medicines. It is thus called by way of distinction from that chemistry which is wholly employed about the transmutation of metals by means of the philosopher's stone; this being called spagiricochemia.

PHEA'SANT, in ornithology, a bird so nearly allied to our common poultry, that it would naturally appear a very easy thing to breed them up from young; but the proper food of them is not sufficiently enquired into. Though they eat corn when full grown and in health, yet they have recourse in their young state, and when sick, to another sort of food, preying on several insects, and that in a very voracious manner.

The young Pheasants and partridges prey upon ants; and they will never succeed with us, if they have not a proper quantity of ants to have recourse to, as soon as they leave their roost in a morning. When musty corn, or want of due care in cleaning their houses, has made them sick, a repast of ants will often recover them. When that fails, they may be offered millepedes or earwigs, or both together, which will always do much better than either singly. To this medicine must be added a proper care that their common food of corn be very sweet, their habitation kept nicely clean, and their water shifted twice a day. They must not be let out of the house in a morning till the dew is off the ground; and after sun-set they must be immediately taken in again: in the heat of the day they must be allowed to bask in the sun in a dry sandy place. With these regulations the birds of this kind will succeed much better than they usually do. The Pheasant is a bird of a sullen disposition, and, when the coupling time is over, there are seldom found more than one in a place. *Philos. Trans.* N°. 23.

PHILADE'LPHIA-*stones*, a name given by some authors to what are called by others Christians bones, found in the walls of that city. It is a common error, that these walls are built of bones, and the tradition of the country is, that, when the Turks took the place, they fortified it for themselves, and built their walls of the bones of the Christians whom they killed there. Dr. Smyth, in one of his epistles, mentions this wall as an instance of the Turkish barbarity; but this is an idle opinion, what passes for bone being only a loose and porous stone of the sparry kind, found in an old aquæduct which is still in the wall. Sir Paul Rycaut brought home pieces of these stones, which he also supposed to have been bones; but on examination they proved to be no other than various bodies, chiefly vegetable, incrusted over and preserved in a spar of the nature of that which forms incrustations in Knaresborough spring, and other places with us. These bodies are often cemented together in great numbers by this matter, and their true shape lost in the congeries, till a diligent and judicious eye traces them regularly. *Woodw. Cat. of Foss.* N°. 2.

PHILOME'LA, *the nightingale*, in zoology, the name of a small bird, famous for his singing.

The nightingale has from all antiquity been allowed the first rank among song birds. He is somewhat less, though longer than a sparrow; far from a beautiful bird, and weighs hardly an ounce. His bill is long and flexible, of a darkish colour; and, when opened, discovers a wide orange-coloured throat. The eyes are full and lively; the feathers of the head, neck, and back fallow; the wings, and especially the tail, somewhat brighter; the throat, breast, and belly of a light ash colour; the legs long, and the claws slender. The hen much resembles the cock, but is a little more upon the ash colour, as are also the young ones. This bird affects solitude, is wild and timorous, and it seems the effect of this natural fearfulness that he often jerks his tail. The most celebrated authors on birds mention no more than one species of nightingales, but the fanciers tell us of no less than three; First, the mountain nightingale, being the smallest of all. Secondly, the middle-sized field nightingale. Thirdly, the water nightingale, which frequents the banks of rivers, and is the biggest, stoutest, and best songster; for that will sing eight months in the year, whereas the others sing no more than three at most. However, the best connoisseurs hold that there is but one species of nightingale, in which there is a variety of size, shape, and colour, as in the gold-finch, and more especially in the canary-bird.

The ordinary resort of the nightingale is the side of some hill, or brook, especially if near an echo: there he most delights to sing, and interrupts his warblings by short pauses, as, if listening and making responses to the echo of his own voice. Hence, few circumstances of place can suit this songster, and, when he quits these, you may be sure he leaves off his singing at the same time; and, when he visits them again, it is as certain that you will again hear him. I have observed, that of these favourite places he prefers that which has the advantage of an echo, and best favours his ambition of being heard by his hen, and every rural animal, as well as mankind; and, in case he repairs to any other, it is only to avoid the wind that then blows, especially a northern one, which is most disagreeable to him. Whilst the hen is laying her eggs, and more especially when she sits, then it is that the male utters his most beautiful notes, and night and day redoubles the energy of his song, to divert and comfort his female for the pains of laying, and the fatigue of sitting. Accordingly, it is remarkable that he then chuses some convenient place in the neighbourhood of the nest. Sometimes he pitches upon a place fit to answer all his several intentions, of hearing his echo, attending upon his female, and keeping an eye upon passengers, and then you will hear him incessantly in his song.

The nightingale usually builds his nest near the ground among briars, in box or yew-trees, at the foot of an hedge or bush; and for this reason many layters of eggs come to ruin, being devoured by dogs, foxes, polecats, weasles, &c. The nest is pretty long and deep, consisting chiefly of dry oak leaves, and holds very well together, provided it be not moved, for it will fall asunder upon a touch. It is assured that the nightingale will in hot countries produce four layters of eggs a year; in this country but three at most, and the third seldom comes to good, on account of the cold beginning to set in. They commonly lay four or five eggs, which look as if they were bronzed over, and from whence are generally hatched more cocks than hens. In order to find a nest, it will be proper to go in the morning at sun-rise, or in the evening towards sun-set, near the place where the cock has been heard to sing, which most commonly is not a great way from the nest; there you are to remain still, and without making the least noise, and in a short time you will perceive whereabouts the nest is, by the coming and going of the cock and hen, and by the chirping of the young ones.

The right time for catching nightingales is the whole month of April, and, the sooner they are caught after their arrival, the longer they continue in song. Those taken in May, being already paired, must be caged a long while before they can be brought to sing, and then their music is short and trifling. From sun-rising to ten in the morning are the best hours for catching them, for after fasting the night they are eager for food, and greedily seize a meal-worm. In a wood it is easy to make choice of that nightingale which has the finest song; for, if the wood be of such extent as to feed four nightingales and their families, these four place themselves at the four corners of the wood, and seldom and never invade each other's bounds. The evening before you set your trap, you must go to the wood they frequent, and mark the places where you hear them; then take a twig, about a foot long, sharpened at one end, a slit at the other, so as to hold a couple of meal-worms spitted upon a pin: stick it up in the ground, about twenty or thirty paces from the place you hear the bird sing, so that he may easily espy it, and turn up the earth round it; and this do wherever you hear a nightingale. Next morning repair to the place where you planted your twigs, and, if you find that the baits have been eaten, you need not doubt but the nightingale will soon return, in expectation of a fresh supply. You are therefore to set your trap near the twig, in as private a place as possible, but so as to leave him a full view of the meal-worms, and turn up the fresh mould, which will invite the nightingale, in hopes of meeting with worms, ants, or other insects, his ordinary food If he should espy you placing the trap, you may depend upon his coming to it soon after you are retired; and, if he should be gone to some other of his favourite places, you need only find him out by his song, and throw a stone at him, which will infallibly send him to his former station. When he is caught in the trap, you must seize him cautiously by his legs, and disengage him from the net, slipping him immediately into a little silk purse, at least six inches long, and two wide, taking all possible care not to rumple his wings or tail, which would considerably retard his singing. I know a fancier, who, to avoid the inconveniency of a net, in which the bird attempting to escape is apt to entangle himself, makes use of a piece of thin green silk, of which he is no more shy than of a net; and thus the feathers are secured from the least damage. On your return home, you are to fix a cage on the outside of your window, which is to remain there the nightingale's whole singing season, wherein you must place his meat and drink, as will be hereafter described. The wires of the cage must be quite covered with a piece of green serge, or cloth, so as to exclude the light. It is absolutely necessary that this cage should be exposed to the east, as much as possible. The heat of the south fatigues the bird, and hinders his singing, and, besides, so dries him up, that he will be apt to turn blind in a few months.

The cage, placed as above directed, must be sheltered from the rain, and the heat of the sun, by an umbrella, or boarded shed. Some set it upon a small table within the window, but then the casement must be left open night and day, and nobody must come into the room, but the person that is to take care of the bird, who must give him his meat and drink as softly as possible, and without jarring his cage. Under such management, a nightingale, newly taken, will sometimes begin to sing in three

three days, but never exceeds eight, provided he was caught before May. In the cage must be placed two small cups, one with water, in which you must put three or four meal-worms, which the nightingale will soon find out; in the other you must put between twenty and thirty meal-worms for his food at first. In caging the nightingale, you must open that end of the purse next the head, and slide him out gently, and, when he is halfway out, you must make him swallow a few drops of water to refresh him, by dipping his beak again and again into the water; when you may let him slip out of the purse into his cage, presently closing the door. The bird will continue sullen for some time under his new confinement, but the meal-worms will soon revive his spirits, and make him forget his loss of liberty. About four hours after caging the bird, it will be proper to visit him, and, softly opening the door of the cage, take out the meal-worm cup to put in twenty fresh worms, and at the same time the bottom of the cup should be covered with a little of the paste I shall hereafter describe, which is to be his constant food. About seven in the evening, visit him again, and give him twenty-five more worms, some of which should be cut in two, that the paste may cling to them, which the nightingale swallowing, will be insensibly brought to like it. The next day give him twenty-five more at eight in the morning, as many at noon, and also at seven in the evening, all cut in two, and mixed with a little of the paste. Be very careful not to stir the cage, which will make the bird wild, nor must you ever suffer him to see you. Do the like the third day, only now cut the worms in three or four pieces, to mix the better with the paste. So you are to go on for three weeks, when you may lessen gradually the number of the meal-worms, and increase the quantity of the paste, and this as you find he relishes it; for some will take to it sooner than others, and it is no small advantage to have a nightingale soon reconcileable to this sort of meat, for it makes him very stout, and continues him long in his song. If you can easily procure meal-worms, it will be proper to give your bird ten or fifteen three times a day, the whole singing season. But you must remember not to put them at first into a transparent glass cup, by which misconduct many have lost their birds in three days, without knowing that the bird, seeing the worms through the sides of the cup, endeavours in vain to seize them, and so is starved to death. It may seem surprising that to make a nightingale sing you must darken him up on all sides, whereas all other birds are quite mute under this circumstance; but experience has shewn that this little creature is so extremely timorous, that every thing he sees is a new object of terror, which sets him a fluttering till he kills or maims himself against the wires of the cage; but, when kept without light, he consoles himself very well with eating and drinking.

The trap, commonly used in England, Mr. Ward describes to consist of a board about the bigness of a round trencher, a spring and a wire as round as the trencher, with a green silk net fastened to it; there is a little cork that comes through with a string, and keeps up the trap; on the cork is pinned a meal-worm, and, when the bird pulls the worm, the trap falls.

Of breeding nightingales. — Towards the end of the spring, which is the time of their last laying, catch a pair of old birds. To which purpose find a nest, as was before directed; then set two traps baited with meal-worms, very near the nest, thus you will soon have both cock and hen; when you have brought them home along with the nest and young ones, you are to put them altogether in a dark closet where not the least light can penetrate. Their meat and drink must be placed near them in two china cups, and in a third about fifty meal-worms; and, every day at the same hours, you must do as has been prescribed for nightingales newly taken: and thus you will soon have the satisfaction of seeing the cock and hen fetch the meat and meal-worms to feed their young; their meat should be one half bread, the other bruised hempseed, and minced boiled beef, with a little parsley, and now and then some yolk of egg boiled hard; or the paste which I shall hereafter describe, mixed with equal parts of raw sheep's heart, or beef finely minced, first, clearing away very carefully all the skin, fat, and sinews. The affection these creatures have for their young ones causes them, without a moment's regret of their lost liberty, immediately to set about nursing them up in their prison. As soon as they can feed themselves, you may put the cock and hen in two separate cages, where they are to be kept the whole winter till the next spring. But, in case the eggs should not be hatched when you take the old ones, you must be content with the birds only, which you are to keep separate, as I have said, but in the same dark closet where you purpose they shall lay eggs the next spring, that so they may be used to the place, for which end you may sometimes suffer them to get out of their cages; and thus you will have a pair of nightingales prepared in every respect for home breeding at the proper season.

The next year about the beginning of April, open the cages for the whole season, and about the closet scatter dry oak leaves, picked dog's grass, and deer's hair, with one or two old nightingale's nests. In the corner of the closet near the window, stick fast two or three branches of slender dry twigs, tied slightly together, letting the lower end rest on the floor. Then take some handfuls of the oak leaves and stuff them among the twigs, leaving open the passage where your hand went in, for an entrance to the nightingales; you must likewise place near at hand a small wooden tray full of ordinary garden mould, and a small shallow earthen pan of water for them to bathe themselves in, which should be renewed every day. This pan however must be taken away when the hen sits. The situation of the closet should be towards the south, so as to be exposed as much as may be to the sun-shine, and skreened from the north-wind. I have known persons of curious taste inclose a pair of nightingales in a grand aviary, or cage built on purpose, in a proper corner of a garden, and surrounded with little yew-trees, maples, and liliacs, where they built their nest and brought up their young as well as in the open country.

With the above precautions you will find the œconomy of our nightingales very diverting. And, if the closet looks into a garden, you may safely venture to take out a pane of the window glass, and leave the old ones at liberty to go out and return, which they will not fail to do, whilst their young ones are incapable of feeding themselves. At first, it will be best not to trust them both out together, but the cock by himself, and then the hen by herself, and at last both together; observe too, that the hole they pass through should be as near the nest as may be. By this management, you will have the pleasure of hearing the cock sing almost continually day and night in your garden, whilst the hen is sitting; and they will have the opportunity of procuring a thousand little insects, after the eggs are hatched, wherewith to feed their young. You must be cautious of visiting the closet too often, especially whilst you allow them the liberty of the garden, and it should be the business of only one person to look after them, which will make them the more familiar. But it is necessary, above all, that neither dog, cat, mouse, or rat, should ever disturb them, for any of these would infalliably drive them away so as never to return again.

How to bring up your nightingales without the cock or hen. You must get a nest of the first layter, as being ever the most stout and vigorous birds, and consequently the best singers, and the least liable to fail in their moulting. The nest should not be taken till the birds are pretty strong, and, when taken, should be carried home in a dark basket, with only a few breathing-holes. To feed them properly is a delicate point, to give them too much or too little is equally dangerous. Their gaping wide is no indication that they want meat, for this they will do whenever you come nigh them, or touch their nest; provided you understood well their language, their cry would be the most significant token; but, if you do not, it will be best to observe the following directions. About half an hour after sun-rising, give them their first feed, the second an hour after, and so on by the hour till sun-set; the last feed should be somewhat more plentiful than the rest. They should be fed with a skewer flatted at the end; give them but four mouthfuls at a time, though they would take more, even to bursting; be sure likewise not to mistake one for another, else some may be starved and others over-crammed. At a month's end, or sooner, if they are of the first layter, they will be able to feed themselves, which you may know by presenting a small meal-worm to them; you may then separate them in different cages. The young ones being so far brought up, you may, for perfecting their song, carry them into the country to hear the old nightingales sing, otherwise they will scarce answer the trouble which has been taken about them; at least, you must wait a long while before they will be able to entertain you to your liking. I know a fancier who has been these twenty years bringing up nightingales from the feeding stick, of which he always has a large stock by him; some of them he had twelve years, and may be called tolerably good, but no ways equal to those bred in the country. This is however an easier way for such as are already provided with old nightingales taken with the trap, and kept a whole year or more. Take a nest of young ones, and place them in the same chamber with an old nightingale. Begin feeding the young ones with the stick, and leave the old one's cage open day and night, taking care to place a small pot of the young ones meat, that is, the paste mixed with minced beef or mutton, close to his own feeding trough. This done, if you suffer the young ones to cry a little while before you proceed to feed them, you will soon perceive the old bird to go out of his cage, chirp to the young ones, fill his bill with their paste, and feed them. When, therefore, at your morning visit, you find that he has been distributing meat to the young ones, you may trust that business to him entirely, for he will feed them till they can feed themselves: or you may afterwards have the pleasure of seeing them eat with him at the same pot, and follow him into his cage. Put them into separate cages. If you pursue this method, as I have done, with success, and may be practised on various other birds, as sparrows and gold-finches, you may spare yourself the pains of attending your young nightingales, which requires a deal of time and fatigue. The old bird will take as good or better care of them than you can, and, besides, will teach them their song.

I will add, that, if you chuse this way of bringing them up, it will be best to provide yourself with a hen, and keep her a whole

whole year in a cage, in order to be a nurfe, under which management fhe never fails to prove one; whereas a cock often fails in this point of duty, nor does he ever fing as long as he is engaged in it.

Of the time and manner of teaching young nightingales tunes by whiftling, or the flageolet.

When you perceive, by the chirping of a young one, that he is a cock, put him into a cage covered with green ferge; and let him hang in a chamber quite out of the hearing of nightingales, as well as of all other birds. For the firft week let him be kept near the window, or the lighteft part of the room; then remove him by degrees backward to the darkeft part, where he muft remain all the time of his learning, nor muft he be annoyed or diverted by any kind of noife whatever, nor difturbed by people's coming near him. His tune fhould not be whiftled or piped to him too often; half a dozen leffons a day will be fully fufficient, two in the morning, two at noon, and as many in the evening. Two feveral tunes are enough for one bird. The flageolet fhould be of the fofteft and mellowelt tone, and not of too high a pitch. I muft again infift upon the neceffity of keeping a young nightingale apart, as foon as he is able to feed, if your intention be to learn him a tune. And another thing I am to admonifh the reader of, that notwithftanding he has kept conftantly whiftling or piping to his bird, even to his moulting time, without having any thing from him in return, more than a little chirping, yet this fhould not difcourage him. The bird's voice is feldom formed before the enfuing fpring, and therefore his leffons fhould be continued without intermiffion. When that feafon arrives, you will find to your equal furprize and delight, that your fcholar has not forgotten his inftructions. I have known it happen, that when the piping has been neglected at the autumn and winter, out of mere defpair, the nightingale has notwithftanding of his own accord ftruck into his tune, and gone through a great part of it at the beginning of the fpring.

How to have finging nightingales all the year.

About the beginning of December put an old cock into the blind cage, then fhut him up in a clofet, which you muft darken by degrees, fo that not a ray of light can enter, till June, when you may gradually let in the light. In this month, as others ceafe, he will begin to fing. Then you are to put another old cock in a light cage, and keep him in the dark till December, and as much as poffible from hearing the finging of the other, and comfort him with a little wood fire in the chimney of the room during the cold of the winter, all which feafon he will likewife fing.

But if you would bring a nightingale to an almoft conftant fong, by blinding him, you muft proceed thus: keep him in the blind cage a whole year, then take the bird in your hand, and clofe up his eyelids thus: break off the bole of a tobacco-pipe, and, having heated the thick end of the ftem red-hot, bring it near the bird's eye, and blow through it, which will caufe him to fhut it, and a glutinous tear will iffue, which will perfectly clofe it up, without any farther inconvenience to your bird; a dexterous operator will eafily do this without at all fcorching of the eye-ball, for, though the anguifh would not kill him, yet he would be a good while in recovering, befides being disfigured; whereas, if proper care be taken, you may reftore his fight by feparating the eye-lids with the fine point of a pen-knife.

As foon as the bird is blinded, make him fwallow a drop of water, then put him in his cage in the fame dark room, keep him till the forenefs of his eyes be gone off, which ufually is in a week or ten days; then let in the light upon him by degrees.

How to make nightingales refort to places unfrequented by them.

In the month of May find a neft of the firft layter, but do not take it till the young ones are at leaft a week old; then go early in the morning, and fet two traps, baited with meal-worms, near the neft, fo you will eafily get the father and mother in your poffeffion in lefs than an hour; as foon as you have caught them, put them in feparate filk bags, and fo bring them to the place where you defign to fix them. Take alfo with you two fmall fquare cages covered with thick green ferge, without wires or perches. In taking the neft, do not feparate it from the branches that fupport it, but cut them off, and bring away the neft and them together; and it will be beft to remove the whole tree, if it be a fmall one; when you have brought it to your intended place, plant it in the fame afpect as before; the neft fhould be covered with wool or cotton in the tranfporting, to keep the young ones from getting out or taking cold. Having fixed the neft, place the two cages with an old one in each, fo that the neft may be between them at twenty or thirty paces diftance, and let the doors of the cages be turned towards the neft. To each door muft be faftened a thread forty or fifty yards long, whofe ends you muft hold together in your hands, and, concealing yourfelf behind fome tree or hedge, pull open the doors and fuffer the old ones to efcape from their cages with the following precautions. Let the young ones grow hungry and chirp for their food before you let the old ones efcape, who then will readily find them: releafe the hen firft, and, fome little while after, the cock; then carry off the cages as quietly as you can, and come no more there that day. Thus from your window you may entertain yourfelf with the pleafure of feeing the old ones bring up their young, which will, themfelves, be fure to breed upon the fame fpot the next year.

Of the tokens of health and ficknefs in nightingales, and how to cure them.

A nightingale may be looked upon to be in a good ftate of health: 1. If he fings much. 2. If he often feathers himfelf. 3. If he be brifk and alert, and jerks his wings much. 4. If he roofts on one leg only, and is greedy of meal-worms. On the contrary, when a nightingale fleeps on his belly in the bottom of the cage, it is a fign he is either fick or fullen, provided his feet are not baked up and difabled with his dung, in which cafe a little warm water in a faucer, placed in his cage, foon relieves him. Sometimes a little impofthume forms on the bird's rump, which fhould be fnipped with the point of a pair of fciffars, and the matter fqueefed out, giving him a few meal-worms to cherifh him, or a fpider or two, which never fhould be omitted at the beginning of March, be he fick or well. If he grows lean through much finging, mix poppy feeds in his meat. When his fong and moulting are over, he is apt to grow too fat, therefore the poppy feeds muft then be left out. If he be very lean, feed him with raw fheep's heart well cleared of all its fkin and fat, minced very fmall and mixed with an equal quantity of the pafte hereafter defcribed. If he is bound up, give him four or five meal-worms, and, if he dungs too loofe and often, fheep's heart and poppy feeds will bring him to rights. The cramp often afflicts him, which, if it once attacks a young one, it is fure to kill him; in old ones, it generally arifes from too much expofure to the cold, and a warmer place is the remedy. There is an odd diforder to which this bird is very liable, it may be called the falling ficknefs. After a few precipitate motions he fhall drop from his perch on his back at once, with his legs ftretched upwards, and his eyes diftorted, when, without fpeedy relief, he foon breathes his laft. The only method is to take him, and, with a pair of fciffars, cut off the hind claws fo near the heel as to draw a drop or two of blood; then wafh his feet in white wine, of which if he does not foon revive, make him fwallow a drop worm, and he will be quite reftored in an hour or two. To conclude, if you would fecure a nightingale in a healthy conftitution, do not fail in the month of March to purge him with half a dozen black fpiders, one every day.

Of the proper food for nightingales.

There is not perhaps a bird eafier to feed than a nightingale; all meat agrees with him, provided it be mixed with flefh, without which he will not be nourifhed. He is naturally carnivorous, and lives on fpiders, wood-lice, ants eggs, flies, and feveral forts of worms, all of them animal fubftances, which agree with his conftitution; the knowledge whereof has put many upon preparing compofitions proper to be fubftituted in the room of his natural food. The moft common of this fort in France is equal parts of bruifed hempfeed, crumbed bread, and minced boiled beef, well mixed together; this does very well for them, but it is troublefome to the feeder, as it muft be made frefh every day in fummer. I fhall therefore give the compofition of a pafte, which will keep good a long time, and what I have ufed many years with great fuccefs.

Take two pounds of lean beef ftakes, Spanifh or chick peafe hufked, millet feeds, poppy feeds, fweet almonds, of each half a pound: wheat flour two ounces; virgin honey, a pound; faffron in powder, a drachm and an half; the yolks of twelve new laid eggs; frefh butter, the quantity of a hen's egg.

Firft let the peafe and millet feeds be powdered and fifted. The poppy feeds muft be only well bruifed, becaufe their oilinefs will not admit of fifting. The beef muft be either finely minced or pounded in a marble mortar, and cleared of all fat and fkin; the almonds muft be likewife pounded after blanching in hot water, and they muft be wrought to a perfect pafte, otherwife the birds cannot digeft them. Then break the eggs and feparate the yolks into a broad earthen difh, and add the honey and the faffron. When thefe three are well mixed, incorporate therewith fucceffively the beef, almonds, meals, and flour, ftirring the whole with a wooden fpatula, till no clots remain; then turn the mixture into another glazed earthen difh, whofe infide has been rubbed over with butter. Set it on a gentle fire, ftirring it continually, efpecially the bottom, to keep it from burning; continue it on the fire till the pafte will no longer ftick to your fingers, and has acquired the ftiffnefs of a new kneaded bifcuit. This done, remove it from the fire, and let it cool in the difh. Afterwards put it into a tin box clofe covered, and keep it in a dry place for ufe.

It is not eafy to fucceed in the preparation at the firft trial; it depends on a degree of drying to be found out only by experience; when it is over dry, it lofes its fubftance, and fheep's heart muft be often mixed up with it, elfe the birds will lofe their flefh; on the other hand, if it be under dried, it will turn mouldy in keeping, if you have not a good number of birds to feed: for it is calculated at the rate of a fix months provifion for one bird. For the want of the Spanifh peafe, maize, or Turkifh corn, will do as well.

Laftly, notwithftanding I have experienced that this pafte is of itfelf fufficient to keep nightingales full in flefh, yet I am convinced that, when I mixed with it an equal quantity of fheep's heart for regaling them upon certain occafions, their fong would be ftronger and more lafting. I would therefore recommend fuch addition during the finging feafon.

PHILO'NIUM *Londinenfe*, the name by which the medicine commonly called Philonium Romanum, is called in the late London Difpenfatory. The compofition is alfo much altered, as well as the name, and is now ordered to be made thus: take white pepper, ginger, carraway-feeds, of each two ounces; opium, fix drachms; fyrup of diacodium boiled to the confiftence of honey, three times the weight of all the reft. The opium is to be diffolved in a little wine, and then mixed with the fyrup; after which the powders are to be ftirred in, and the whole made into an electuary. *Pemberton's London Difpenfatory.*

PHILOSO'PHIC *Chemiftry*, an art of dividing or refolving all the bodies in our power by means of all the inftruments that can be procured, and that as well into integrant as into conftituent parts, and joining thefe parts together again, fo as to difcover the principles, relations, and changes of bodies, make various mixtures and compofitions, find out the phyfical caufes of phyfical effects, and hence improve the ftate of natural knowledge, and the arts depending on it. *Shaw's Lectures.*

PHILO'SOPHY (*Dict.*)—Philofophy may be divided into three parts, intellectual, moral, and phyfical. The intellectual part comprifes logic and metaphyfics. The moral part contains the laws of nature and nations, ethics and politics. And, laftly, the phyfical part comprehends the doctrine of bodies, animate or inanimate. Thefe, with their various fubdivifions, will take in the whole of Philofophy.

Wolfius makes the three parts of Philofophy to be the doctrine of God, the human foul, and of bodies. However, when he fubdivides, and comes to treat the feveral branches feparately, his divifions readily come under the three heads intellectual, moral, and phyfical, before-mentioned. The doctrine of God and the human foul may be ranged under the fame head metaphyfics, the notion of the divine nature being formed from that of the human foul, excluding limitations and imperfections.

PHILOSOPHY *of the Afiatics.* All the inhabitants of Afia are either Mahometans, Pagans, or Chriftians. The Mahometan fect is the moft numerous; one part of the people which inhabit this part of the world have preferved the worfhip of idols; what few Chriftians are found among them, are fchifmatics, and only the remains of fome ancient fects, efpecially that of Neftorius. What will appear at firft moft furprifing, is yet true, that the latter are the moft ignorant, and perhaps the moft fuperftitious people in all Afia. As to the Mahometans, they are divided into two fects, that of Abubeker and that of Ali: thefe two fects mutually hate each other, though the difference between them confifts rather in ceremonies and fome private opinions than in fundamental doctrines. Some among the Mahometans have preferved certain opinions of the ancient philofophic fects, particularly thofe of the old Oriental philofophy. The information which the famous M. Bernier gives us, who lived a long time among them, and was himfelf well fkilled in philofophy, has put this matter paft all doubt. 'He tells us the Perfian magi, whom he calls cabalifts, affert that God or the almighty being whom they term Achar, immoveable, immutable, not only produced fouls out of his own proper fubftance, but every material and corporeal being of the univerfe alfo; and that this production is not performed fimply in the manner of efficient caufes, but in the fame manner as a fpider, who fpins a thread from her navel firft, and fpreads it when fhe will. The creation, therefore, according to this doctrine, is an extraction and extenfion, which God makes of his own proper fubftance, of thefe nets, which he draws as it were out of his entrails; and deftruction, therefore, is nothing but a refumption which the almighty being makes of his own divine fubftance within himfelf; fo that the laft day, which they call maperle or pralia, at which they believe all things fhall be deftroyed, will be nothing but a general refumption of all thefe filaments, which God had in this manner drawn out of himfelf. Therefore, fay they, there is nothing of reality, in all we imagine of feeing, hearing, fmelling, tafting, and feeling: the univerfe is nothing but a dream and an illufion; the multiplicity and variety of objects that ftrike us, are only one and the fame thing, which is God alone, as all the different numbers we know, ten, twenty, &c. are nothing more than the fame unit repeated feveral times.' But if you afk them fome reafon for their opinion, or to explain how this extraction and refumption of fubftance is performed, this extenfion and apparent diverfity; or how it is poffible that God, not being corporeal but fimple, as they acknowledge, and incorruptible, can neverthelefs be divided into fo many portions of fouls and bodies; they only reply by allegories, and never anfwer directly: God, fay they, is like an immenfe ocean, in which feveral phials full of water moved; that thefe phials, which way foever they went, were yet in the fame ocean, and that, if any of them broke, the water, contained in them, was at the fame time united to its whole, to this ocean of which they were parts. Or they will tell you that God, like light, is the fame through the whole univerfe, and yet, like that, appears in a hundred different forms, according to the diverfity of objects on which it falls, or according to the different colours and figures of glaffes through which it is tranfmitted: thus they avoid anfwering objections by recurring to allegories, and throw duft in the eyes of an ignorant people. The laft recourfe of the magi themfelves is to reveries, and the aurea carmina of their Goult-hen-raz.

This is the doctrine of the Pendets, heathens of the Indies; and the cabala of the magi and the generality of the Perfian literati is of a piece with it, and which is fet forth in moft lofty and fublime verfes in their Goult-hen-raz, or Flower bed of Myfteries: this was the doctrine of Fludd, whom the famous Gaffendi has fo learnedly refuted; and from the little we know of the doctrines of Zoroafter, and the Oriental philofophy, it feems highly probable the philofophy we have now fpoken of proceeded from them.

After the Perfians come the Tartars, whofe empire is the moft extenfive in all Afia, for they poffefs all that vaft tract of land which lies between mount Caucafus and China. What accounts travellers have given us of this people are fo uncertain, that it is difficult to determine, whether they ever had any tincture of philofophy. We only know that they have funk into the groffeft fuperftition, and are either Mahometans, or idolaters. But, as there are numerous orders of priefts among them called lamas, it may be worth enquiring whether they had not more learning than the people committed to their care; but no great infight can be got from what authors have publifhed on this fubject.

The worfhip which thefe lamas pay to idols proceeds on the belief that the idols are images of the divine emanations, and that fouls which are alfo emanations from God dwell in them. All thefe lamas have a high-prieft over them called the grand lama, whofe common refidence is on the top of a mountain. One can fcarce imagine the profound veneration the idolatrous Tartars have for him; they look on him as immortal, and the inferior priefts keep up the cheat by their tricks. All travellers in fhort agree, that the Tartars are the moft rude, fuperftitious, and ignorant people of all Afia. The law of nature is almoft totally extinguifhed among them; we muft not therefore be furprifed at their having made no greater progrefs in philofophy.

If we go out of Tartary into India, we fhall not meet with lefs ignorance and fuperftition, and thefe to fo great a degree that fome authors have been of opinion that the Indians had no knowledge of a God: but this opinion feems not well grounded. Abraham Rogers in fhort tells us that the Bramins acknowledge one fole and fupreme God whom they call Viftnou; that the firft and moft ancient production of this God was an inferior deity called Brama, which he formed out of a flower that floated on the great abyfs before the creation of the world. The virtue, fidelity, and gratitude of Brama were fo eminent, they tell us, that Viftnou gave Brama power to create the univerfe. The particulars of their doctrine are related by different authors with a variety fo very perplexing, that it is extremely difficult to diftinguifh the truth: this variety proceeds in fome meafure from the great refervednefs of the Bramins to all ftrangers, but principally from this, that thofe travellers who have taken upon them to tranfmit their opinions to us, have been very little fkilled in their language. But all modern accounts concur in this, that the Indians acknowledge one or feveral Deities.

We cannot in this place omit fpeaking of Budda or Xekia, fo much celebrated among the Indians, for having taught them the worfhip of the Deity; thefe people look upon him as the greateft philofopher that ever exifted, but the hiftory of him is fo full of fables and contradictions, that it is impoffible to reconcile them: all we can conclude from the diverfity of fentiments which authors have delivered upon this fubject, is that Xekia made his firft appearance in the fouthern part of India; that he at firft taught the inhabitants dwelling on the fea-coafts, and that from thence he fent his difciples forth who fpread his doctrine throughout all India.

The Indians and Chinefe both unanimoufly bear witnefs, that this impoftor had two forts of doctrine; one public calculated for the people, the other kept as a fecret and revealed only to fome of his difciples. Le Comte, La Loubere, Bernier, and efpecially Kempfer, have fufficiently explained the former to us, which they call the exoteric; and thefe are its principal tenets.

1ft. There is a real difference between good and evil.

2d. The fouls of men and brutes are immortal, and only differ in proportion to the fubjects they inform.

3d. The fouls of men, feparated from their bodies, receive either recompenfe of their good actions in a place of delights, or the punifhment of their crimes in a place of torments.

4th. The retreat of the bleffed is a place where they fhall tafte happinefs without end, and this place they call Gokurakf.

5th. The gods differ from each other according to their nature, and the fouls of men according to their merits; confequently the degree of happinefs they fhall enjoy in thefe Elyfian ſian fields ſhall be in proportion to their deſerts: notwithſtanding the proportion of happineſs that each of theſe ſhall enjoy will be ſo great, that they ſhall not deſire any thing beyond it.

6. Amida is the governor of theſe bleſſed retreats and protector of human ſouls, eſpecially of thoſe deſtined to enjoy eternal happineſs. He is the ſole mediator who can obtain the remiſſion of ſins for men, and life eternal. Note. Many Indians and Chineſe aſcribe this to Xekia himſelf.

7th. Amida will not grant this happineſs but to ſuch as follow the law of Xekia, and lead a virtuous life.

8. Now the law of Xekia contains five general precepts, on the practice of which depends eternal ſalvation. The firſt forbids killing any thing that hath life: the ſecond forbids theft: the third inceſt: the fourth lying: the fifth and great commandment forbids the uſe of ſtrong liquors.

Theſe five precepts are held in great reverence, throughout all ſouthern and eaſtern Aſia. Several of their learned men have wrote comments on them, and conſequently rendered them obſcure, for they have divided them into ten counſels, to enable them to acquire the perfection of virtue, every counſel is ſubdivided into five go frakkai, or private admonitions, which have rendered the doctrine of Xekia extremely ſubtile.

9. All men, both lay and eccleſiaſtic, who ſhall have rendered themſelves unworthy of eternal happineſs, by the iniquity of their lives, ſhall be ſent after death into a place of horror, called Dſegokſ, where they ſhall ſuffer torments which ſhall not be eternal, but endure a certain undetermined time; theſe torments ſhall be in proportion to their crimes, and inflicted more ſeverely in proportion to the neglect of occaſions offered for the practice of virtue.

10. Jemma O is the governor and judge of theſe dreadful priſons; he will examine all the actions of men, and puniſh them with different torments.

11. The ſouls of the damned may receive ſome alleviation of their woe from the virtue of their relations and friends, and nothing can be more ſerviceable to them, than prayers and ſacrifices made for the dead, by the prieſts, and addreſſed to Amida the great father of all mercies.

12. The interceſſion of Amida prevails on the inexorable judge of hell to mitigate the rigour of his decrees, and render the puniſhments of the damned more ſupportable, without offending his juſtice, by ſending them back again into the world as ſoon as poſſible.

13. After ſouls have been thus purified, they are ſent into the world again to animate bodies, not of men, but of unclean beaſts, whoſe nature correſponds to the vices which had infected the damned during their lives.

14. Souls ſhall paſs by ſucceſſion from baſer into more noble ſubtile bodies, till they again deſerve to animate the human frame, in which they may, by a virtuous life, merit eternal happineſs. But if on the contrary they again commit ſin, they muſt undergo the ſame puniſhments and tranſmigrations.

This is the doctrine Xekia taught the Indians, and which he wrote with his own hand on the leaves of trees. But his exoteric and eſoteric doctrine differed greatly: Indian authors tell us that, when Xekia drew near his end, he called his diſciples to him, and diſcovered to them thoſe dogmas which he had kept ſecret during his life-time. Thoſe which follow have been extracted from the books of his ſucceſſors.

1. The void, vacuum, is the beginning and end of all things.

2. From that all men proceeded and to that they ſhall return after death.

3. All that exiſts comes from this principle, and returns to it again after death; this principle conſtitutes our ſouls and all the elements, conſequently all things which think and have a being, however different they ſeem to be, differ not really in themſelves, and have no diſtinct eſſence.

4. This principle is univerſal, wonderful pure, limpid, ſubtile, infinite, can neither be born, die, nor be diſſolved.

5. This principle has neither virtue, nor intelligence, nor power, nor any ſuch-like attribute.

6. Its eſſence is to do nothing, think of nothing, deſire nothing.

7. He that deſires to lead an innocent and happy life muſt uſe all his endeavours to become like his principle, that is to ſay, he ought to conquer or rather extinguiſh all his paſſions, that he may not be troubled or diſquieted by any thing whatever.

8. He who obtains this point of perfection, ſhall be abſorbed in ſublime contemplations, without any uſe of his intellectual faculties, and will enjoy a divine repoſe which is the completion of all happineſs.

9. When we have arrived at the knowledge of this ſublime doctrine, we muſt leave the exoteric doctrine to the people, and countenance it.— It is probable this ſyſtem gave birth to a famous ſect among the Japaneſe, which teaches, that there is only one principle of all things; that this principle is clear, luminous, incapable of increaſe or decreaſe, without figure, powerfully perfect, wiſe, but deſtitute of reaſon or intelligence, being in an abſolute inaction, and perfectly tranquil, like a man whoſe attention is fixed intenſely on one object without thinking on any other: they tell you farther, that this principle is in all and every being, and communicates its eſſence to them, in ſuch a manner, that they are the ſame thing with it, and reſolve themſelves into it, upon their diſſolution.

This opinion is different from Spinoſiſm, becauſe it ſuppoſes the world to have been formerly in a very different ſituation from what it is at preſent. A follower of Conſucius has refuted the abſurdities of this ſect by the common maxim, Ex nihilo nihil fit; from whence it appears they taught, that nothing was the firſt principle of all things, and conſequently that the world had a beginning, without matter or cauſe efficient; but it is more probable that they meant, by the word void, only ſome thing which has not the ſenſible properties of matter, perhaps the ſame as the moderns call ſpace, which is a being very diſtinct from body, the extenſion of which is indiviſible, impalpable, penetrable, immoveable, and infinite. It is very evident ſuch a being could not be the firſt principle, if it was incapable of acting as Xekia aſſerted. Spinoſa has not carried the abſurdity ſo far; the abſtract idea which he gives of the firſt principle, is, properly ſpeaking, nothing but the idea of ſpace to which he has attributed motion, in order to join to it all the properties of matter afterwards.

The modern Jews are not unacquainted with the doctrine of Xekia; their cabaliſts account for the origin of things by emanations from a firſt cauſe, which muſt neceſſarily have been pre-exiſtent, though perhaps under another form. They ſpeak alſo of a return of all things into the firſt ſtate, as if they were of opinion, that their enſoph or firſt infinite being contained all things, and that the ſame quantity of beings ſubſiſted before, as after creation. When the being is in its uncreated ſtate, God is ſimply all things; but when the being comes into the world, it does not therefore increaſe in quantity, but God opens and expands himſelf by emanations. Therefore, they often ſpeak of great and ſmall veſſels deſtined to receive theſe emanations of rays which proceed from God, and of canals by which theſe rays are tranſmitted; in a word, when God withdraws theſe rays, the external world periſhes, and all things become God again.

What we have ſaid concerning the doctrine of Xekia may help us to trace out its true original. It ſeems probable that India was not his native country, not only becauſe his doctrine appeared new, when he carried it thither, but farther becauſe there is no Indian nation that boaſts of having given him birth, and Croza's authority, who relates that all the Indians agreed in ſaying Xekia was born of an Indian king, is not ſufficient to make us alter our opinion: for Kempfer has very well obſerved that all the nations ſituated on the eaſt of Aſia give the name of India to all the ſouthern parts of that vaſt country. This unanimous concurrence of the Indians only proves therefore that Xekia was born in ſome ſouthern climate. Kempfer conjectures he was an African, that he had been inſtructed in the Philoſophy and myſteries of the Egyptians, that a war which laid all Egypt waſte, drove him thence, whereupon he, with ſome companions, took refuge among the Indians, who received him as another Hermes and a new legiſlator; he taught them not only the hieroglyphic doctrine of the Egyptians but their myſteries alſo: Kempfer offers theſe arguments in ſupport of his opinion.

1. The religion which the Indians received from this legiſlator has a very evident connection with that of the ancient Egyptians: for all theſe nations repreſented their gods under the ſhape of animals and men of monſtrous figures.

2. The two principal dogmas of the religion of the Egyptians were the tranſmigration of ſouls, and the worſhip of Serapis under the figure of an ox or cow. Now the ſame doctrines are evidently the grounds of the religion of the Aſiatic nations. Every one knows, the blind reverence theſe people have for all animals, even the moſt noxious, from a perſuaſion that human ſouls inhabit their bodies; they pay ſuperſtitious honours to the cow, and her image is placed in their temples. It is remarkable theſe notions prevail more among all theſe barbarous people, as they come nearer to Egypt.

3. The people of Aſia, on the Eaſt, have the Egyptian deities, and worſhip them, though under different names.

4. This conjecture is confirmed by a paſſage in hiſtory. Cambyſes king of Perſia, 536 years before Chriſt, made an invaſion into Egypt, ſlew Apis, which was the palladium of this kingdom, and drove all the prieſts out of the country. Now, if we compare the eccleſiaſtical epocha of the Siameſe, which begins from the death of Xekia, with the time of the expedition of Cambyſes, we ſhall find them coincide exactly.

5. Laſtly, the image of Xekia repreſents him with an Ethiopian viſage and woolly hair, which are particular to the people of Africa. All theſe arguments, well weighed, ſeem to leave no room to doubt but that Xekia was an African, and taught the Indians thoſe doctrines he had learned in Egypt.

PHLEBOTOMY (*Dict.*)— In bleeding it ſometimes happens, that an artery is opened either inſtead of, or together with, the vein: an accident of this kind is attended with the utmoſt danger. An artery is known to be wounded when the blood ſpins out very forcibly from the orifice, and that, by ſtarts or leaps, not in an even ſtream, and extends itſelf in a greater arch from the orifice to the baſon. The colour of the blood from an artery is alſo much more florid than from a vein; to which add, that, on preſſing the finger on the veſſel below the orifice,

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the blood starts out more violently than before, and stops, or at least abates, on pressing above the orifice; quite the contrary of what happens on the opening a vein.

In an accident of this kind, the surgeon should have presence of mind not to betray the case by his fears to the patient, or attendants: he should observe whether the blood flows freely from the orifice, or whether it insinuates itself in any considerable quantity between the integuments. If the first is the case, he must take a large quantity of blood away, even till the patient faints, persuading the attendants that the heat of the blood requires it; and, while the patient is in his fainting fits, as the flux then ceases, he may commodiously dress and bind up the wound, and by this precaution hinder a fresh hæmorrhage or an aneurism. The surgeon must place some small piece of money between the folds of the first compress, and on this place two, three, or more compresses, each larger than the other: and then, binding the cubitus, apply two bandages in this manner, as after bleeding in the vein, only a little tighter; and lay a thick, long, and narrow compress over the artery, from the cubitus to the axilla: and the patient must be warned to wear his arm in a sling, pinned to his cloaths, for a fortnight, and refrain from all use of it.

If the blood from the wounded artery be found to insinuate itself between the integuments, the orifice must be immediately compressed, and tied up as before directed; and the arm often inspected, to see whether a bleeding within the integuments does not yet continue. The patient must be frequently bled in the other arm, and if a large quantity of blood should be lodged from the wounded artery under the integuments, it will be necessary to open the integuments to discharge it.

It is too common an accident to find a nerve or a tendon punctured in bleeding, and this is generally known to be the case by the patient's making a severe outcry at the time; and especially if he complains afterwards of acute pains, and the limb begins to swell and be inflamed, convulsed, stiff, and extended as in the cramp; which symptoms, if not timely relieved, threaten convulsions of the whole body, a gangrene of the part, and even death in a short time.

The best method to be taken in this accident, is, to first bathe the part with a mixture of oil of turpentine and spirit of wine, and then invest the whole arm with the diachalciteos plaister, melted down in oil of vinegar and roses, retaining it on by the expulsive bandage; which, beginning upon the hand, ends gradually by spiral turns to the top of the shoulder; by which means the impulse of the blood on the part is not only much abated, but also the pain and inflammation much diminished: and, lastly, the following cataplasm should be applied to the arm, to complete the cure: take flour of barley and bitter vetch, of each two ounces; chamomile flowers and melilot flowers, of each two handfuls, fresh butter, an ounce and an half: boil these into a cataplasm with soap suds, and apply them to the arm, till the pain and other bad symptoms are removed. *Heister's Surgery.*

PHO'CA, *the sea calf*, in the Linnæan system of zoology, a distinct genus of animals, the characters of which are, that they have two paps placed near the navel, feet adapted to swimming, and have no ears.

There are two kinds of this animal: the common one, called the sea calf, which has its canine, or dog-teeth, inclosed, like the others, in its mouth; and the other, which some improperly call the hippopotamus, or sea horse, which has these teeth exerted or thrust out. *Linnæi System. Natur.*

We have a draught of this animal in the Philosophical Transactions, N°. 469, by Dr. Parsons, who observes, that Aldrovandus, Johnston, Rondeletius, and Gesner, have made several mistakes in the figure of this creature, so as to convey no just idea of it.

This animal is viviparous, and suckles its young by the mamillæ, like quadrupeds; and its flesh is carneous and muscular. That dissected by Dr. Parsons was seven feet and an half long, though very young, having scarce any teeth, and having four holes regularly placed about the navel, which in time become papillæ.

PHO'LAS, in natural history, the name of a genus of shells, the characters of which are these: it is an oblong multivalve shell, composed of five shells, though in some improperly accounted species of this genus, only of two. It is smooth in some species, in others rough, and in some reticulated; in some species it shuts close and even, in others it gapes always open.

PHO'LIS *, in natural history, the name of a genus of fossils of the class of the gypsums or plaister-stones, the distinguishing characters of which are, that the bodies of it are considerably hard, composed of somewhat broad particles, and of a bright crystalline lustre.

* The word is derived from the Greek φολὶς, a scale, or small flake, from these bodies being composed of particles of that form.

PHO'SCAS, in zoology, the name of a fresh water fowl of the duck kind, and of the size of the common widgeon. Its body is remarkably flat; its beak and legs are blue; its head and neck are of a brownish colour, variegated all over with numerous triangular black spots; and on the top of the head these spots are larger than elsewhere, and are of a somewhat greenish hue; the back, wings, and tail are of a dusky brown, but the edges of the feathers are pale or whitish; the wings are variegated by two long white streaks; the breast and sides are of the same colour with the back, but paler; and the belly of a fine white, but with a few dusky spots under the tail. *Ray's Ornithol.*

Antimonial PHO'SPHORUS, in chemistry, the name of a substance, having the qualities of the Phosphorus discovered by Mr. Geoffroy in his experiments on antimony. This gentleman had prepared a soap from pot-ashes, quick-lime, and oil, with which he made several experiments on antimony; among others, he was desirous, by means of this, to reduce some diaphoretice antimony, which he had before made from two parts of the regulus antimony, and three parts of nitre; but, instead of the reduction which he was labouring after, his operations afforded him a much more singular phænomenon: the result of them being a Phosphorus, which he had never thought of; a matter, which, after having remained perfectly quiet, while closely stopped down, took fire, as soon as ever it was exposed to the air; and that with a violent detonation, and darting every way a shower of fire.

It is easy to see, that there are in the preparation all the requisites for such an effect; nitre, charcoal furnished by the burnt soap, and sulphur both from the soap and from the regulus of antimony; and, to all these, a sort of calx, either from the soap, or from some earthy parts of the antimony. It is easy to conceive, that all these substances, coming to a mixture together, should be ready to catch fire, and blaze upon a proper application; but it is not less difficult to account for this effect's being produced merely by the air, after the whole had been for a long time in a state of rest.

The method of preparing this new species of Phosphorus is this: Mr. Geoffroy mixed two ounces of his soap with one ounce of this diaphoretic antimony; this mixture, being put by little and little into a red-hot crucible, took fire, and swelled very much. After it had done flaming, the mass subsided, and became a red or fire-coloured substance, of an even surface, but still throwing up a vast quantity of bluish green luminous vapours; and all this regularly happens on every fresh throwing in of the matter, without the least variety. When the whole quantity was thrown in, and had ceased to give any flame or luminous vapour, it remained in the crucible in the form of an inverted mushroom, being hollow, very porous, and of a black colour. When the crucible was taken out of the fire, the edges of this substance were beaten down into the middle, and the whole covered with an ounce of fresh soap. When this last soap was burnt, and a small bluish flame appeared upon the surface of the mass, the crucible was covered with a lid, and a large quantity of charcoal laid upon it, and the fire blowed up very briskly, by an hundred blasts of the bellows, or thereabouts; but, notwithstanding the fierceness of the fire, there were no fluid scoriæ formed, but the whole mass remained spongy and porous. The fire was then suffered to go out, and the crucible placed in a corner of the elaboratory to rest for five hours. In the evening, when the crucible was perfecty cold, Mr. Geoffroy went to examine the matter, and a servant went to uncover the mass, by removing its surface with an iron instrument; but, the moment the air was admitted, the whole mass took fire, burning with a very considerable noise, and darting its flames to a very great distance.

Mr. Geoffroy repeated the process several times, and always with the same success, whether his own diaphoretic antimony, or that made in the common manner. The great caution, to insure the success, seems to be the taking care of not carrying the fire too far before the addition of the last quantity of soap. *Mem. Acad. Scienc. Par.* 1736.

PHOSPHORUS *of sulphur*, the name given by the French academians to a new-discovered species of the Phosphorus, which readily takes fire on being exposed to the open air.

The invention was M. le Fevre's, and the process is this: the ingredients are two drachms of common sulphur, half an ounce of steel filings, ten grains of colophony, and six drachms of common water. These things being all weighed and set apart, powder about half a drachm of the sulphur in a small mortar, then add the colophony, and afterwards the remainder of the sulphur. When this is all reduced to a fine powder, put in the steel-filings, and rub the whole together till it is so thoroughly mixed, that the steel does not appear, but the colour of the whole looks every-where uniform and regular: then add about twenty drops of the water, and, after beating the whole together, add as much more, and continue to do so till the mass is of the substance of a paste, but not too moist. Put this paste into a small matrass that will contain about three ounces, and pour on it more of the water till it swim above the surface of the paste near a quarter of an inch. The matter of the paste will then break, and appear in form of a granulated powder under the water; put the matrass on a sand furnace, but give it no greater heat than that the hand can lie upon the matrass. When it begins to heat, the mixture will ferment and swell, and become black; it is then to be stirred with an iron rod, and a little more water must be added every

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quarter of an hour, till the whole is used. The matter will then be very black and liquid, and it is to be then taken from the fire, and set by for the whole night. This is the first and most essential part of the operation, and, in this, great care is to be taken that the fire be not too violent; for if the sulphur be burnt, the operation will be spoiled, and the matter would ferment so high as to run over at the mouth of the vessel.

To finish the operation, a little water must be added to the matter, so as to swim over it, and the vessel must be again set in the sand, and a stronger fire given than before; this is known to be strong enough, when there is any humid vapour observed to arise out of the mouth of the vessel. This fire is to be continued about two hours, that the greater part of the humidity may be evaporated; which is known by the iron rod finding some resistance when put into the vessel, and the matter it brings up being granulated and solid, or no longer moist; it must then be immediately taken from the fire, and the whole is then finished. It is necessary to be very exact in this last critical minute, for a very little longer standing on the fire will burn the sulphur, and render all the former care of no effect. The black matter remaining in the matrass is to be taken out, and the sides scraped clean with an iron rod; any piece of this that happens to fall on a paper takes fire in a very little time, and burns away like the other Phosphorus. The process is a very nice one, but, by observing all the rules here laid down, several persons have succeeded in making the Phosphorus to perfection: the whole intent of the operation seems to be to join together the minute particles of steel and sulphur; which, when thus joined, cannot fail to be very inflammable, and to take fire on receiving the smallest humidity from the air to make them ferment.

It cannot but be observed, that this Phosphorus is founded on Lemery's experiments of steel and sulphur taking fire together; but this is a greatly more nice and accurate operation, and a fine improvement on the original plan, which was only, by mixing large quantities of steel filings and sulphur together into a paste with water, and burying this in the earth, to make it take fire of itself, and thus represent the natural phænomena of vulcanos, thunder, lightning, &c. *Mem. Acad. Par.* 1728.

PHRY'GIAN *stone, phrygius lapis*, in natural history, the name of a stone described by the ancients, and used in their time in dying; probably from some vitriolic or aluminous salt contained in it, which served to enliven or fix the colours used by the dyers.

It was a light spongy mass, resembling a pumice, and the whitest and lightest were esteemed the best. Pliny gives us an account of their preparing it for use for dying, which was by moistening it with urine, and then heating it red-hot, and suffering it to cool again; this calcination was repeated three times, and the stone was then fit for use; and Dioscorides recommends it in medicine after burning ;he says it was drying and astringent.

PHYLLERE'A, *phyllerey*, in botany, the name of a genus of plants, the characters of which are these: the flower consists only of one leaf, and is of a bell-like shape, and divided into four segments at the edges. The pistil arises from the cup, and is fixed in the manner of a nail to the hinder part of the flower. This finally becomes a fruit of a roundish figure, containing roundish seeds.

PHYLLI'TIS *marina, sea hart's tongue*, in natural history, a name given by some authors to a species of sea plant, the leaves of which, in some degree, resemble those of the common hart's tongue. It grows on the rocks at great depths, and is seldom seen, unless when taken up by the coral-fishers. Its leaves are sometimes single, sometimes they divide into two: they are of a dusky green colour, and are about two inches in length: they have each a nerve or rib running along their middle; they are very thin and transparent, and are of a sort of cartilaginous structure; and each has several rows of small points on each side of the middle rib, which not unaptly resemble the seed spots on the leaves of some of the capillary plants; but not on those of the Phyllitis, or hart's tongue, in particular, because they are in that plant not round but oblong, and stand only in a single row on each side the rib.

When this plant is viewed by the microscope, it appears, in all parts of the leaf, full of little holes; and those which are so plain to the naked eye, are no other way different from the imperceptible ones, but in that they are larger. The plant has no root, and therefore takes in its nourishment by these numerous holes in its surface. *Marsigli, Hist. de Mer.*

PHYLLOBO'LIA, φυλλοβολια, in antiquity, a custom, that prevailed among the ancients, to strew flowers and leaves on the tombs of the dead. The Romans adopted this custom from the Greeks, and added likewise wool.

The Phyllobolia was also used on occasion of a victory obtained at any of the public games, when not only the victors, but likewise their parents, were strewed with flowers and leaves. *Hoffm. Lex. Univ. in voc.*

PIANI'SSIMO, in the Italian music, is used to signify that the part to which it is added should be played very softly, and so as that the sound may seem at a great distance, and almost lost in air.

PIA'NO, in the Italian music, signifies soft and sweet, by way of an echo.

PIANO PIANO, in the Italian music, is nearly the same with pianissimo, or rather a degree between it and Piano.

Piu PIANO, in the Italian music, signifies more slow or more soft, and is much the same with Piano Piano.

PI'CA, *the pye, or magpye*, in the Linnæan system of zoology, the name of one whole order of the bird kind; the character of which is, that they have a convex beak, flatted above. The birds of this order are, the bird of paradise, the magpye, the crow, the cuckow, the wood-pecker, the sitta, the creeper, the hoopoe, and the ispida. *Linnæi. Syst. Nat.*

PICA *marina*, in ornithology, the name of a bird called in English the sea pye, and, by Bellonius and some others, the hæmatopus. It is of the size of the common magpye; its beak is three fingers breadth long, straight, and of a reddish or a blackish colour, and ending in a point, and seeming well fitted for its business of rooting up the limpets from the rocks, the bodies of this fish being its common food; its legs are red; it has no hinder toe, and has its other toes so far connected by a membrane, as to seem almost of a middle nature between the web-footed and other birds; its head, neck, back, throat, and half its breast are black, as is also its rump; its tail is half black and half white, as are also its wings. It is common on the western shores of England, and on the shores of Wales. *Ray's Ornithology.*

PICK, among miners, is a tool with which they use to cut down the clifts and rocks of stone to make passages in the earth. *Houghton's Complete Miner in the Explanation of the Terms.*

PICK-*ax*, in the military art, a tool carried by the pioniers to dig up ground that is too hard for the spade; they are of great use for mending ways, and in fortification.

PI'CKER, or *horse* PICKER, in the manege, an iron instrument five or six inches long, bent or crooked on one side, and flat and pointed on the other. It is used by the grooms to cleanse the inside of the horses feet, and to pick out the earth, sand, or small stones that get into them.

PI'CKEREL, in ichthyology, an English name used by some authors for the jack or pike.

PICTAVIE'NSIS *colica*, the name of a kind of very terrible nervous cholic, more usually called colica Pictonum; and by the natives in the West-Indies, where it rages, the dry belly ach. It is so popular a disease in the Leeward islands, that it may be very justly reckoned endemic among them, most of the people there having been at one time or other subject to it in all its fury.

PIE'RRE *d'Automne*, a French name translated from the Chinese. It is the name of a medicinal stone, famous throughout the East for curing all disorders of the lungs.

It is a tedious preparation of human urine, and made as follows: they put thirty pints of the urine of a strong and healthy young man into a large iron pot, and set it over a gentle fire; and when it begins to boil, they add to it, drop by drop, about a large tea cup full of rape oil: it is then left on the fire till the whole is evaporated to a thick substance resembling black mud; they then take it out of the pot, and laying it on a flat iron, they dry it so that it may be powdered very fine. This powder they moisten with fresh oil, and put the mass into a double crucible, surrounded with coals, where it stands till thoroughly dried again. They finally powder this again, and, putting it into a china vessel covered with silk, cloth, and a double paper, they pour on boiling water, which makes its way, drop by drop, through these coverings, till so much is got in, as is sufficient to reduce it to a paste. This paste is well mixed together in the vessel it is kept in, and this is put into a vessel of water, and the whole set over the fire. The matter thus becomes again dried in balneo mariæ, and is then finished. *Observ. sur les Cout. de l'Asie.*

PIE'RIDES, among the ancients, an epithet given to the muses, upon account of their having been born in that part of the country of Macedon which was called Pieria. *Pitisc. in voc.*

PIGA'YA, in natural history, a word used by the natives of Brazil as a name for the famous ipecacuanha-root.

PI'GUS, in zoology, the name of a species of leather-mouthed fish, very much approaching to the nature of the carp.

It is of the same shape and size with the common carp, and its eyes, fins, and fleshy palate wholly the same. From the gills to the tail there runs a crooked dotted line: its back and sides are bluish, and its belly reddish: it is covered with large scales, from the middle of every one of which there rises a fine, pellucid, and very sharp prickle.

It is a finer fish than the carp for the table, and is in season in the months of March and April. It is caught in lakes in some parts of Italy, and is mentioned by Pliny, though without a name.

PIKE, in ichthyology, a name given by us to the fish called by authors the lucius and esox, and by the old Greek writers oxyrynchus.

This fish is the tyrant of the fresh waters, and is at once the most voracious and the longest-lived of all fish, according to the generality of naturalists.

The very large Pike are esteemed as a pompous fish at the tables of great people; but they are coarse, and the middling ones are in reality much the best.

The Pike never swims in shoals, as most other fish do, but always lies alone, and is so bold and ravenous, that he will seize upon almost any thing less than himself. This fish breeds but once in a year, which is in March. It is found in almost all fresh waters, but is very different in goodness, according to the nature of the places where it lives. The finest Pike are those which feed in clear rivers; those in ponds and mires are inferior to these, and the worst of all are those of the fen ditches. They are very plentiful in these last places, where the water is foul and coloured, and their food, such as frogs, and the like, very plentiful, but very coarse; so that they grow large, but are yellowish and high-bellied, and differ greatly from those which live in the clearer waters.

The fishermen have two principal ways of catching the Pike; by the ledger, and by the walking bait.

The ledger bait is fixed in one certain place, and may continue while the angler is absent: this must be a live bait, a fish or frog; and, among fish, the dace, roach, and gudgeon, are the best; of frogs, the only caution is to chuse the largest and yellowest that can be met with. If the bait be a fish, the hook is to be stuck through the upper lip, and the line must be fourteen yards at least in length: the other end of this is to be tied to a bough of a tree, or to a stick driven into the ground near the Pike's haunt, and all the line wound round a forked stick, except about half a yard. The bait will by this means keep playing so much under water, that the Pike will soon lay hold of it.

If the bait be a frog, then the arming wire of the hook should be put into the mouth, and out of the side; and with a needle and some strong silk the hinder leg of one side is to be fastened by one stitch to the wire-arming of the hook. The Pike will soon seize this, and must have line enough to give him leave to get his haunt and poach the bait.

The trolling for Pike is a pleasant method also of taking them: in this a dead bait serves, and none is so proper as a gudgeon. This is to be pulled about in the water till the Pike seizes it, and then it is to have line enough, and time to swallow it: the hook is small for this sport, and has a smooth piece of lead fixed at its end, to sink the bait; and the line is very long, and runs through a ring at the end of the rod, which must not be too slender at top.

The art of feeding Pike, so as to make them very fat, is, the giving them eels, and, without it, it is not to be done under a very long time; otherwise pearch, while small, and their prickly tender fins, are the best food for them. Bream put into a Pike pond are very proper food: they will breed freely, and their young ones make excellent food for the Pike, who will take care that they shall not increase over much. The numerous shoals of roaches and ruds, which are continually changing place, and often in floods get into the Pike's quarters, are food for them a long time.

Pike, when used to be fed by hand, will come up to the very shore, and take the food that is given them out of the finger of the feeder. It is wonderful to see with what courage they will do this, after a while practising; and it is a very diverting sight, when there are several of them nearly of the same size, to see what striving and fighting there will be for the best bits, when they are thrown in. The most convenient place is near the mouth of the pond, and where there is about half a yard depth of water; for, by that means, the offal of the feedings will all lie in one place, and the deep water will serve for a place to retire into and rest in, and will be always clean and in order.

Carp will be fed in the same manner as Pike; and though by nature a fish as remarkably shy and timorous as the Pike is bold and fearless, yet, by custom, they will come up to take their food out of the person's hand, and will, like the Pike, quarrel among one another for the nicest bits. See the article FEEDING *of fish*.

Half PIKE, in the military art, is the weapon carried by an officer of foot. It differs from a Pike, because it is but eight or nine feet long, and the spear is smaller and narrower.

PIKE, is also the name of an Egyptian measure, of which there are two kinds, the large and the small.

The larger Pike, called also the Pike of Constantinople, is 27 $\frac{200}{1000}$ English inches. They measure all foreign goods with this, excepting only such as are made of flax and cotton: for then they use the small Pike, called Pike belledy, or the Pike of the country; because they measure with it all the manufactures of the country. This Pike consists of about 25 $\frac{576}{1000}$ English inches. *Pocock's Egypt.*

PILATRO, or PILATRO *di Levante*, a salt used in the glass trade, in some particular cases. It is extracted from the froth of the sea, coagulated by heat in the hot countries. *Merret's Notes on Neri.*

PILCHARDUS, *the common pilchard*, in zoology, a fish much approaching to the nature of the common herring, but smaller and differing in several other particulars.

It is generally found swimming in vast shoals, and is caught on many parts of the English shores. Its flesh is better tasted than that of the herring.

PILE-*worms*, are a kind of worms found in the Piles of the sea dykes in Holland. These worms are of various sizes, some of the young ones are not above an inch or two in length; but others have been found of thirteen or fourteen inches long. The heads of these creatures were covered with two hard shells, or hemicrania; which together form a figure resembling an augre, and with which they bore the wood. The best remedy against them is, to perforate the Pile with many small holes, about an inch asunder; then it must be done over with a varnish in the hottest sun, and, while the varnish is hot, brick dust must be strewed over it; and this being several times repeated, the pile will be covered with a strong crust, impenetrable to all insects. See a farther account of these creatures in the *Phil. Trans.* N°. 455.

PILES, the popular name for the hæmorrhoids. See the article HÆMORRHOIDES, *in the Dictionary*.

PILE (*Dict.*)—As we are often obliged to set inclined Piles, in order to give more strength to works intended to support a swell of water or projection of earth, the description of a machine to drive them may not be disagreeable, as it is quite a modern invention, and never published in English that we know of.

Plate XXXIV. *fig.* 1, 2, and 3, exhibit this machine fully; *fig.* 3, which is the plan of it, is composed of four shafts, on one of which A B are raised the uprights C D, E F, marked with the same letters in *fig.* 1, 2, which shew the elevation and profile of the machine, and, consequently, the inclination these parts have to their base; the two in the middle seen in the reverse, as well as the others, serve for guides to the ram G, the ears of which H H are fastened with keys; these uprights exceed the height of the cross-piece I to support the pulley K on which the rope passes that makes the ram play. The two pieces, in form of a buttress, support the fore part of the machine, and the axis N, common to both wheels, made like a drum; on each of which is twisted a cord, but contrariwise, so that one may wind off as the other winds on, and reciprocally, while a third, corresponding to the axis, winds off or on as the ram ascends or descends. As, for example, to raise it, draw the rope T which winds off above the great drum P; then the second V winds on the little drum O, and the third rope Y which communicates with the ram G winds up on the axis N, and, when the ram is come to the top of the guide, draw the rope of the counterpoise Z, and the ram falls.

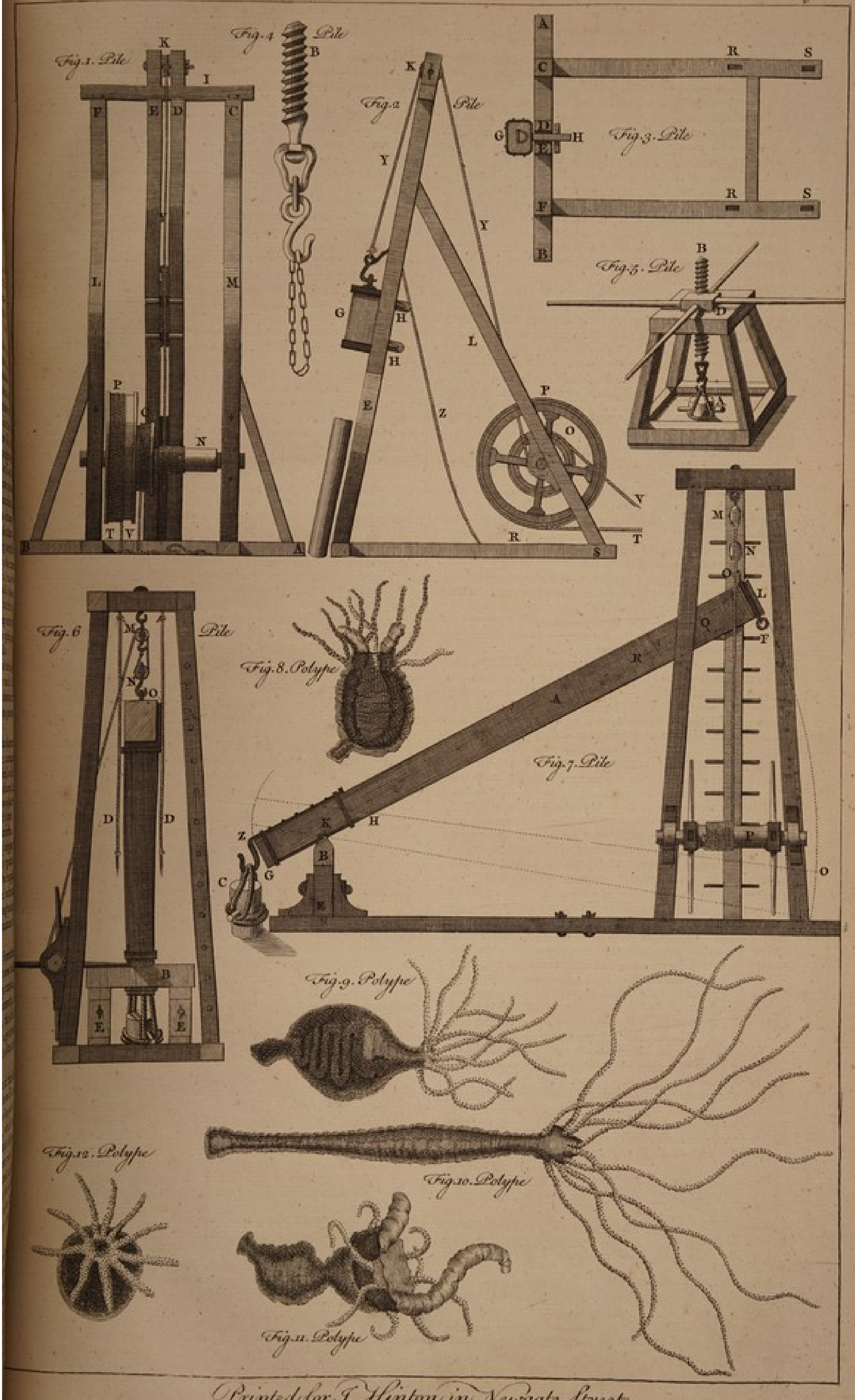
To repeat the operation, draw the rope V of the small wheel, then the rope T winds on as the former winds off, which also causes the third rope Y to be drawn downwards by the counterpoise which is hooked to the ram; then proceed as before.

The great wheel P is supposed to be six feet in diameter, the little wheel O three feet, and the axis N one; consequently the power T, communicating with the great wheel, will be as one to six, to the weight of the ram; therefore six men can easily raise a ram of 900 pounds, estimating the power of each man at no more than 25 pounds, which is the lowest it can be rated at in a work of this kind; because, as the ram rests on an inclined plane, the rope Y does not absolutely support the whole weight; but I do not mention this as any great abatement, because the friction of the machine may be supposed to compensate for it. It is easy to see that the inclination of the guide may be increased or diminished by lengthening or shortening the buttresses L M, according to the situation of the Pile, and the design of direction in driving it.

A description of a machine to draw PILES.—It is sometimes necessary to draw Piles when we intend to erect new buildings, in places where the vestigia of old buildings remain; or to make use of Piles, which have been driven formerly, and are of no service where they stand at present; this last was the case, when, on the demolition of Dunkirk, a great part of the Piles were drawn, and timbers made use of to form the sluice of Mardyke.

Plate XXXIV. *fig.* 4, 5, represent a machine of this kind; *fig.* 5. exhibits a wooden frame, supporting a screw B and nut D placed over the Pile A, the head of which is supposed to have been bored, in order to receive an iron pin, which takes firm hold on the Pile, by the help of a rope or chain suspended to a hook, represented *fig.* 4. By turning the nut with levers as you do a capstan, the screw is forced to ascend and draws the Pile with it. The principal difficulty is to fix the machine on a foundation solid enough to resist the power of the screw; if it should happen that the Pile is under water, a flying scaffold placed on boats may be made use of.

Fig. 6. and 7. represent another machine of the same kind, which are intelligible enough by the draught without any long explanation; its design is to lift, at the extremity L, a beam G L placed on a fulcrum B, to make the counterpoise, because there is a notch at K to prevent it from slipping; we will suppose the length of the beam being divided into nine equal parts, G K to be one, consequently the remaining part K L will be equal to eight. This beam must likewise be furnished at its extremities with proper irons to draw the Pile C. We are to suppose it at first in a state of rest, represented by the dotted lines; that a rope is fastened at its extremity O, which after having passed on pullies, comes out opposite to the roll of the machine; which, being put in motion, raises L, the



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the extremity of the beam into the position we see it, to hook the rope which goes round the Pile at the lower extremity G; then the roll is let loose, to leave the beam to its own proper weight; which, assisted by the advantage that the arm of a lever gives it, acts very forcibly on the Pile, as may be judged from the following calculation.

To calculate the action of this beam, we will suppose it eighteen feet in length and twelve inches square; then G K will be two feet, and K L sixteen feet in length: now, a solid foot of dry oak weighs about sixty pounds, we will call it so in the present calculation: to be exact, we must take K H, equal to G K, in order to look on both parts of the weight of the beam, as in equilibrium to each other; then imagine the remainder of its gravity to be reunited in A, the center of gravity of the part H L, which acts on the Pile, is equal to a power of 840 pounds, which is the weight of fourteen cubical feet of oak timber, equal to the arm of the lever K A of nine feet, while the other K G acts in proportion to its length two feet; thus, in a state of equilibrium, the power A equal to 840 pounds will be to its action on the Pile as K G to K A, or 2 to 9, which is equal to 3780 pounds; this may be increased in proportion to a power applied at the extremity R L; let us suppose, for example, 600 pounds applied at the extremity of the lever K Q the sextuple of K G, their effort on the Pile will be 3600 pounds; which, added to 3780 pounds, make 7380 pounds, for the force acting upon the Pile. This machine was experienced by Marshal Belleisle, in 1749, to be of the greatest use in drawing Piles, when he had a mind to destroy the two bridges he had thrown over the Var; these stood on a forest of Piles, but they were easily extracted by these engines; those driven into a strong soil fourteen or fifteen feet could not resist them above four or five minutes.

The force of this machine may be surprisingly increased, by making use of a roller to draw down the extremity of the beam L, notwithstanding the resistance of the Pile C. Put the beam in the position G L, *fig.* 7; unhook the pulley M N, the beam will keep its place; then hook the pulley M by an S to the ring F, fasten the other end of the pulley N in like manner to the foot of the machine, in order to obtain a fulcrum, and you may draw the beam down easily by a power applied to the lever of the roller. It might still be made to produce a greater effect, if the impulse of a ram were applied at the extremity of the beam, and this might easily be contrived in one machine.

A description of a saw to cut off PILES *under water.*— The saw contrived for this purpose is in the form of a triangular prism, and represented in *Plate* XXXV. *fig.* 1, 2, 3; twenty-eight men may be employed in working it, though a less number may suffice; these men are placed upon a float to work the machine; the use of the saw is to cut the Piles and stakes in the platform of the pier down level; the manner of its working is shewn *fig.* 1, K is the blade, which weighs about 250 pounds, is four inches broad and seven lines thick on the fore part, which declines gradually to four or five lines on the back, F, F, F, F, the frame, A, A, A, A, the plat-form of piles.

At the same time that the men are employed in pushing and drawing the saw perpendicularly to the side of the Piles, being set to the arm which are at the top L, *fig.* 2, 3, the extremities of the blade are drawn parallel to the same sides by weights suspended at the extremity of the ropes R R, *fig.* 1, which go on pullies fastened at the head of the compass of the frame of the periphery of the Pile.

PILL, *Aromatic* PILLS, *pilulæ aromaticæ*, a form of medicine in the New London Dispensatory, intended to stand in the place of the pilulæ diambræ of the former, and the pilulæ alephanginæ, or aloephanginæ, of that, and some other dispensatories.

The composition is this: take socotrine aloes, an ounce and an half; gum guaiacum, an ounce; the aromatic species and balsam of Peru, of each half an ounce; let the aloes and gum guaiacum be powdered separately, and afterwards mixed with the rest, and formed into a mass with syrup of orange peel. *Pemberton's Lond. Disp.*

PILLS *of colocynth with aloes*, *pilulæ colocynthide cum aloe*, a name given, in the New London Pharmacopœia, to the purging pill, commonly known by the name of pilulæ cociæ minores.

As this is originally a prescription of Galen's, and the manner of proportioning the ingredients has been altered for the worse, since his time, by enlarging the quantity of that nauseous ingredient the colocynth; the college have reduced it to its former proportions, and ordered it to be made in this manner: take socotrine aloes and scammony, of each two ounces; pith of coloquintida, one ounce; oil of cloves, two drachms; let the dry species be reduced to powder separately, the oil mixed among them, and the whole formed into a mass, with syrup of buckthorn. *Pemberton's Lond. Disp.*

Mercurial PILLS, *pilulæ mercuriales*, a form of medicine prescribed in the late London Pharmacopœia, and containing crude mercury mixed for internal use.

The composition is to be made as follows: take of pure quicksilver, five drachms; of Strasburg turpentine, two drachms; of the cathartic extract, four scruples; rhubarb powder, one drachm; grind the quicksilver with the turpentine till it makes one uniform mass, and then add the other ingredients, and beat up the whole into Pills. If the turpentine be too hard, it must be softened with a little oil of olives. *Pemberton's Lond. Disp.*

Soap PILLS, *pilulæ saponaceæ*, a form of medicine prescribed in the late London Dispensatory, and ordered to be made in the following manner: take almond soap, four ounces; strained opium, half an ounce; essence of lemons, a drachm; soften the opium a little with wine, and beat that and the soap with the essence, till it be reduced to the form of a Pill.

This is intended to stand in the place of the Pill, commonly called Mathews's Pill, and is very happily corrected, in regard to the taste of the soap, by the addition of the essence of lemons. *Pemberton's Lond. Disp.*

Ward's PILL. See WARD's *Pill.*

PI'LLOW *of a plough*, a term used by the farmers to express that part of a plough which serves to raise or sink the beam, and with it the share, as the land is to be plowed shallower or deeper.

This Pillow is a cross piece of wood, reaching from one of the crow-staves or uprights to the other; and, as they are bored with two rows of holes, this Pillow can be slipped up or down to any height, and kept there by pegs or cords in the holes. *Tull's Husb.* See PLOUGH.

PILULA'RIA, *pepper-grass*, the name of a very remarkable little plant, of which Mr. Bernard de Jussieu has given a very accurate account in the Memoirs of the Academy of Sciences of Paris.

PI'MPERNEL, *pimpernella*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one petal, which is of a rotated form, and is deeply divided into four segments, and contains a vast number of stamina, or a fimbriated style. The cup finally becomes a fruit usually of a quadrangular figure, and pointed at each end: this is sometimes divided into two cells, sometimes it consists only of one; and it contains numerous seeds, usually of a longish figure.

The seeds of this plant are warm, carminative, and discutient: they are given with success in cholics and flatulencies, and in suppressions of urine. The leaves and roots also possess the same virtues; and when the diuretic property only is expected from it, the root alone, fresh taken up, cut small, and boiled in water, is the best. The decoction is to be drank in large draughts, and often repeated.

PI'MPLE, in medicine, a small pustule arising on the face.

By mixing equal quantities of the juice of houseleek, sedum minus, passed through paper, and of spirit of wine rectified by itself, a white coagulum of a very volatile nature is formed, which Dr. Burghart commends for curing Pimples of the face; and says, that the thin liquor separated from it, with sugar-candy, is an excellent remedy for thick viscid phlegm in the breast. *Satyr. Silesiac. Spec.* 4. *Ob.* 2.

PIN (*Dict.*)— The perfection of Pins consists in the stiffness of the wire, and its blanching, in the heads being well-turned, and the points filed. The London pointing and blanching are in most repute; because after forming the points on the stone, our Pin-makers smooth them again on the polisher; and in blanching, use fine tin well calcined, and sometimes silver leaves prepared by the gold-beaters; whereas, in other parts, they use a mixture of tin, lead, and quick-silver, which not only blanches worse than the former, but is also dangerous, by reason of the ill quality of that mineral, which renders a puncture with a Pin thus blanched very difficult to cure.

The consumption of Pins, and the number of artificers employed in the manufacture thereof, are incredible. In Paris alone there were anciently above 1000 people employed in it, at present there are none; yet there is every year sold above 50,000 crowns worth of the Pin-wire, to the Pin-makers of the neighbouring places, all brought thither from Stockholm.— In the little town of Rugle in Normandy, there are computed at least 500 workmen employed in the Pin manufacture; the whole town being peopled therewith.

Notwithstanding that there is scarce any commodity cheaper than Pins, there is none that passes through more hands before they come to be sold.— They reckon twenty-five workmen successively employed on each Pin, between the drawing of the brass-wire and the sticking of the Pin in the paper.

Pins are distinguished by numero's; the smaller called from N° 3, 4, 5, thence to the 14th, when they are only accounted by two to two, viz. N°. 16, 18, and 20, which is the largest size.

Besides the white Pins, there are also black ones made for mourning from N°. 4, to N°. 10.—These are usually of iron-wire.

Lastly, there are Pins with double heads, of several numero's, used by the ladies to fix the buckles of their hair for the night, without danger of being disturbed by their pricking, &c.

PINE-*tree*, *pinus*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the amentaceous kind, being composed of a great number of stamina, but it is barren: the embryo fruit appear in other parts of the tree, and finally become a sort of cone, between the several scales of which, each having two hollows, there are found two seeds contained in a stony husk, which is frequently elated. To

this

this it is to be added, that the leaves grow more than one out of the same theca.

Pitch, tar, resin, and turpentine, are all made from these trees by a very familiar process. In the spring time, when the sap is most free in running, they pare off the bark of the Pine-tree, to make the sap run down into a hole which they cut at the bottom to receive it: in the way, as it runs down, it leaves a white matter like cream, but a little thicker: this is very different from all the kinds of resin and turpentine in use, and it is generally sold to be used in the making of flambeaux, instead of white bee's wax. The matter that is received in the hole at the bottom, is taken up with ladles, and put in a large basket; a great part of this immediately runs through, and this is the common turpentine. This is received into stone or earthen pots, and is ready for sale. The thicker matter, which remains in the basket, they put into a common alembic, adding a large quantity of water; they distil this as long as any oil is seen swimming upon the water; this oil they separate from the surface in large quantities, and this is the common oil or spirit of turpentine: the remaining matter, at the bottom of the still, is common yellow resin. When they have thus obtained all that they can from the sap of the tree, they cut it down, and, hewing the wood into billets, they fill a pit dug in the earth with these billets, and, setting them on fire, there runs from them, while they are burning, a black thick matter: this naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, out at which the tar runs like oil: if this hole be made too large, it sets the whole quantity of the tar on fire; but, if small enough, it runs quietly out.

The tar, being thus made, is put up in barrels, and, if it be to be made into pitch, they put it into large boiling vessels, without adding any thing to it: it is then suffered to boil a while, and, being then let out, is found, when cold, to be what we call pitch. *Phil. Transf.* N°. 243.

PINE-*apple*. See ANANAS, Dictionary and Supplement.

PINE-*apple*, in metallurgy, a word used to express a sort of mould, used in the refining silver. It has this name from its shape, resembling the fruit of that name.

When the refiners have taken the mixture of the silver and mercury together out of the cauldron, and strained it through two coarse wet cloths, to make it the thicker, they then beat it with a sort of battledoors, to drive out yet more of the quicksilver; and, straining it again after this, they take out the remaining amalgame, and, forming it into little pellets, they put these carefully into the moulds called Pine-apples, pressing them down. The amalgame, when put into this vessel or mould, is usually so rich as to be about one fifth silver. The manner of divesting this of the quicksilver afterwards is by means of fire; in which the quicksilver rises in vapour, and the silver is left pure behind: but the carelessness of the workmen in doing this, and particularly the using bad vessels, or the not luting them close, causes a waste of this mineral greater than could be conceived. Alonso tells us, that in the city of Potosi alone, at the time of his writing, when the trading in metals ran but low, above thirty-thousand pieces of eight were wasted in quicksilver that was lost one year with another. To prevent this, they then principally studied the means of keeping the silver as dry of quicksilver as they could, in the Pine-apple; but, it then holding four fifths of the whole mass in quicksilver, the great waste was in the separating it afterwards. *Alonso Barba de Metal.*

PINE-*salt*, a name given to a preparation of the bark of the Pine-tree, used as a sort of seasoning to food in the manner in which we use salt.

Scotch PINE, generally called the Scotch fir, is the most profitable of all the sorts, to cultivate in large plantations; and will grow in almost any soil or situation; for in the most barren sand, where little else but fern and heath would grow, I have seen plantations of these trees thrive much beyond expectation; and upon chalky hills, where there have been scarce three inches of earth, there are many noble plantations of this sort. I have also observed, where they have been planted in a strong clay, and also in a moist peaty soil, that they have grown to admiration; so that there is no part of England, in which these trees might not be propagated to a great advantage.

But where these trees are designed to be planted in large quantities, it will be much the better way to make a nursery on the spot where the seeds should be sown, and the plants raised until they are three years old, which is a proper age to plant them out for good; for, the younger they are planted, the better they will thrive, provided they are kept clear from weeds; and, if the situation where they are intended to stand is much exposed to winds, the plants should be planted closer together, that they may be a shelter to each other, and draw themselves upward; and, as the trees advance, they may be thinned by degrees; and the thinnings of these plantations have, in many places, paid the expence of planting; for these are very serviceable for scaffolding, and many other useful businesses.

It is the wood of this tree which is the red or yellow deals, and is more valuable than that of any other sort of pine or fir: this is a native of Denmark, Sweden, and many other northern countries: and in the High-lands of Scotland there are several large woods of this tree now growing; and the seeds being brought from thence into England, has occasioned the name of Scotch Fir being generally applied to it here, but in Norway it is called grana.

PINK, a well known flower in our gardens, being a species of the genus of the carnation. See CARNATION.

The damask Pink, white shock, scarlet, pheasant's-eyed Pink, of which there are great varieties, both with single and double flowers, the old man's head, and the painted lady pinks, with several others. These may be propagated by layers, as the carnations, and many of them by cuttings planted in July, or from seeds, by which method new varieties may be obtained. The manner of sowing these seeds being the same with the carnations, I shall refer back to that, to avoid repetition, and shall proceed to the China Pink, which is a flower of later date amongst us than any of the former; which, although it hath no scent, yet, for the great diversity of beautiful colours which are in these flowers, with their long continuance in flower, merits a place in every good garden.

The double China-PINK. — There is a great variety of different colours in these flowers, which vary annually as they are produced from seeds, so that, in a large bed of these flowers, scarcely two of them are exactly alike, and their colours in some are exceeding rich and beautiful; we should therefore be careful to save the seeds from such flowers only as are beautiful; for they are very subject to degenerate from seeds.

And the seeds of the double sort will produce many double flowers again, but the seeds of the single will scarcely ever produce a double flower.

These flowers are only propagated by seeds, which should be sown towards the end of March, in a pot or box of good light earth, and set under a glass to forward its vegetating; giving it water as often as you shall see necessary, and in about a month's time your plants will come up and be of some bigness; you must therefore expose them to the open air, and in a short time after prepare some beds of good fresh earth, not too stiff, in which you may prick out these plants, about three inches square, observing to water and shade them, as the season may require.

In those beds they may remain until the middle of June, at which time you may remove and plant them in the borders of the pleasure garden, being careful to preserve as much earth to their roots as possible; and in a month's time after they will begin to flower, and continue until the frost prevent them. About the middle or latter end of August their seeds will begin to ripen, at which time you should look over them once a week, gathering off the pods that are changed brown, and spread them on papers to dry, when you may rub out the seed, and put it up for use. Though these plants are usually termed annuals, and sown every year, yet their roots will abide two years, if suffered to remain, and will endure the greatest cold of our winters, if planted in a dry soil, and without any shelter; as I experienced anno 1728, at which time I had a large bed of these flowers, which was raised a foot above the level of the ground; and, although its situation was such, that the sun never shone upon it from October to March, yet I had not one root destroyed in the whole bed, although it stood open, and without any care taken of it. *Miller's Gard. Dict.*

PIN'NA, *a fin*, in natural history, the name of that part of a fish which distinguishes it from other aquatic creatures, no animal but a fish having fins and wanting legs.

The fin is properly a part standing out, or hanging from the body of the fish, and consisting of a membrane supported by several rays or oblong bones; which are in some hard and firm, and in others cartilaginous.

PINNA *marina*, in natural history, the name of a shell fish, by the latest writers on these subjects referred to the genus of muscles.

PINTA'DO, *or Afra avis*, in natural history, a name given by the antient Roman authors to the Guinea hen.

Varro, Columella, and Pliny, with many others, make the meleagris the same species of bird; but Suetonius, Scaliger, and some others are of opinion, that the antients meant two very different birds by these names; and the latter of these authors endeavours to bring Varro over to his side, by altering the pointing in the passage of that author which relates to it.

The bird is of late become very common in England, and breeds with us in great plenty. The hen lays her eggs and sits upon them in the same manner with the common hen; but the eggs are smaller and not so white as the hen's eggs, but have a tinge of flesh colour and some black spots. They are not so tame and domestic as our own fowls, and particularly they will not lay in houses, but get into the hedges and among bushes, where they lay and hatch; but this is the occasion of great loss among them, the wild vermin destroying a great part of the young brood. The female also is less careful about the great business of hatching and taking care of them, than any other bird we are acquainted with. She will often leave her nest when the eggs are near hatching, and never return to it again; and often will desert the young as soon as hatched, if she remains at her nest till that time. The best

best method, therefore, is to set other fowls upon the eggs of this kind. The young fowls of this kind are very beautiful, they look like so many partridges. Their beaks and legs are red, and their whole plumage is at that time of the colour of the partridge. See *Tab. of birds*, N°. 21.

The hen, if her nest is found, and the eggs at times taken away, but so as always to have one there, will continue to lay till she has deposited an hundred, or sometimes an hundred and fifty eggs, which are very well tasted. This is a very active and sprightly bird, and of an unquiet and troublesome disposition to the owner. It runs very swiftly, in the manner of the quail and partridge; but its wings are short, and it is not made for flying; yet at night it will not roost among other fowl, but gets upon a house or tree, or any other high and safe place. The cry of the bird is sharp and disagreeable to many ears, and it is almost continually making it. It is of a quarrelsome disposition, and will be mistress of the yard: its agility, and the sharpness of its beak, generally obtaining it the victory with whatever bird it fights.

PIPE, in mining, is where the ore runs forwards end-ways in a hole, and doth not sink downwards or in a vein. *Houghton's Compl. Miner, in the explan. of the terms.*

PIQUET, or *picket*, a celebrated game at cards, much in use throughout the polite world.

It is played between two persons, with only thirty-two cards; all the duces, threes, fours, fives, and sixes, being set aside. In reckoning at this game every card goes for the number it bears, as a ten for a ten; only all court-cards go for ten, and the ace for eleven: and the usual game is one hundred up.—In playing, the ace wins the king, the king the queen, and so down. Twelve cards are dealt around, usually by two and two; which done, the remainder are laid in the middle: if one of the gamesters finds he has not a court in his hand, he is to declare he has carte-blanche, and tell how many cards he will lay out, and desire the other to discard, that he may shew his game, and satisfy his antagonist, that the carte-blanche is real; for which he reckons ten.

Each person discards, i. e. lays aside a certain number of his cards, and takes in a like number from the stock. The first, of the eight cards, may take three, four, or five; the dealer all the remainder, if he pleases.

After discarding, the eldest hand examines what suit he has most cards of, and reckoning how many points he has in that suit: if the other have not so many in that, or any other suit, he tells one for every ten of that suit.—He who thus reckons most is said to win the point.

The point being over, each examines what sequences he has of the same suit, viz. how many tierces, or sequences of three, quartes or fours, quintes or fives, sixiemes or sixes, &c. For a tierce they reckon three points, for a quarte four, for a quinte fifteen, and for a sixieme sixteen, &c. And the several sequences are distinguished in dignity by the cards they begin from: thus ace, king, and queen are called tierce major; king, queen, and knave, tierce to a king; knave, ten, and nine, tierce to a knave, &c. and the best tierce, quarte, or quinte, i. e. that which takes its descent from the best card, prevails; so as to make all the others in that hand good, and destroy all those in the other hand.—In like manner a quarte in one hand sets aside a tierce in the other.

The sequences over, they proceed to examine how many aces, kings, queens, knaves, and tens each holds; reckoning, for every three of any sort, three: but here too, as in sequences, he that, with the same number of threes, has one that is higher than any the other has, for example, three aces, has all his others made good hereby, and his adversary's all set aside.—But four of any sort, which is called a quatorze, always sets aside three.

All the game in hand being thus reckoned, the eldest proceeds to play, reckoning one for every card he plays above a nine, and the other follows him in the suit; and the highest card of the suit wins the trick.—Note, unless a trick be won with a card above a nine (except the last trick) nothing is reckoned for it; though the trick serves afterwards towards winning the cards; and that he who plays last does not reckon for his cards, unless he wins the trick.

The cards being played out, he that has most tricks reckons ten for winning the cards.—If they have tricks alike, neither reckons any thing.—The deal being finished, and each having marked up his game, they proceed to deal again as before, cutting afresh each time for the deal.

If both parties be within a few points of being up, the carte-blanche is the first thing that reckons, then the point, then the sequences, then the quatorzes or threes, then the tenth cards. He that can reckon thirty in hand by carte-blanche, points, quintes, &c. without playing, before the other has reckoned any thing, reckons ninety for them;—and this is called a repique;—if he reckons above thirty, he reckons so many above ninety.—If he can make up thirty, part in hand, and part play, before the other has told any thing, he reckons for them sixty. — And this is called a pique. Whence the name of the game.

He that wins all the tricks, instead of ten, which is his right for winning the cards, reckons forty,—and this is called a capot.

This game has in some cases been the object of mathematical computations.

Thus Mr. de Moivre has proposed and solved the following problems.

1°. To find at Piquet the probability which the dealer has for taking one ace or more in three cards, he having none in his hands. He concludes from his computation, that it is 29 to 28, that the dealer takes one ace or more.

2°. To find at Piquet the probability which the eldest has of taking an ace or more in five cards, having no ace in his hands. Answer, 232 to 91, or 5 to 2 nearly.

3°. To find at Piquet the probability which the eldest has of taking both an ace and a king in five cards, he having none in his hand. Answer, the odds against the eldest hand taking an ace and a king are 331 to 335, or 21 to 20 nearly.

4°. To find at Piquet the probability of having twelve cards dealt to, without king, queen, or knave; which case is commonly called cartes-blanches. Answer, the odds against cartes-blanches are 323 to 578,956, or 1791 to 1 nearly.

5°. To find how many different sets, essentially different from one another, one may have at Piquet before taking in. Answer, 28,967,278. This number falls short of the sum of all the distinct combinations, whereby 12 cards may be taken out of 32, this number being 225,792,840; but it ought to be considered, that, in that number, several sets of the same import, but differing in suit, might be taken, which would not introduce an essential difference among the sets.

Mr. de Moivre also gives some observations on this game, which he had from an experienced player. See *Doctrine of Chances, pag.* 151 to 159.

Monf. de Monmort has also treated of Piquet in his Analyse des Jeux de Hazard.

PISSASPHALTUM, in natural history, the name of a genus of fossils, the characters of which are these: they are fluid mineral bodies, of a somewhat thick consistence, dusky, and opake, of a strong smell, and readily inflammable, but leaving a residuum of greyish ashes after burning.

Brine PITS, the name given, by the people of Worcestershire and Cheshire, to the wells or Pits affording the salt water, out of which they extract the salt.

These waters, though they all contain salt, yet have other things also in them, and these not in small quantity. They all contain a very large proportion of stony matter; this is common to the whole set, but particular substances besides this are found in the particular Pits. At Northwich in Cheshire, there are four Pits, the water of all which stinks very strongly of sulphur, and contains so much vitriol, that it will turn black like ink, with a decoction of galls; yet this is boiled into a very fine and pure kind of salt, common at our tables under the name of basket salt, and having no such properties.

There is a vast quantity of stony matter precipitated from these pans of brine in the boiling them to salt; this is partly saved in small pans set at the side of the boiler, and partly precipitates to the bottom of the pan, where it forms a crust like that at the bottoms and sides of our tea-kettles, which the workmen find it necessary to remove every week; but there is no vitriol or sulphur separated. *Phil. Transf.* N°. 150.

In the country near where these brine Pits are, the instruments used in boring bring up fine and hard salt; so that they give proofs of there being rocks of salt in many places. All along the river Weever, on each side, the earth affords brine wherever it is opened; but all these are not fit for boiling, many of the Pits affording a brine too weak to be worked to any advantage. The very strongest Pits sometimes also become at once too weak; it is owing to the irruptions of fresh openings into them, and sometimes the river itself makes its way into them, and overflows them with such a quantity of fresh water, that they are utterly spoiled. The brine-Pits at Weston, near Stafford, afford a brine that stinks like rotten eggs; this turns instantly to ink with galls, and purges and vomits violently, if taken even in a small quantity. This in boiling deposits a white flaky sand, or stony matter, without smell or taste, and the salt is pure and fine.

The Pit at Droitwich, in Worcestershire, affords no sand in the boiling, nor any the least sediment of the stony matter at the bottom of the pan, and the salt is the purest of all the others; and by the people of the country is esteemed the most wholesome, because of its being without the sand. This and the other Pits hereabout all have the smell of rotten eggs, especially after a little rest, as on the Monday morning after the Sunday's rest. If meat be put to pickle in the brine of these Pits, instead of being preserved it will stink in twenty-four hours, sometimes in twelve, yet they yield the best salt of any inland Pits in the world.

The sulphur spaws of Yorkshire, which are very numerous in different parts of the county, all stink violently of rotten eggs; but, if well drawn and worked, they would prove as inoffensive as the rest, and only so many weaker or stronger brine-Pits; and the smell is no other than that of the Cheshire and Staffordshire brine, when it has been left some time at rest. It is remarkable, that, though the stony matter is deposited in such vast plenty by the waters of all our salt springs, it is not found

found in any abundance in those places where salt is made out of the sea-sand, as in Lancashire and some other places; so that it is much more than the natural quantity of spar contained in water that is thus deposited; and indeed it appears from trial, that the brine of our salt-springs, in general, contains more than twenty times the quantity of spar that common water does.

This stony matter separates itself from the water before the salt does, and thus it appears to do in many other waters impregnated with mineral particles. The vitriolic waters all contain ochre and salt, and in all these the ochre separates itself first in the boiling, and then the vitriol, and the stony matter precipitated from common salt springs affords, on an analysis, the salt called nitrum calcarium, in considerable abundance. *Phil. Transf.* N°. 156.

PITH (*Dict.*)—As the substance of the trunk in trees becomes more woody, the Pith is compressed and strained to such a degree, that it wholly disappears.

The Pith of trees is continued farther into their minute parts than is generally conceived; the smallest branches and pedicles of the leaves and flowers have their share of it, according to the nature of the trees they belong to; and even the middle ribs of the leaves, when examined by the microscope, are not without it: a transverse section of one of these ribs of the leaf of a pithy tree shews a very beautiful arrangement of vessels, or little bladders, containing a quantity of clear liquor, and resembling in all respects those of which the Pith in the branches is composed. The Pith in these is not round, however, as in the others, but flat, and runs from one end of the pedicle to the other, in form of a thin white rib, gradually lessening to a point.

The Pith of plants, in fine, seems what the marrow is in animals, a congeries of an infinite number of vesicles, which seem destined to separate a finer juice than is necessary for the nourishment of the coarser parts of the tree. It is observed of plants which have a larger than ordinary share of Pith, that they produce larger quantities of flowers than others; instances of this are seen in the rose, the iliac, and the common elder: and, in the ferulaceous plants, the quantity of flowers is not only profusely large, according to the great quantity of Pith in their stalks, but the Pith seems carried up the stalks all the way to the seeds themselves; the long seeds of the sweet myrrhis, and other the like plants, while not ripe, being only Pith. *Mem. Acad. Scien.* 1709.

PLANE *tree*, *platanus*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the amentaceous kind, and is of a glomerated shape, and composed of a great number of stamina with their apices. These flowers are barren, and the embryo fruits are found on other parts of the plant; these finally become larger, and contain several seeds winged with down.

PLANET (*Dict.*) — *Plate* VII. *fig.* 2, 3, 4, 5, 6, 7, and 8, exhibit the proportion that the several Planets bear to each other.

PLANS *of bridges*, the representations of these structures laid down on a plane, such as they appear on the ground.

PLANTA'GO, *plantain*, in botany, a genus of plants whose characters are:

The calyx is monophyllous, quadrifid, tubulous, and very tender. The flower in it is monopetalous, shaped somewhat like a bason, quadripartite, and expanded in form of a star: the ovary is guarded by four long stamina; whence some take the flower to be apetalous. The fruit is a shell, almost of an oval or conic form, when ripe, opening transversly into two parts (one of which rests upon the other;) and is divided by an intercloſure into two capsules, full of oblong seeds.

Plantain is cold, dry, and binding, and useful in all kinds of fluxes and hæmorrhages, as spitting and vomiting of blood, bleeding at the nose, the excess of the catamenia, or lochia, as also, for the involuntary making of urine, its heat and sharpness, and the gonorrhœa. It is likewise good to stop the bleeding of wounds, and to consolidate their lips.

The only officinal preparation is the simple distilled water. *Miller's Bot. Off.*

Its leaves are bitter, astringent, and give a faint red colour to the blue paper; the roots give it a deeper, and are only astringent; which shews, that, in the leaves, the sal ammoniac, and the terrestrial parts of this plant, are clogged with a great deal of sulphur; thus the Plantain is vulnerary, resolving, and febrifugous. Tragus commends it very much for the phthisic. In the country they drink the juice, from two ounces to four, at the first access of the paroxysm of intermitting fevers; two drachms of the extract of this plant, or a drachm of its seed reduced to powder, cure a looseness, and all sorts of hæmorrhages. The ptisan and water of Plantain have the same virtues. They are prescribed in the dysentery, spitting of blood, in the immoderate flux of the piles, or terms, for the whites, and losses of blood. In fine, the Plantain is used in all vulnerary and detersive potions. In the inflammation of the eyes, Camerarius made a collyrium with the juice and leaves of this plant mixed with rose-water and sugar. Simon Pauli used the extract of Plantain, and the decoction of sarsaparilla, to cure a young man that made bloody urine, after a gonorrhœa. The gargarism of Plantain is excellent for the diseases of the throat; this plant is an ingredient in the powder which Julian Paulmier has prescribed to cure madness. *Martyn's Tournefort.*

PLA'SHING, a term used by our farmers to express an operation performed at certain times upon the quick-set hedges, in order to assist their growth and continuance. This operation is performed sometimes in October, but more usually in February; and this is by much the better season for it. Suppose a hedge to be of twenty or thirty years growth, and full of old stubs, as well as young shoots, this is the kind of hedge that requires Plashing most of all.

The old stubs must be cut off within two or three inches of the ground, and the best and longest of the middle-sized shoots must be left to lay down. Some of the strongest of these must also be left to answer the purpose of stakes. These are to be cut off to the height at which the hedge is intended to be left, and they are to stand at ten feet distance one from another: when there are not proper shoots for these at due distances, their places must be supplied with common stakes of dead wood. The hedge is to be first thinned, by cutting away all but those shoots which are intended to be used either as stakes, or the other work of the Plashing: the ditch is to be cleaned out with the spade, with sloping sides each way; and when there is any cavity on the bank on which the hedge grows, or the earth has been washed away from the roots of the shrubs, it is to be made good by facing it, as they express it, with the mould dug from the upper part of the ditch; all the rest of the earth dug out of the ditch is to be laid upon the top of the bank, and the owner should look carefully into it, that this be done; for the workmen, to spare themselves trouble, are apt to throw as much as they can upon the face of the bank; which, being by this means overloaded, is soon washed off into the ditch again, and a very great part of the work undone again, whereas what is laid on the top of the bank always remains there, and makes a good fence of an indifferent hedge.

In the Plashing the quick, two extremes are to be avoided; these are, the laying it too low, and the laying it too thick: this makes the sap run all into the shoots, and leaves the Plashes without sufficient nourishment; which, with the thickness of the hedge, finally kills them. The other extreme of laying them too high is equally to be avoided; for this carries up all the nourishment into the Plashes, and so makes the shoots small and weak at the bottom, and, consequently, the hedge thin. This is a common error in the north of England. The best hedges, made any where in England, are those of Hertfordshire; and they are plashed in a middle way between the two extremes, and the cattle are by that prevented both from cropping the young shoots, and from going through; and a new and vigorous hedge soon forms itself.

When the shoot is bent down that is intended to be plashed, it must be cut half-way through with the bill: the cut must be given sloping, somewhat downwards, and then it is to be wound about the stakes, and, after this, its superfluous branches are to be cut off, as they stand out at the sides of the hedge. If, for the first year or two, the field where a new hedge is made can be plowed, it will thrive the better for it; but, if the stubs are very old, it is best to cut them quite down, and to secure them with good dead hedges on both sides, till the shoots are grown up from them strong enough to plash; and, wherever void spaces are seen, new sets are to be planted to fill them up. A new hedge, raised from sets in the common way, generally requires Plashing about eight or nine years after. *Mortimer's Husbandry.*

PLA'STERING. The modern taste runs greatly into Plastering, and it were much to be wished that this art could be again brought to its ancient perfection. In our best buildings, the plastered walls and ceilings crack and fly, and in a little time grow damp, or moulder to decay. The Romans had an art of rendering their works of this kind much more firm and durable, and there is no reason to despair of reviving this art by proper trials.

The ancient Plastering of these people, preserved to this time, where it has not met with violent blows or injuries from accidents, is still found as firm and solid, as free from cracks and crevices, and as smooth and polished on the surface, as if made of marble. The bottoms and sides of the Roman aqueducts were made of this Plastering, and endured many ages without hurt, unless by accidents; witness that, whereof some yards are still to be found on the top of the Ponte de Gards, near Nismes, for the support of which that famous bridge was built to carry water to the said town. The roofs of houses and the floors of rooms at Venice are covered with a sort of plaster, made of later date, and yet strong enough to endure the sun and weather for several ages, without cracking or spoiling, and without much injury from people's feet.

The secret of preparing this Venetian plaster is not among us; but it would be worth while to try whether such a substance might not be made by boiling the powder of gypsum dry over the fire, for it will boil in the manner of water; and, when this boiling or recalcining was over, the mixing with it rosin, or pitch, or both together, with common sulphur, and the powder of sea shells. If these were all mixed together, and the water added to it hot, and the matter all kept hot upon the fire till

till the inſtant of its being uſed, ſo that it might be laid on hot, it is poſſible this ſecret might be hit upon.

Wax and oil of turpentine may be alſo tried as additions : theſe being the common ingredients in ſuch cements as we have accounts of as the firmeſt. Strong ale-wort is by ſome directed to be uſed, inſtead of water, to make mortar of lime-ſtone be of more than ordinary ſtrength. It is poſſible, that the uſe of this tenacious liquor to the powdered ingredients of this propoſed plaſter might greatly add to their ſolidity and firmneſs. *Philoſ. Tranſ.* N°. 93.

PLATES, in gunnery.—The prize Plates are two Plates of iron on the cheeks of a gun carriage, from the cape ſquare to the center, through which the prize bolts go, and on which the hand-ſpike reſts where it poiſes up the breach of the piece. Breaſt Plates are the two Plates on the face of the carriage, one on each cheek. Train Plates are the two Plates on the cheeks at the train of the carriage. Dulidge Plates are the ſix Plates on the wheel of a gun carriage, where the fellows are joined together, and ſerve to ſtrengthen the dulidges.

PLA'TFORM (*Dict.*) — All practitioners are agreed, that no ſhot can be depended on, unleſs the piece be placed on a ſolid Platform ; for, if the Platform ſhakes with the firſt impulſe of the powder, it is impoſſible but the piece muſt likewiſe ſhake ; which will alter its direction, and render its ſhot uncertain. To prevent this accident, the Platform is uſually made extremely firm to a conſiderable depth backwards, ſo that the piece is not only well ſupported in the beginning of its motion, but likewiſe through a great part of its recoil. However, it is ſufficiently obvious, that, when the bullet is ſeparated from the piece, it can be no longer affected by the trembling of the piece or Platform ; and by a very eaſy computation it will be found, that, in a piece ten feet in length, carrying a bullet of twenty-four pounds, and charged with ſixteen pounds of powder, the bullet will be out of the piece before it has recoiled half an inch ; whence, if the Platform be ſufficiently ſolid at the beginning of the recoil, the remaining part of it may be much ſlighter, ſince its unſteadineſs beyond the firſt half inch will have no influence on the direction of the ſhot : and hence a more compendious method of conſtructing Platforms may be found out. *New Princip. of Gunn.*

PLA'TONISM (*Dict.*)—In after-times, about the firſt ages of the Chriſtian church, the followers of Plato quitted the title of Academiſts, and took that of Platoniſts.

It is ſuppoſed to have been at Alexandria in Egypt, that they firſt aſſumed the new title, after having reſtored the ancient academy, and re-eſtabliſhed Plato's ſentiments ; which in proceſs of time had many of them been laid aſide.

Porphyry, Plotin, Iamblichus, Proclus, and Plutarch, are thoſe who acquired the greateſt reputation among the Greek Platoniſts : and, among the Latins, Apuleius and Chalcidius. — Among the Hebrews, Philo Judæus.—The modern Platoniſts own Plotin the founder, at leaſt the reformer of their ſect.

The Platonic philoſophy appears very conſiſtent with the Moſaic ; and a great party of the primitive fathers follow the opinions of that philoſopher, as being favourable to Chriſtianity. —Juſtin is of opinion, Plato could not learn many things he has ſaid in his works, from mere natural reaſon ; but thinks he might have learnt them from the books of Moſes, which he read when in Egypt.

Hence Numenius, the Pythagorean, expreſſly calls Plato the Attic Moſes ; and upbraids him with plagiariſm, in that he ſtole his doctrine about the world and God, from the books of Moſes. Theodoret ſays expreſsly, that he has nothing good and commendable about the Deity, and his worſhip, but what he ſtole from the Hebrew theology ; and Clemens Alexandrinus calls him the Hebrew philoſopher.

Gale is very particular in his proof of the point, that Plato borrowed his philoſophy from the ſcriptures, either immediately, or by means of tradition; and, beſides the authority of ancient writers, brings ſome arguments from the thing itſelf.— As, for inſtance, Plato's confeſſion that the Greeks borrowed their knowledge of the one infinite God, from an ancient people, better and nearer to God than they ; by which people, our author makes no doubt, he meant the Jews : from his account of the ſtate of innocence ; as, that man was born of the earth, that he was naked, that he enjoyed a truly happy ſtate, that he converſed with brutes, &c.—In effect, from an examen of all the parts of Plato's philoſophy, phyſical, metaphyſical, and ethical, this author finds, in every one, evident characters of its ſacred original.

As to the manner of the creation, Plato teaches that the world was made according to a certain exemplar, or idea, in the divine architect's mind. And all things in the univerſe, in like manner, he ſhews, do depend on the efficacy of eternal ideas.

This ideal world is thus explained by Didymus : ' Plato ſuppoſes certain patterns or exemplars of all ſenſible things, which he calls ideas ; and, as there may be various impreſſions taken off from the ſame ſeal, ſo is there a vaſt number of natures exiſting from each idea.' This idea he ſuppoſes to be an eternal eſſence, and to occaſion the ſeveral beings in nature to be ſuch as itſelf is : and that moſt beautiful and perfect idea, which comprehends all the reſt, of whatever kind, he maintains to be the world.

Further, Plato teaches that the univerſe is an intelligent animal, conſiſting of a body and a ſoul.

The firſt matter whereof this body was formed, he obſerves, was a rude indigeſted heap, or chaos : now, adds he, the creation was a mixed production ; and the world is the reſult of a combination of neceſſity and underſtanding, i. e. of matter, which he calls neceſſity, and the divine wiſdom.

The principles, or elements, which Plato lays down, are fire, air, water, and earth.

He ſuppoſes two heavens ; the empyrean, which he takes to be of a fiery nature, and to be inhabited by angels, &c. and the ſtarry heaven, which he teaches is not adamantine or ſolid, but liquid and ſpirable.

His phyſics, or doctrine de corpore, is chiefly laid down in his Timæus ; where he argues on the properties of body, in a geometrical manner ; which Ariſtotle takes occaſion to reprehend in him.—His doctrine de mente is delivered in his tenth book of Laws, and his Parmenides.

St. Auguſtine commends the Platonic philoſophy ; and even ſays, that the Platoniſts were not far from Chriſtianity : he adds, that the generality of the new Platoniſts of his time embraced the faith.

Juſtin Martyr profeſſes, that Plato's doctrine was of the utmoſt advantage to him, in helping him to believe the myſteries of the Chriſtian faith.—To which it may be added, that it was in good meaſure by Plato's help that Origen confuted Celſus.

Indeed, the late author of Platoniſme devoilé carries things to an extravagant length, when he contends, that the dogmata of of our religion are only the opinions of Plato ; that the fathers give us nothing of the myſteries thereof, but what they learnt from him ; and that Chriſtianity is only Platoniſm veiled, or covered over. To which opinion, however, M. le Clerc ſeems a little inclined.

Among the multiplicity of things to be done, and to be avoided, for the preſervation of animal life, &c. how ſhould we have diſtinguiſhed between the one and the other, but for the ſenſations of pleaſure and pain ? Theſe are not only ſpurs, to urge us on, but alſo guides, to direct us whither we are to go. Where-ever nature has fixed pleaſure, we may take it for granted, ſhe there injoins a duty ; and ſomething is to be there done, either for the individual, or the ſpecies.

Hence, it is that our pleaſures vary at different ſtages of life ; the pleaſures, for inſtance, of a child, a youth, a grown man, an old man, &c. all tending to thoſe particular things required by nature in that particular ſtate of life, either for the preſervation, ſimply, or for that and propagation, &c.

Hence, from the different conſtitutions of the body, at different ages, it were very eaſy to account for all the particular taſtes and pleaſures thereof : not by deducing the pleaſures mechanically from the diſpoſition of the organs in that ſtate ; but by conſidering what is neceſſary for the perfection and well-being of the individual in that ſtate, and what it is to contribute to that of the ſpecies.—In a child, mere preſervation in the preſent ſtate is not enough ; it muſt likewiſe grow : to bring this to paſs, nature has made the returns of hunger, &c. more frequent, as well as more acute ; and the pleaſures of feeding more exquiſite. And, that the exceſs of aliment in proportion to the bulk of the body may be diſpenſed withal, ſhe has made one of the great pleaſures of that ſtate to conſiſt in a ſeries of ſportive exerciſes, by means whereof the parts of the body come to be opened and expanded, and arrive at maturity. This done, the pleaſures that conduced thereto diſappear ; and others, ſuited to the new ſtate, ſucceed.

PLEURONE'CTES, in ichthyology, the name of a genus of fiſhes of the malacopterygious kind, the characters of which are theſe : the branchioſtege membrane, on each ſide, contains ſix bones of a cylindric figure ; and in the middle between theſe, but lower down, there are two others joined together at the end, but theſe are ſcarce conſpicuous. Both the eyes are placed in one ſide of the head ; in ſome they are in the right ſide, and in others in the left. The eyes are covered with a ſkin. One ſide of the fiſh is always white, the other is ſpotted or obſcure.

PLO'MO, in metallurgy, a name given by the Spaniards, who have the care of the ſilver mines, to the ore of that metal when it is found adhering to the ſurface of ſtones, and incruſting their cracks and cavities in the form of ſmall and looſe grains of gunpowder. Though theſe grains be but few in number, and the reſt of the ſtone have no ſilver in it, yet, they are always very happy in meeting with it, as it is a certain token that there is a very rich vein ſomewhere in the neighbourhood. And, if, in digging forwards, they ſtill meet with theſe grains, or the Plomo, in greater quantity, it is a certain ſign that they are getting nearer the good vein.

PLO'VER, *pluvialis*, in zoology, a bird of paſſage well known among ſportſmen.

The Plovers are very eaſily taken at the time of their firſt coming over, when they have not got any other birds mixed among them ; but, when they afterwards pick up the teal and other ſhy birds among them, it becomes more difficult. The beſt ſeaſon for taking them is in October, eſpecially in the beginning of that month : after this they grow timorous, and are not eaſily taken again till March, which is the time of their coupling. The ſevereſt froſts are not the beſt ſeaſon for taking them in nets, but variable weather does better. The north-weſt wind is found diſadvantageous to the taking of them ;

 and,

and, in general, great regard is to be paid to the courſe of the wind in ſetting of the nets. All ſea fowl fly againſt the wind when the land lies that way; and the nets for the taking them are therefore to be placed in a proper direction accordingly.

PLOUGH (*Dict.*)— The advantage of digging with the ſpade, or ſuch other inſtrument, very naturally led men to the invention of the Plough, a greatly more expeditious way of doing the ſame thing; that is, cutting and breaking the earth into ſmall pieces; but in this the ſpade has the advantage of the common Plough, as it goes deeper, and divides the earth more minutely; but the improvement of the common Plough into the four-coultered one, ſhews that it is eaſy to make the Plough perform this office as much better, as it uſually does it worſe than the ſpade.

The Plough deſcribed by Virgil had no coulter; and at this time, the Ploughs of Italy and the ſouth of France, have none; and the Ploughs in Greece, and in the eaſtern nations in general, are of the ſame kind. Neither is it indeed poſſible to uſe a coulter in ſuch a Plough; becauſe the ſhare does not cut the bottom of the furrow horizontally, but obliquely: in going one way it turns off the furrow to the right-hand, but in coming back it turns it off to the left; therefore if it had a coulter, it muſt be on the wrong ſide every other furrow.

It is a great miſtake in thoſe who ſay that Virgil's Plough had two earth-boards, for it had really none at all; but the ſhare itſelf, always going obliquely, ſerved inſtead of an earth board; and two ears, which were the corners of a piece of wood lying under the ſhares, did the office of ground-wriſts. This faſhion of the Plough continues to this day in thoſe countries; and in Languedoc this ſort of Plough performs tolerably well when the ground is fine, and makes a ſhift to break up light land. This is the ſort of land that is common in the Eaſt, and the arable lands about Rome, being never ſuffered to be fallow ſo long as to come to turf: this Plough ſucceeds very well in ſuch places, but it would be wholly impoſſible to turn up what in England we call ſtrong land, with it.

The Engliſh Ploughs are therefore different from theſe, as the ſoil is different. Our Ploughs, where well made, cut off the furrow at the bottom horizontally; and therefore, it being as thick on the land ſide as on the furrow ſide, the Ploughs cannot break it off from the whole land at ſuch a thickneſs, being ſix times greater than what the eaſtern Ploughs have to break off, and for this purpoſe it muſt have, of neceſſity, a coulter to cut it off: by this means the furrow is turned perfectly whole, and no part of the turf of it is broken; and if it lie long without new turning, the graſs from the edges will ſpread, and form a new turf on the other ſide, which was the bottom of the furrow before the turning; but is now become the ſurface of the earth, and will ſoon become greener with graſs than it was before plowing.

If whole, ſtrong, turfy furrows are plowed croſs-ways, as is too commonly practiſed, the coulter cannot eaſily cut them; becauſe, being looſe underneath, they do not make a proper reſiſtance or preſſure againſt its edge, but are apt to be drawn on heaps, and turned in all directions, but without cutting.

Some of our Ploughs have heavy drags, with long iron tines in them; and though theſe broken pieces of furrows, being now looſer than before, require keener edges to cut them, theſe tines have no edges at all. Thus the clods of earth are toſſed into heaps again, and the ſurface left bare between them, and great labour and expence is uſed to very little purpoſe: all this is owing to the one coulter.

If the ſoil be ſhallow, it may be broken up with a narrow furrow, which will the ſooner be brought into tilth; but if it be a deep ſoil, the furrows muſt be proportionably enlarged, or elſe a great part of the good mould will be left unmoved, and ſo be loſt. The deeper the land is, the worſe it is broke by one coulter; that is, it is broke into larger furrows, and it requires ſuch repeated labour to conquer this, that, often, the beſt land will ſcarce pay the tillage.

This gives an opportunity to ſervants to cheat their maſters. They plow ſuch deep land with a ſmall furrow, and ſhallow, to the end, that the turf and furrows may be broken the ſooner, and the ſuperficial part made fine. They pretend the Plough will go deeper the next time; but this is never the caſe,

This ſort of land muſt not be plowed the ſecond time in wet weather; for this will cauſe the weeds to multiply, and the earth will be formed into thick and heavy clods where trodden: and in dry weather, the reſiſtance of the untouched earth below, and the ſlight preſſure of the Plough above, will always be reaſons why the Plough will enter no deeper the ſecond time than it did the firſt.

Another way to conquer a ſtrong turf, is to plow it up firſt with a breaſt Plough, very thin; and when the ſwerd is rotten, then it is to be plowed to the proper depth: but this method is liable to great objections; it is very troubleſome and expenſive, and if the turf be pared off in the winter, or early in ſpring, it is a chance but the rains come on, and ſet it to growing faſter than before: if, on the other hand, it be pared later in the year, though the turf be thoroughly killed by the ſucceeding dry weather, yet the time is loſt, and the farmer loſes the ſowing ſeaſon for wheat, which is the proper corn for ſuch ſtrong land.

The four-coultered Plough is the proper inſtrument for the farmer to have recourſe to on this and many other the like occaſions. This is an improvement on the common Plough, that makes it cut the pieces of earth into four; that is, it thus divides the earth four times as ſmall as the common Plough.

The common two-wheeled Plough has of late years become univerſally uſed in many countries, and is found greatly preferable to the Ploughs they uſed before; there is an objection to it, indeed, in regard to ſome ſtiff and miry lands, in which the wheels become clogged up, and cannot turn. This, however, is eaſily remedied by twiſting thumb ropes of ſtraw about the iron circle and ſpokes of the wheels; theſe ſpreading as they turn, and, as the circle twiſt bears upon the ground, throw off the dirt, and never clog. The two principal parts of this Plough are the head and the tail: the Plough-head contains the two wheels and their axis, or ſpindle, paſſing through a box, and turning round both in it and in the wheels. There are fixed perpendicularly in this box two crow-ſtaves, as they are called, which are flat and narrow boards, each having on it two rows of holes, whereby to raiſe or ſink the beam of the Plough, by pinning up or down the pillow, to increaſe or diminiſh the depth of the furrow. Behind are a pair of gallows, through which the crow-ſtaves paſs at the top by mortiſes, into which they are pinned; and to theſe are faſtened what are called the wilds, which are rings and crooks of iron, by which the whole Plough is drawn in the working. From the box to the center of the beam there is carried an iron-chain, conſiſting of four, five, or more long links, and called the tow-chain: this faſtens the Plough-tail to the Plough-head. It is fixed to an iron collar, faſtened in the beam at one end, and at the other paſſes through a hole in the middle of the box, and is pinned in with a wooden pin.

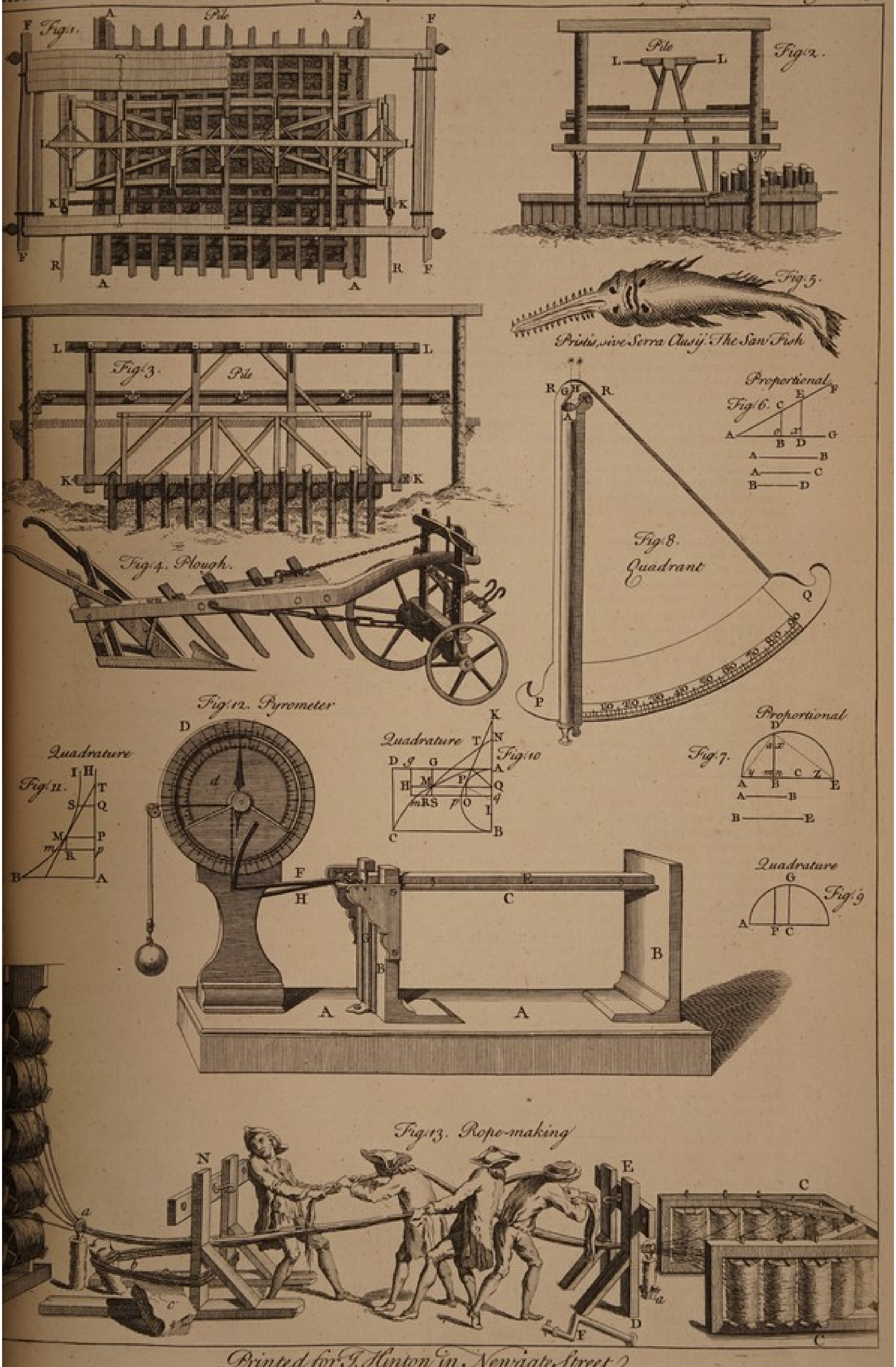
From the ſame iron-collar to which the tow-chain is fixed, there is alſo another chain faſtened, called the bridle-chain: this runs above the beam, as the tow-chain does below it, and is compoſed of ſmaller and more numerous links. At the upper end, as the tow-chain enters the box of the Plough, this bridle-chain is fixed to the top of what is called the ſtake of the Plough: this is a perpendicular ſtick, carried up parallel with the left crow-ſtaff, and pretty near it, and faſtened to it by a wyth or rope, or by the end of the bridle-chain itſelf, when that is long enough. This ſtake is alſo faſtened in its lower part, under the gallows, to the ſame crow-ſtaff, by another wyth or piece of rope.

Theſe are the parts of which the head-part of the Plough is compoſed. The Plough-tail conſiſts of the beam carried from the head to the very extremity, and ſerving as the ſupport and baſe of all the reſt. A little below the collar to which the tow-chain and bridle-chain are faſtened, this beam is pierced with a large hole, which lets through the coulter: this is a long and narrow piece, terminating in an edge, and reaching juſt to the ſhare; and it is fixed immoveably in its place by means of a wedge which is driven into the hole of the beam with it: the office of this coulter is to cut the earth as it is thrown up by the ſhare. Behind theſe, the ſame beam is pierced with two more holes, one very near its end: theſe give paſſage to two oblong pieces, called the fore-ſheat and hinder-ſheat, by which the Plough-ſhare is ſupported in its place. To the top of the hinder-ſheat there is faſtened a ſhort handle by a wooden pin. Parallel to the hinder-ſheat there runs up a piece of wood of much the ſame form, called the drock; and to this is faſtened another horizontal piece, called the ground-wriſt: theſe are all on the right-hand ſide of the Plough, and parallel with the fore-ſheat. There runs another piece of much the ſame form with it, on the right-hand; and the bottom of this is the earth-board. The long handle of this, which reaches as far that of the ſheat, is faſtened to the drock by a pin, the other end of which goes into the beam. Near the lower end of the fore-ſheat, there are two flat pieces of iron, which paſs from the two ſides of it up to the beam; and being let through it, are faſtened to the upper part by ſcrews and pins. Theſe keep the ſheat in its place.

The ſtructure of the four-coultered Plough is different, in ſome reſpects from this, though in general founded on it. Its beam is ten feet long, whereas that of the common Plough is but eight. The beam is ſtraight in the common Plough, but in this it is arched in one fourth part of its length, near the Plough-head. At the diſtance of three feet two inches from the end of the beam at the Plough-tail, the firſt coulter, or that next the ſhare, is let through; and at thirteen inches from this, a ſecond coulter is let through: a third at the ſame diſtance from that; and, finally, the fourth at the ſame diſtance from the third, that is, thirteen inches.

The crookedneſs of the upper part of the beam in this Plough is contrived to avoid the too great length of the three foremoſt coulters, which would be too much, if the beam was ſtraight all the way; and they would be apt to bend and be diſplaced, unleſs they were vaſtly heavy and clumſy. Aſh is the beſt wood to make the beam of, it being ſufficiently ſtrong, and yet light.

The ſheat in this Plough is to be ſeven inches broad. The fixing



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ing of the ſhare in this, as well as in the common Plough, is the niceſt part, and requires the utmoſt art of the maker; for the well going of the Plough wholly depends upon the placing of this. Suppoſing the axis of the beam, and the left ſide of the ſhare, to be both horizontal, they muſt never be ſet parallel to each other; for, if they are, the tail of the ſhare, bearing againſt the trench as much as the point, would cauſe the point to incline to the right-hand, and it would be carried out of the ground into the furrow. If the point of the ſhare ſhould be ſet ſo, that its ſide ſhould make an angle on the right ſide of the axis of the beam, this inconvenience would be much greater; and if its points ſhould incline much to the left, and make too large an angle on that ſide with the axis of the beam, the Plough would run quite to the left-hand; and, if the holder, to prevent its running quite out of the ground, turns the upper part of his Plough toward the left-hand, the pin of the ſhare will riſe up, and cut the furrow diagonally, leaving it half unplowed. To avoid this and ſeveral other inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs leſs againſt the ſide of the trench than the point does.

The great thing to be taken care of, is the placing the four coulters; for on this the ſucceſs of the whole depends. Theſe muſt be ſo ſet, that the four imaginary planes deſcribed by their four edges, as the Plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from either of the other, then they would not enter the ground together. In order to the placing them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and an half more on the right-hand than the firſt: the third muſt be as much more to the right of the ſecond, and the fourth the ſame meaſure to the right-hand of the third: and this two inches and an half muſt be carefully meaſured from the center of one hole to the center of the other. Each of theſe holes is a mortiſe of an inch and a quarter wide, and is three inches and an half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the ſtanding of the coulter, which is wedged tight up to the poll. A perſpective view of this curious Plough the reader will find in *Plate* XXXV. *fig.* 4.

The coulter is two feet eight inches long, before it is worn; the handle takes up ſixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. *Tull's Horſe-hoeing Huſbandry.* See COULTER.

PLUM-*tree*, *prunus*, in botany, the name of a large and well known genus of fruit-trees.

All the ſpecies of Plums have within their fruit a hard ſtone, within which there is contained a ſoft and tender kernel: this kernel contains the ſeminal plant, from which would be produced another tree of the ſame kind, if it were ſet in the ground; and it is very natural to ſuppoſe, that the only uſe of the thick ſtone or huſk of this was only to preſerve its tender ſubſtance from rotting too ſoon in the earth, and to give it a proper time for developing its parts, to preſerve its natural oilineſs during that time, and to furniſh from its own ſubſtance a proper nouriſhment to the growing plant; for obſervation ſhews, that it finally breaks into a very fine powder.

There has not been found any ſpecies of Plum which had not its kernel contained in a ſtony coat of this kind, from whatever grafts they have been propagated; nor is there any art known by which the kernel of this ſort of fruit can, while growing, be deprived of its coat.

Mr. Marchand, however, in the year 1735, ſhewed, before the Academy of Sciences at Paris, certain Plums, whoſe kernels had no ſtone or ſhell round them; and found that they grew upon a tree which never had produced any others, and which had been known to produce ſuch for twenty years. The kernel in theſe was covered with a reddiſh ſkin, which was rough to the touch; and, within that, with another which was thinner and white. The kernel had nothing particular in it, except that it carried on one ſide of its outer ſurface, and that always in the ſame place, a little ſtony prominence, more or leſs dented on its convex part: this is uſually a twelfth of an inch broad, and two thirds of an inch long, and has no other appearance but that of a diſtempered part of the kernel, only that all the kernels have it.

The thick wrinkled ſkin which ſurrounds the kernel, ſeems in this caſe to ſupply the place of the ſtone or hard ſhell; and in this alſo it reſembles it, that the pulp of the fruit parts eaſily and readily from it: and the hard oblong body, which is placed on one ſide of the kernel, is by no means proper for this purpoſe. *Mem. Acad. Scienc. Par.* 1735.

All the ſorts of Plums are propagated by budding, or grafting them upon ſtocks of the muſcle-Plum, the white pear Plum, the St. Julian, or the bonum magnum.

Budding is much properer than grafting for theſe trees, as they are apt to throw out a great deal of gum from the wound: and the trees ſhould be no more than one year's growth from the bud, when they are tranſplanted; for, if they are more, they ſeldom ſucceed well, being very ſubject to canker; and, if they eſcape that, they uſually produce only two or three luxuriant branches. The whole management of planting and pruning them is the ſame with that of peaches.

If the walls againſt which they are planted are low, they ſhould be ſet eighteen feet aſunder; if they are higher, then fourteen or ſixteen.

Plums ſhould have a middling ſoil, for they ſeldom ſucceed well in too moiſt or too dry a one; and, when planted againſt walls, ſhould have an eaſt or a ſouth-eaſt proſpect. If they have one at full ſouth, they are apt to ſhrivel up, and become mealy.

Plums in general ſucceed very well with proper care on eſpaliers; they will alſo bear very well as ſtandards, but the fruit will be not ſo well taſted. Plums do not only produce their fruit on the laſt year's wood, but alſo on ſpurs that come out of the wood at two or three years old. It is a common error to be too free with the knife in the winter pruning, cutting off the extremities of all the branches; the conſequence of which is, that there is an over quantity of young ſhoots produced, and the fruit is ſmall and poor. *Miller's Gard Dict.*.

PLUMBA'GO, *lead-wort*, in botany, a genus of plants, whoſe characters are:

The root is fibrous, thick, fleſhy, hot, and perennial; the leaves are alternate and entire. The end of the ſhort pedicle unfolds itſelf into a monophyllous, quinquefid, and very hairy calyx, ſhaped like a tube, in whoſe center is ſeated the ovary furniſhed with its proper tube. On the apex of the ovary, grows a monopetalous flower, conſiſting of a long tube, which has its upper part expanded into a circle, ſo as to reſemble the flower of jeſſamin; theſe flowers are diſpoſed in ſpikes. The ſeed is oblong and acuminated.

This is a plant ſeldom or never uſed. It is of an hot and even a cauſtic nature, like pellitory of Spain; and has been made uſe of, like that, for the tooth-ach; it is ſaid, that, even held in the hand, it will cure the pain of the teeth. *Miller's Bot. Off.*

PLUMIE'RIA, in botany, a genus of plants, whoſe characters are:

It has the appearance of the apocynum, and abounds with a lacteous juice. The end of the pedicle paſſes into a little ſhort monophyllous calyx, out of which grows the flower, as in the nerium, but wants the petaloid crown. The ovary, which grows in the bottom of the calyx, becomes a long ſiliquous, double fruit, when opening, likewiſe, and pregnant with a multitude of ſeeds, placed as in the apocynum, but foliated.

This name was given to this beautiful ſpecies of plants, by Dr. Tournefort, in honour to father Plumier, who was botaniſt to the late king of France, and a long time in America, ſearching after new plants; and who has publiſhed a catalogue of the plants, with the new genuſes he conſtituted; and two volumes in folio, with figures and deſcriptions of many of the plants.

Theſe plants grow wild in the Spaniſh Weſt-Indies, from whence ſome of the moſt beautiful kinds were brought into the Engliſh ſettlements in America, and are cultivated in their gardens for ornament. The firſt ſort here mentioned is the moſt common kind, which is preſerved in the gardens of the inhabitants of Jamaica and Barbadoes. The flowers of this kind nearly reſemble thoſe of the red oleander, but are larger, and have an agreeable odour. Theſe are produced in ſmall bunches, at the extremity of the ſhoots, and generally appear in July and Auguſt in this climate, but in the Weſt-Indies they flower a great part of the year.

The milky juice of theſe plants is very cauſtic, and reckoned very poiſonous: in cutting off any of the branches of the plants, if the knife be not immediately cleaned, the juice will corrode it, and turn the blade almoſt black in a very little time, ſo as not to be cleaned off again; and, if dropped on linen, will cauſe it to waſh in holes, equal to aqua fortis.

PLU'MMING, among miners, a term uſed to expreſs the uſing a mine-dial, in order to know the exact place of the work where to ſink down an air-ſhaft, or to bring an adit to the work, or know which way the load inclines, when any flexure happens in it.

It is performed in this manner: a ſkilful perſon with an aſſiſtant, and with pen, ink, and paper, and a long line and a ſun-dial, after his gueſs of the place above ground, deſcends into the adit or work, and there faſtens one end of the line to ſome fixed thing in it; then the incited needle is let to reſt, and the exact point where it reſts is marked with a pen: he then goes farther in, the line ſtill faſtened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwiſe; and then, letting down the dial again, he there likewiſe notes down that point at which the needle ſtands in this ſecond poſition. In this manner he proceeds from turning to turning, marking down the points, and marking the line till he comes to the intended place; this done, he aſcends and begins to work, on the ſurface of the earth, what he did in the adit, bringing the firſt knot in the line to ſuch a place where the mark of the place of the needle will again anſwer its pointing, and continues this till he comes to the deſired place above ground, which is certain to be perpendicularly

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larly over the part of the mine into which the air-ſhaft is to be ſunk.

PLUMO'SE *Antennæ*, in natural hiſtory, a term uſed to expreſs the antennæ, or horns of certain moths and butter-flies which are formed in the manner of feathers, being compoſed of a ſtem and fibres, iſſuing on each ſide from it: theſe are jointed and moveable any way, and even the ſmall fibres, at their ſides, are jointed at their bottoms and are moveable, but they move all together. *Reaumur's Hiſt. of Inſects.*

PLY'MOUTH-*marble*, among our artificers, a term uſed for a ſort of marble dug in great plenty about Plymouth and other parts of Devonſhire, where it lies in very thick ſtrata, and whence it is brought in large quantities to us; and, when wrought, looks little leſs beautiful than ſome of the Italian marbles.

It is very hard and firm, and of a beautiful texture; its ground is a bluiſh white, and its variegations are principally a pale red, and in ſmaller quantities brown and yellow: theſe lie in very orderly beds, and often there is a very agreeable glow of a faint red diffuſed through the whole ſubſtance. It is remarkably even in its whole ſtructure, and is therefore capable of a more than ordinarily elegant poliſh.

PO'CKET, in the wool trade, a word uſed to expreſs a large ſort of bag, in which wool is packed up to be ſent from one part of the kingdom to another.

The Pocket contains uſually twenty-five hundred weight of wool.

POD, among botaniſts, a ſpecies of pericarpium, conſiſting of two valves which open from the baſe to the point, and are ſeparated by a membranaceous partition, from which the ſeeds hang by a kind of funiculus umbilicalis.

PODE'RIS, in antiquity, a robe hanging down to the feet; but is chiefly uſed to expreſs a linen garment, a ſurplice, a ſhirt. The Jewiſh prieſts were covered with this kind of long ſurplices, during the time of their attendance in the temple; and this was the proper habit of their order. *Calmet, Dict. Bibl.*

PO'GGE, *or cataphractus*, in zoology, the name of a ſmall ſea-fiſh, caught in the Engliſh and ſome other ſeas.

POINT *of contrary flexure*, (*Dict.*) — The points of contrary flexure and reflexion of curves are uſually determined by ſuppoſing the ſecond fluxion of the ordinate to be nothing or infinite, that is, $\ddot{y} = o$, or *o o*, or $d\,d\,y = o$, or *o o*. See *L'Hopital Analyſe des Inf. petits.*

But this rule is liable to ſeveral exceptions, as is ſhewn very fully and clearly by Mr. Mac Laurin, in his Treatiſe of Fluxions.

The ordinate *y* paſſes through a point of contrary flexure, when, the curve being continued on both ſides of the ordinate, $\dot{y}$ is a maximum, or minimum. But this does not always happen when $\ddot{y} = o$, or *o o*. Mr. Mac Laurin obſerves in general, that if $\ddot{y}$, $\dddot{y}$, $\ddddot{y}$, &c. vaniſh, the number of theſe fluxions being odd, and the fluxion of the next order to them having a real and infinite value; then *y* paſſes through a point of contrary flexure; but, if the number of fluxions that vaniſh be even, it cannot be ſaid to paſs through ſuch a point, unleſs it ſhould be allowed that a double infinitely ſmall flexure can be formed at one point. *Lib. cit.*

The curve being ſuppoſed to be continued from the ordinate *y*, on both ſides, if $\dot{y}$ be infinite, the extremity of the ordinate is not therefore always a point of contrary flexure, as $\dot{y}$ is not always, in this caſe, a maximum, or minimum, and the curve may have its concavity turned the ſame way on both ſides of the ordinate. But theſe caſes may be diſtinguiſhed by comparing the ſigns of $\ddot{y}$ on the different ſides of the ordinate; for, when theſe ſigns are different, the extremity of *y* meeting the curve is a point of contrary flexure.

The ſuppoſitions $\dot{y} = o$, or *o o*, and of $\ddot{y} = o$, or *o o*, ſerve to direct us where we are to ſearch for the maxima and minima, and for points of contrary flexure; but we are not always ſure of finding them. For though an ordinate or fluxion that is poſitive, never becomes negative at once, but increaſing or decreaſing gradually; yet, after it has decreaſed till it vaniſh, it may thereafter increaſe, continuing ſtill poſitive, or, after increaſing till it becomes infinite, it may thereafter decreaſe without changing its ſign.

POINT *of reflexion*, in geometry, is commonly uſed inſtead of Point of retrogradation, or retrogreſſion.

Hop-POLES, the upright pieces of wood that ſerve for the Hops to twiſt round and grow upon.

The number, length, and bigneſs of the Poles are to be regulated according to the bigneſs of the hills, and their diſtance, and the nature of the ground and ſtrength of the plants. If the hills are wide, there muſt be the more Poles, ſometimes four or five to a hill, or more than that; but, if they ſtand near, two may ſerve for every hill. In hot, dry, and hungry ground, the Poles ſhould ſtand nearer than in rich mellow land, where they are more ſubject to grow groſs and heavy.

If the plants are ſtrong, and the ground rich, the Poles muſt be both large and long, or elſe the crop will ſuffer greatly: if the crop be poor, it is beſt to have but few, and thoſe ſmall and ſhort Poles, otherwiſe the hop will eaſily run itſelf out of heart, and the root will be impoveriſhed.

The Poles ſhould never be made over long the firſt year. The propereſt wood for hop-Poles is the aſh or the alder, and, if they have a ſort of fork at the top, they will keep up the hop the better. The Poles are to be diſpoſed between the hills, to be in readineſs; but they muſt not be ſet up till the plants begin to appear, that it may be known where they ought to be placed. This may be continued till the plants are a yard high, but it ought to be finiſhed at that time, becauſe the plants will be ſtinted or injured in their growth, if they have not ſomething to ſupport them, when arrived at that height.

The Poles muſt be placed not in the hill, but near that part of it out of which each plant to be ſupported grows. They muſt be driven far enough into the ground, ſo that they may rather break than be torn up. Their depth is to be judged by the nature of the ground, their own height, and their expoſure to the wind. Let all the Poles lean outward one from another, that they may ſeem to ſtand at an equal diſtance at the top, to prevent the choaking up the plants below: and they ſhould always lean towards the ſouth, that the ſun may the better ſhine in among them. A ſloping Pole is always more ready to bear a quantity of hops than an upright one, and the ſun ſhines on more of the plants at once by means of it. It is always neceſſary to keep ſome ſpare Poles, by way of reſerve, to be ready in caſe of the others breaking; for, in this caſe, the hops are ſoon ſpoiled with lying on the ground. If a Pole be over-burthened with hops, they may be unwound, and wrapped round a ſtronger Pole put in the place of the other.

The largeſt ſort of hop-Poles ſhould be twenty feet long, and nine inches in circumference, for hops at full growth; and they ſhould be polled about fourteen days after the dreſſing in of rich land. An acre of hop ground generally requires about three thouſand poles.

When the hops are grown to three feet high, they are to be conducted to ſuch of the Poles as are neareſt, or have feweſt hops on them; and they are to be wound about theſe Poles according to the courſe of the ſun, and tied to them looſely with ſome ruſhes, or with ſoft yarn: two or three ſtrings are ſufficient to each Pole, and great care is to be taken that the young ſhoots are not broken in the doing this: they are much more brittle in the morning than the heat of the day. During the months of April and May the plants are to be carefully attended, and kept turned round the Poles; and, when out of reach, a fork, ſtick, or ladder are to be uſed to this purpoſe.

About Midſummer they uſually leave running at length, and begin to branch; ſuch as do not, ſhould have the end broke off, to incline them to it, it being much to the advantage of the owner that they ſhould branch out. From the middle of May to the end of ſummer, the ground between the Poles ſhould be dug or turned up with a plough, to kill the weeds; and the earth about the hills raiſed higher, to keep them moiſt. *Mortimer's Huſb.*

POLAEDRA'STYLA, in natural hiſtory, the name of a genus of cryſtals. The word is derived from the Greek πολὺς, many, ἕδρα, ſides, the privative particle α, not, and στῦλος, a column; and expreſſes a cryſtal compoſed of many planes and having no column.

The bodies of this genus are cryſtals compoſed of two octangular pyramids, joined baſe to baſe, and conſequently the whole body conſiſting of ſixteen planes. Of this genus there are only two known ſpecies: 1. A brown kind with ſhort pyramids, found in conſiderable plenty in Virginia, on the ſides of hills; and, 2. A colourleſs one, with longer pyramids. This has yet been found only in one place, which is the great mine, at Goſſelaer, in Saxony, and there uſually lies at great depths. *Hill's Hiſt. of Foſſ.*

PO'LISHING *of ſhells*. This is an art of no long ſtanding in the world, in its preſent perfection; and as the love of ſea-ſhells is become ſo common among us, it may not be diſagreeable to the reader to find ſome inſtructions in executing ſo pleaſing a method of adding to their natural beauty, and the rules for which are at preſent ſo little known, though the effect of them be ſo much eſteemed.

Among the immenſe variety of ſhells which we are acquainted with, ſome are taken up out of the ſea, or found on its ſhores, in all their perfection and beauty; their colours being all ſpread by nature upon the ſurface, and their natural poliſh ſuperior to any thing art could give. Where nature is in herſelf thus perfect, it were madneſs to attempt to add any thing to her charms; but in others, where the beauties are latent, and covered with a coarſer outer ſkin, art is to be called in, and, the outer veil being taken off, all the internal beauties appear.

Among the ſhells which are found naturally poliſhed are the porcelanes, the caſſanders, the dolia, or conchæ globoſæ, the buccinums, the cornets, and the cylinders, or, as they are generally, though improperly called, the rhombi; excepting only two or three, as the tiara, the plume, and the butter-tub rhombus; where there is an unpromiſing film on the ſurface, hiding a very great ſhare of beauty within.

Though the generality of the ſhells of theſe genera are taken out

out of the sea in all their beauty, and in their utmost natural polish, there are several other genera in which all or most of the species are taken up naturally rough and foul, and covered with an epidermis, or coarse outer skin, which is in many rough and downy or hairy. The tellinæ, the muscles, the cochleæ, and many others are of this kind. The more nice collectors, as naturalists, insist upon having all their shells in their native and genuine appearance, as they are found, when living, at sea; but the ladies who make collections, hate the disagreeable outsides, and will have all such polished: it would be very advisable, however, for both kinds of collectors to have the same shells in different specimens, both rough and polished; the naturalist would by this means, besides knowing the outside of the shell, be better acquainted with its internal characters than he otherwise could be, and the lady would have a pleasure in comparing the beauties of the shell, in its wrought state, to its coarse appearance as nature gives it. How many elegances in this part of the creation must be wholly lost to us, if it were not for the assistance of an art of this kind! many shells in their native state are like rough diamonds, and we can form no just idea of their beauties till they have been polished and wrought into form.

Though the art of Polishing shells is a very valuable one, yet it is very dangerous to the shells; for, without the utmost care, the means used to polish and beautify a shell will often wholly destroy it. When a shell is to be polished, the first thing to be examined is, whether it have naturally a smooth surface, or be covered with tubercles or prominences.

A shell which has a smooth surface, and a natural dull polish, need only be rubbed with the hand, or with a piece of chamoy leather, with some tripoli or fine rotten-stone, and it will become of a perfectly bright and fine polish. Emery is not to be used on this occasion, because it wears away too much of the shell. This operation requires the hand of an experienced person, that knows how superficial the work must be, and where he is to stop; for, in many of the shells, the lines are only on the surface, and the wearing away ever so little of the shell defaces them. A shell that is rough, foul, and crusty, or covered with a tartarous coat, must be left a whole day steeping in hot water: when it has imbibed a large quantity of this, it is to be rubbed with rough emery on a stick, or with the blade of a knife, in order to get off the coat. After this, it may be dipped in diluted aquafortis, spirit of salt, or any other acid; and, after remaining a few moments in it, be again plunged into common water. This will greatly add to the speed of the work. After this it is to be well rubbed with linen cloths, impregnated with common soap; and, when by these several means it is made perfectly clean, the polishing is to be finished with fine emery and a hair brush. If after this the shell, when dry, appears not to have so good a polish as was desired, it must be rubbed over with a solution of gum-arabic; and this will add greatly to its gloss, without doing it any sort of injury. The gum-water must not be too thick, and then it gives no sensible coat, only heightening the colours. The white of an egg answers this purpose also very well; but it is subject to turn yellow. If the shell has an epidermis which will by no means admit the Polishing of it, it is to be dipped several times in diluted aquafortis, that this may be eaten off; and then the shell is to be polished in the usual way with putty, fine emery, or tripoli, on the hair of a fine brush. When it is only a pellicle that hides the colours, the shells must be steeped in hot water, and after that the skin worked off by degrees with an old file. This is the case with several of the cylinders, which have not the natural polish of the rest.

When a shell is covered with a thick and fatty epidermis, as is the case with several of the muscles and tellinæ: in this case aqua-fortis will do no service, as it will not touch the skin; then a rough brush and coarse emery are to be used; and, if this does not succeed, seal skin, or as the workmen call it fish-skin and pumice-stone, are to be taken in to assist.

When a shell has a thick crust, which will not give way to any of these means, the only way left is to plunge it several times into strong aqua-fortis, till the stubborn crust is wholly eroded. The limpets, auris marina, the helmet-shells, and several other species are of this kind, and must have this sort of management; but as the design is to shew the hidden beauties under the crust, and not to destroy the natural beauty and polish of the inside of the shell; the method of using the aquafortis must be this: a long piece of wax must be provided, and one end of it made perfectly to cover the whole mouth of the shell; the other end will then serve as a handle, and, the mouth being stopped by the wax, the liquor cannot get in to the inside to spoil it; then there must be placed on a table a vessel full of aqua-fortis, and another full of common water.

The shell is to be plunged into the aqua-fortis, and, after remaining a few minutes in it, is to be taken out and plunged into the common water. The progress the aqua-fortis makes in eroding the surface is thus to be carefully observed every time it is taken out: the point of the shell, and any other tender parts, are to be covered with wax, to prevent the aquafortis from eating of them away; and, if there be any worm holes, they also must be stopped up with wax, otherwise the aqua-fortis would soon eat through in those places. When the repeated dippings into the aqua-fortis shew that the coat is sufficiently eaten away, then the shell is to be wrought carefully with fine emery and a brush; and, when it is polished as high as can be by this means, it must be wiped clean and rubbed over with gum-water, or the white of an egg. In this sort of work the operator must always have the caution to wear gloves, otherwise the least touch of the aqua-fortis will burn the fingers, and turn them yellow; and often, if it be not regarded, will eat the skin and the nails.

These are the methods to be used with shells, which require but a moderate quantity of the surface to be taken off; but there are others which require to have a larger quantity taken off, and to be uncovered deeper; this is called entirely scaling a shell. This is done by means of an horizontal wheel of lead or tin, impregnated with rough emery; and the shell is wrought down in the same manner in which stones are wrought by the lapidary. Nothing is more difficult, however, than the performing this work with nicety: very often shells are cut down too far by it, and wholly spoiled; and, to avoid this, a coarse vein must be often left standing in some place, and taken down afterwards with the file, when the cutting it down at the wheel would have spoiled the adjacent parts.

After the shell is thus cut down to a proper degree, it is to be polished with fine emery, tripoli, or rotten stone, with a wooden wheel turned by the same machine as the leaden one, or by the common method of working with the hand with the same ingredients, when a shell is full of tubercles, or protuberances, which must be preserved. It is then impossible to use the wheel; and, if the common way of dipping into aqua-fortis be attempted, the tubercles, being harder than the rest of the shell, will be eat through before the rest is sufficiently scaled, and the shell will be spoiled: in this case, industry and patience are the only means of effecting a polish. A camel's hair pencil must be dipped in aqua-fortis, and with this the intermediate parts of the shell must be wetted, leaving the protuberances dry: this is to be often repeated, and, after a few moments, the shell is always to be plunged into water to stop the erosion of the acid, which would otherwise eat too deep, and destroy the beauty of the shell. When this has sufficiently taken off the foulness of the shell, it is to be polished with emery of the finest kind, or with tripoli, by means of a small stick; or the common Polishing-stone used by the gold-smiths may be used.

This is a very tedious and troublesome thing, especially when the echinated oysters and murexes, and some other such shells, are to be wrought; and what is worst of all is, that, when all this pains has been taken, the business is not well done; for there still remain several places which could not be reached by any instrument; so that the shell must necessarily be rubbed over with gum-water, or the white of an egg afterwards, in order to bring out the colours and give a gloss; in some cases it is even necessary to give a coat of varnish.

These are the means used by artists to brighten the colours, and add to the beauty of shells; and the changes produced by Polishing in this manner are so great, that the shell is often not to be known afterwards for the same it was; and hence we hear of new shells in the cabinets of collectors, which have no real existence as separate species, but are the polished appearance of others well known. To caution the reader against errors of this kind, it may be proper to add the most remarkable species thus usually altered.

The onyx-shell, which in its natural state is of a simple pale brown, when it is wrought slightly, or polished with just the superficies taken off, is of a fine bright yellow; and when it is eat away deeper, it appears of a fine milk-white with the lower part bluish: it is in this state that it is called the onyx-shell; and it is preserved in many cabinets in its rough state, and in its yellow appearance, as different species of shells. The violet shell, so common among the curious, is a species of porcelane, which does not appear in that elegance till it has been polished; and the common auris marina shews itself in two or three different forms, as it is more or less deeply wrought. In its rough state it is dusky and coarse, of a pale brown on the outside and pearly within; when it is eaten down a little way below the surface, it shews variegations of black and green, and, when still farther eroded, it appears of a fine pearly hue within and without. The nautilus, when it is polished down, appears all over of a fine pearly colour; but, when it is eaten away but to a small depth, it appears of a fine yellowish colour with dusky hairs. The burgau, when entirely cleared of its coat, is of the most beautiful pearl-colour; but, when only slightly eroded, it appears of a variegated mixture of green and red; whence it has been called the parroquet-shell. The common helmet-shell, when wrought, is of the colour of the finest agate: and the muscles in general, though very plain shells, in their common appearance, become very beautiful when polished, and shew large veins of the most elegant colours. The Persian shell in its natural state is all over white, and covered with tubercles; but when it has been ground down on a wheel, and polished, it appears of a very grey-colour with spots, and veins of a very bright and highly polished white. The limpets in general become very different when polished, most of them shewing very elegant colours; amongst these the tortoise-shell-limpet is the principal; it does not appear at all of that colour or transparency till it has been wrought.

The elegant species of shell called the junquil-chama, which has

has deceived so many judges of these things into an opinion of its being a new species, is only a white chama with a reticulated surface; but, when this is polished, it loses at once its reticular work and its colour, and becomes perfectly smooth, and of a fine bright yellow: and the violet-coloured chama of New England, when worked down and polished, is of a fine milk-white, with a great number of blue veins disposed like the variegations in agates.

The asses-ear-shell, when polished, after working it down with the file, becomes extremely glossy, and obtains a fine rose-colour all about the mouth. These are some of the most frequent among an endless variety of changes wrought on shells by Polishing; and we find there are many of the very greatest beauties of this part of the creation which must have been lost, but for this method of searching deep in the substance of the shell for them.

The Dutch are very fond of shells, and are very nice in their manner of working them: they are under no restraint, however, in their works, but use the most violent methods, so as often to destroy all the beauty of the shell. They file them down on all sides, and often take them to the wheel, when it must destroy the very characters of the species; nor do they stop at this, but, determined to have beauty at any rate, they are for improving upon nature, and frequently add some lines and colours with a pencil, afterwards covering them with a fine coat of varnish; so that they seem the natural lineations of the shell: the Dutch cabinets are by this means made very beautiful, but they are by no means to be regarded as instructors in natural history. There are some artificers of this nation who have a way of colouring shells all over with a different tinge from that which nature gives them; and the curious are often deceived by these tricks into the purchasing them as new species.

There is another kind of work bestowed on certain species of shells, particularly the nautilus; this is the engraving on it lines and circles, and figures of stars, and other things: this is too obvious a work of art to suffer any one to suppose it natural. Bonani has figured several of these wrought shells at the end of his work, but it is miserably throwing away labour to do them; the shells are spoiled as objects of natural history by it, and the engravings seldom worth any thing. They are principally done in the East-Indies.

Shells are subject to several imperfections; some of these are natural, and others accidental: the natural ones are the effect of age, or sickness in the fish. The greatest mischief happens to shells by the fish dying in them. The curious in these things pretend to be always able to distinguish a shell taken up with the fish alive, from one found on the shores: they call the first a living, the second a dead shell, and say that the colours are always much the faintest in the dead shells. When the shells have lain long dead on the shores, they are subject to many injuries, of which the being eaten by sea worms is not the least: age renders the finest shells livid or dead in their colours.

The finest shells are those which are fished up at sea, not found on the shores. The other natural defects of shells are their having morbid cavities, or protuberances, in parts where their should be none. When the shell is valuable, these faults may be hid, and much added to the beauty of the specimen, without at all injuring it as an object of natural history, which should always be the great end of collecting these things. The cavities may be filled up with mastic, dissolved in spirit of wine, or with isinglass; these substances must be either coloured to the tinge of the shell, or else a pencil dipped in water-colours must finish them up to the resemblance of the rest, and then, the whole shell being rubbed over with gum-water, or with the white of an egg, scarce any eye can perceive the artifice: the same substances may also be used to prepare the battered edge of a shell, provided the pieces chipped off be not too large. And, when the excrescences of a shell are faulty, they are to be taken down with a fine file. If the lip of a shell be so battered that it will not admit of repairing by any cement, the whole must be filed down to an evenness, or ground on the wheel.

POLLI'CIPES, *the toe-shell*, in natural history, the name of a genus of shells, the characters of which are these: they are multivalve flat shells, of a triangular figure, each being composed of several laminæ, which end in a sharp point. They stand upon pedicles, and are furnished with a great number of hairs. We have only one known species of this genus, and this always found in large clusters.

PO'LVERINE, the calcined ashes of a plant; a substance of the nature of our pot-ashes, or pearl-ashes.

It is brought from the Levant and Syria; but in the glass trade, though it be of the nature of the other ashes they use, it is always to be preferred to any other. The barillia, or pot-ashes of Spain, yield more pure salt than the Polverine of the Levant, but the glass made with it has always some tinge of bluishness: that made with the Polverine is ever perfectly white, and this is the substance that ought always to be used for the finest crystal.

The method of procuring the pure salt from these ashes, is to sift them and throw them in a proper quantity into a large copper of boiling water, continuing the boiling till all the salt of the ashes be dissolved by the water, and adding to the water, before the Polverine is put in, about ten pounds of tartar calcined to a blackness. The lee or water, thus impregnated with the salt, must stand a considerable time to settle; and, when perfectly clear, must be evaporated till it thicken, and begin to shew a white dry salt about its edges: then the fire must be kept very slow, and, a skimmer full of holes being sunk into the bottom of the copper, the salt will gather and harden upon it; and this must be taken out every now and then, and the salt taken off and dried for use. Three hundred pounds of Polverine thus yield eighty or ninety pounds of clear salt. When this is dried, it must be slightly calcined in the glass furnace, and then powdered and sifted through a coarse sieve, and kept dry. *Neri's Art of Glass.*

POLYADE'LPHIA *, in botany, a class of plants, whose stamina are formed into three or more separate bodies.

* The word is derived from the Greek πολὺς, many, and ἀδελφὸς, communiter. Among the plants of this class are orange-trees, St. John's wort, &c.

POLYA'NDRIA *, in botany, a class of plants, with hermaphrodite flowers, and a large number of stamina, or male parts, in each.

* The word is derived from the Greek πολὺς, many, and ἀνὴρ, male. The hermaphrodite flowers of this class have a large number of stamina on each, always more than twelve, and those growing to the receptacle of the future seeds.

Of this class are the water-lily, poppy, celandine, &c.

POLYA'NTHUS (*Dict.*) — A great number of plants, called Polyanthus, are found in our gardens; they are all species of a genus called primula. See PRIMULA.

The several varieties of Polyanthus's are produced by sowing of seeds, which should be saved from such flowers as have large upright stems, producing many flowers upon a stalk, the flowers large, beautifully striped, and that open flat: from the seeds of such flowers, there is room to hope for a great variety of good sorts.

These seeds should be sown in boxes filled with light earth, in December, being very careful not to bury the seed too deep; for, if it be only covered with light earth, it will be sufficient: these boxes should be placed where they may receive the benefit of the morning-sun until ten of the clock; but must by no means be exposed to the heat of the day, especially when the plants begin to appear; for at that time one whole day's sun will intirely destroy them: in the spring, if the season should prove dry, you must often refresh them with water; and, as the heat increases, you should remove the boxes more in the shade; for the heat is very injurious to them.

In May, these plants will be strong enough to plant out; at which time you should prepare some shady borders, which should be made rich; upon which you must set the plants about four inches asunder, observing to water them until they have taken root; after which they will require no farther care but to keep them clean from weeds, until the latter end of August following; when you should prepare some borders, which are exposed to the east, with a good light rich earth, into which you must transplant your Polyanthus's, placing them six inches asunder equally in rows, observing, if the season proves dry, to water them until they have taken root. In these borders your plants will flower the succeeding spring; at which time you must observe to mark such of them as are fine, to preserve; and the rest may be transplanted into wildernesses, and other shady places in the garden; where, though they are not very valuable flowers, they will afford an agreeable variety.

Those which you intend to preserve, may be removed soon after they have done flowering (provided you do not intend to save seeds from them) and may be then parted and transplanted into a fresh border of the like rich earth, allowing them the same distance as before; observing also to water them until they have taken root, after which they will require no farther care, but only to keep them clean from weeds; and the following spring they will produce strong flowers; and, if the kinds are good, will be little inferior to a shew of auricula's.

These roots should be constantly removed and parted every year, and the earth of the border changed, otherwise they will degenerate, and lose the greatest part of their beauty.

If you intend to save seeds, which is the method to obtain great variety, you must mark such of them, which, as I said before, have good properties: these should be, if possible, separated from all ordinary flowers; for, if they stand surrounded with plain-coloured flowers, they will impregnate each other; whereby the seeds of the valuable flowers will not be near so good, as if the plants had been in a separate border where no ordinary flowers grew; therefore, the best way is to take out the roots of such as you do not esteem, as soon as the flowers open, and plant them in another place, that there may be none left in the border, but such as you would chuse for seeds.

The flowers of these should not be gathered, except such as are produced singly upon pedicles, leaving all such as grow in large bunches; and, if the season should prove dry, you must now and then refresh them with water, which will cause their seeds to be larger, and in greater quantity, than if they were intirely neglected.

Towards the latter-end of May, the seed will be ripe, which may be easily known by the pods changing brown, and opening; so that you should at that time look over it three times a week, gathering each time such of it as is ripe, which should

ſhould be laid upon a paper to dry, and may then be put up until the ſeaſon of ſowing. *Miller's Gard. Dict.*

POLYCRO'TA, in the naval architecture of the ancients, a word uſed to expreſs ſuch of their gallies as had three, four, five, or more tires of rowers, ſeated out different heights; they were diſtinguiſhed by this term from the monocrota, or thoſe which had only ſingle rows of oars.

POLYGA'LA, *milkwort*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the perſonated kind, conſiſting of one leaf, not perforated behind, and divided before into two lips; the upper lip is bifid, and the lower one elegantly fimbriated. The piſtil ariſes from the lower part of the flower, and ripens at length into a fruit or capſule of a compreſſed figure, divided into two cells, and full of oblong ſeeds. The fruit is uſually found ſurrounded with the cup of the flower, which conſiſts of five leaves, two large and three ſmall ones, which claſp round the ſeed veſſel in the manner of ſo many wings.

Dr. Tennent gives his rattle-ſnake-root, or Virginian Polygala, in the doſe of thirty-five grains in ſubſtance, or in three or four ounces of a ſtrong infuſion, or in a yet ſtronger, in a proportionably ſmaller doſe. The effects of this root being found very great, it was ſuppoſed that its place might poſſibly be ſupplied by this ſpecies of our own growth. It is very certain, that the place of growth may, in ſome plants, make a very great alteration in their virtues; and that the different ſpecies of the ſame genus may, in other inſtances, produce different effects in the human body, ſome ſpecies of plants agreeing in their external forms and generical characters, while they differ in their virtues and qualities.

There appeared on trial a conſiderable difference to the taſte between the American and the European Polygala roots, that of Virginia being very aromatic, acrid, and bitter, and the European only ſlightly acrid, with a very feeble bitterneſs. Another thing that gave great ſuſpicion as to the parallel virtues of the roots of theſe two ſpecies was, that Geſner was found, in his account of virtues of the European Polygala, to call it a very briſk cathartic; a quality which might render its uſe very improper in many of the diſeaſes in which Mr. Lemery and Juſſieu found the Virginian kind to prove a ſerviceable medicine. This laſt was found always very ſpeedily to allay fevers of the pleuritic kind, without increaſing in any great degree the diſcharges by ſtool.

The roots of the European Polygama, being very ſmall and ſlender, gave alſo ſome trouble as to the procuring them in ſufficient quantity; and in hopes it might become a general medicine, it was determined to try the effects of the whole plant, root, leaf, and branch, in the diſeaſe in which the Virginian kind had been given with the greateſt ſucceſs, that is, in pleuriſies; and this was accordingly fairly tried.

The principal inſtances of their trials were two; the firſt to a woman of twenty-two years old, who had a violent fever, with a ſizy blood, and pain in the ſide. She was twice blooded, and had immediate, but not laſting relief from it, and was ordered the common ptiſans given on theſe occaſions. The malady increaſed, and the expectoration was but ſmall, and that of a thick yellow matter: a third bleeding finally was judged neceſſary, but was of no more ſervice than the others; and after this ſhe had the ſame ptiſan continued, but with the addition of a large quantity of the common European Polygala, ſtalk, root, and leaf. This took place in two or three hours, the expectoration became vaſtly plentiful, and the matter thin and white, from being thick and yellow. The woman, in fine, was cured, and the medicine was not obſerved to occaſion any nauſea, nor did it prove, as ſuppoſed, a violent purge.

The ſecond inſtance was in a man of a ſtout robuſt habit, and of twenty-five years of age. He was violently attacked with a pleuriſy; he was bled ſeven times, and was brought into one of the hoſpitals delirious, and ſeemingly very near death: he was there blooded in the foot, which reſtored his ſenſes; and he took a large quantity of the decoction of the Polygala, which cauſed him to expectorate in great abundance. The matter was firſt blackiſh, then reddiſh, and finally white, and the patient was perfectly cured. *Mem. Acad. Scienc. Par.* 1739.

Theſe are ſuch remarkable inſtances of the good effect of an herb to be had every-where in our own country, that they ſeemed very worthy to be recorded. The plant grows with us on dry grounds and heaths, and is about four inches long, not erect, but trailing upon the ground: the leaves are long and narrow, of a pale green, and the flowers are large and look beautiful: they ſtand in ſpikes, and are uſually blue; but very often white, and ſometimes red. The herb ſhould be pulled up root and all for drying.

POLYGLO'TTA *avis*, in zoology, the name of a bird deſcribed by Nieremberg, and which, he ſays, he ſaw and heard with admiration, ſinging in all tones. It is of the ſize of our ſtarling.

Its back is brown, and its breaſt and belly white; and near the neck and tail it is variegated with ſpots and ſtreaks of white. Its head has a ſtreak of white, which repreſents a ſort of crown of ſilver. It is mightily eſteemed, and kept in cages by the Spaniards, as infinitely ſuperior to all other birds in melody. It feeds on almoſt any thing that is given it, and is moſt fond of the warmer climates; but endures the more temperate ones without harm. *Ray's Ornithology.*

POLYGA'MIA *, in botany, a claſs of plants, which have a diverſity of combinations of male and female parts of their flowers, and many ways of fructification in the ſame ſpecies; ſome having male flowers, others female, each diſtinct and perfect in its kind; and others mixed, or hermaphrodite, with both male and female organs of fructification in each. See *Plate* XXXVI. *fig.* 6.

* The word is derived from the Greek πολὺς, many, and γάμος, marriage.

Among the plants of this claſs are the orach, pellitory of the wall, the aſh, &c.

POLYGON, *in fortification* (*Dict.*)—In order to ſhew the method of fortifying regular Polygons, it will be neceſſary to give a table ſhewing the meaſures of the principal lines and angles, in all regular works of this kind from four to twelve ſides incluſive.

A table of Polygons, ſhewing the meaſure of their lines, angles, &c.

Dodecagon	Undecagon	Decagon	Nonagon	Octagon	Heptagon	Hexagon	Pentagon	Square	Names of the Polygons.
360	360	360	360	360	360	360	360	360	The exterior ſide in yards.
695,46	638,78	582,50	526,28	470,36	414,82	360,00	306,24	254,56	Radius of exterior ſide in yards.
300,20	292,60	288,52	285,86	280,06	272,44	261,26	247,90	231,00	Interior ſide in yards.
572,14	519,36	466,90	417,86	365,96	313,96	261,26	210,00	163,34	Radius of interior ſide in yards.
123,32	119,42	115,60	108,42	104,40	100,06	98,68	95,34	91,22	Capital in yards.
86	82	78	72	68	64	60	54	45	Normal in yards.
138,68	142,90	147,34	149,40	150,54	151,80	152,80	154,22	156,06	Curtin in yards.
76,18	73,96	71,66	65,92	62,12	58,32	54,54	48,92	49,54	Flank in yards.
104	102	100	100	100	100	100	100	100	Face in yards.
276,34	276,30	276,46	274,32	272,86	271,62	270,28	268,42	265,96	Line of defence in yards.
78,76	74,84	70,58	68,21	64,76	60,72	54,26	46,84	37,48	Demigorge in yards.
30° 00′	32° 44′	36° 00′	40° 00′	45° 00′	51° 26′	60° 00′	72° 00′	90° 00′	Angle of the center.
150 00	147 16	144 00	140 00	135 00	128 34	120 00	108 00	90 00	Angle of the Polygon.
102 46	102 15	101 43	100 54	100 21	99 47	99 13	98 21	97 01	Angle of the curtin.
128 18	126 45	125 09	122 42	121 03	119 21	117 39	115 03	111 03	Angle of the ſhoulder.
98 56	98 16	97 08	96 24	93 36	89 26	83 08	74 36	61 56	Angle of baſtion, or flanked angle.
25 32	24 30	23 26	21 48	20 42	19 34	18 26	16 42	14 02	Diminiſhed angle.
128 56	131 00	133 08	136 24	138 36	140 52	143 08	146 36	151 56	Exterior flanked angle.
46 yds.	44 yds.	42 yds.	40 yds.	40 yds.	40 yds.	36 yds.	33 yds.	30 yds.	Breadth of the foſs, in yards.

By the help of this table, every thing relative to the maſter line of any of theſe fortreſſes are readily conſtructed.

1. To deſcribe any of the Polygons in the table.

Firſt. To conſtruct a Polygon in a circle. *Plate* XXXIII. *fig.* 10.

1. With the exterior radius of the given Polygon deſcribe a circle.

2. Apply the exterior ſide equal to 360 yards within the circumference of that circle, from A to B, B to C, C to D, &c. as many times as the propoſed Polygon has ſides.

3. Draw the lines AB, BC, CD, &c. and the Polygon will be conſtructed.

Secondly. To conſtruct a Polygon upon the exterior ſide. *Plate* XXXIII. *fig.* 11.

1. Draw the exterior ſide AB equal to 360 yards.

2. At the ends A, B, make angles equal to the angle of the Polygon, and in that position draw the lines A E, B C, each of the length of A B.

3. At the points E, C, make angles as before, and in those positions draw the lines E D, C D, each of the same length as A B.

And thus proceed until the Polygon is constructed.

Note, The two last lines may be found by describing intersecting arcs D, with the radius A B, from the centers E and C.

2. To fortify any regular Polygon in the table.

Or, To draw the master line of a regular fortress.

First. From the exterior side. *Plate* VI. *fig.* 13.

1. Make the exterior side A B equal to 360 yards, and find its middle C.

2. Draw C D at right angles to A B, and make C D equal to the normal.

3. Through D draw the lines of defence A D H, B D G.

4. Make the faces A E, B F, each of their proper lengths.

5. Transfer the distance F E from F to G, and from E to H.

6. Draw the curtin G H, and the flanks E G, F H.

This work being done for every front or side, the master line of the fortress will be described.

This method is most fit, when the master line is to be laid down on a place where there were no works before.

Secondly. To fortify from the curtin.

1. Make the curtin G H of its proper length, for the given Polygon.

2. Make the angles of the curtin H G E, G H F, as per table.

3. In the lines G E, H F, take the flanks G E, H F, of their proper length.

4. Make the angles of the shoulders G E A, H F B, as per table.

5. Make the faces F B, E A, of their proper lengths.

This method is proper to be used when a piece of an old fortification is to serve for a curtin, to save expence.

Thirdly. To fortify from the interior side.

1. Make the interior side I K of the length given in the table for the proposed Polygon.

2. From each end set off its proper demigorge K H and G I.

3. On K and I as centers, with the extent of the capital, as per table, describe arcs at B and A.

4. On H and G as centers, with the length of the line of defence, as per table, cut the former arcs in A and B.

5. Draw the lines A H, B G; in which take the faces A E, B F, and draw the flanks E G, F H.

This method is useful when modern ramparts and bastions are to be annexed to simple walls surrounding a place.

In either of the above methods, the work here described for one front is to be applied to every front of the Polygon; and it is recommended to the learner, that he applies the precepts given for one front to a complete Polygon; and, should a frequent repetition of these operations to a whole Polygon become disagreeable, they may be done only on two fronts, which may be thus drawn.

Draw a capital line A L; make the angles L A B, L A A, each equal to half the angle of the Polygon; and make the sides A B, A A, each equal to 360 yards.

POLYGONA'TUM, *Solomon's seal*, in botany, a genus of plants, whose characters are:

The flower consists of one leaf, is tubulous, and expands at the top in shape of a bell, and is divided into several segments: the ovary, which is situated in the center of the flower, becomes a soft globular fruit, containing roundish seeds.

These plants are easily propagated by parting of their roots in the spring, before they begin to shoot, observing always to preserve a bud to each off-set: they should be planted in a fresh light earth, where they will thrive exceedingly; but, if it be over rich, it will destroy their roots.

POLY'GONUM, *common knot-grass*, in botany, a genus of plants, whose characters are:

The root is creeping, and very fibrous; the stalks and branches are very full of joints; the calyx is deeply cut into five segments, which in their lower part, are herbaceous; but, above, of a flosculous colour; when ripe, the calyx becomes a capsule of seed. The flowers are produced at the wings of the leaves, and are concealed in their first rise under a very thin membrane; the seed is exactly triangular.

Knot-grass is cooling, drying, and binding, a good vulnerary, and helpful against all kinds of bleedings either external or internal, as against fluxes; and outwardly applied, is good for blood-shot inflamed eyes. *Miller's Bot. Off.*

This plant has an herby glutinous taste, and a little acid; it gives a deep tincture of red to the blue paper; it is likely, that the salt of knot-grass resembles alum, but is mixed in this plant with a little sal ammoniac and a great deal of sulphur.

For, by the chemical analysis, it yields a great deal of acid, earth, and oil, a little volatile, concrete, and very lixivial fixed salt.

Knot-grass is very vulnerary and astringent; the juice ptisan, or infusion of it in wine, is given to drink for the dysentery, piles, spitting of blood, and all sorts of hæmorrhages; the extract has the same virtues; the leaves, bruised, cure wounds. *Mart. Tournefort.*

PO'LYPE, or POLYPUS, in zoology, a small fresh water insect, which, when cut into a number of separate pieces, becomes in a day or two so many distinct and separate animals; each piece having the surprising property of producing a head and tail, and the other organs necessary for life, and all the animal functions. See *Plate* XXXIV. *fig.* 8, 9, 10, 11, 12.

The first discovery of this animal was owing to Mr. Leuwenhoek, who, in the year 1703, presented to the royal society of London a description of it, and an account of its uncommon way of producing its young: but the discovery of its amazing property of reproducing the several organs from its various pieces, was not made till the year 1739, by Mr. Trembley, at the Hague.

The production of its young is, indeed, different from the common course of nature in other animals; for the young one issues out from the side of its parent, in form of a small pimple or protuberance, which lengthening and enlarging every hour, becomes, in about two days, a perfect animal, and drops from off its parent to shift for itself: but before it does this, it has often another growing from its side; and sometimes a third from it, even before the first is separated from its parent. They breed quicker in hot than in cold weather; and what is very extraordinary is, that there never has yet been discovered among them any distinction of sex, or appearance of copulation; every individual of the whole species being prolific, and that as much if kept separate, as if suffered to live among others.

If the method of this little animal's producing its young be very amazing, its production of the several parts, when cut off, is much more so. The discovery of this was perfectly accidental; for Mr. Trembley, who had often met with the creature in the water, and from its fixed residence in one place, and some other observations, not being able to determine whether it were an animal or a vegetable, made the trial by cutting it asunder, when, to his amazement, he found, that in a few days each of these pieces was become a perfect animal, the head part having shot forth a tail, and the tail a head. A thousand other trials, by cutting the animal in different manners, first by Mr. Trembley, and afterwards, at his request, by Monf. Reaumur at Paris, and Mr. Folkes, Mr. Baker, and the other naturalists in England, were the result of this; and all succeeded in the same manner, by whoever they were tried.

It is not easy to say what is the size of this creature; for it can contract or extend its body at pleasure from the length of an inch or more, and the thickness of a hog's bristle, to the shortness of a single line, with a proportionable increase of thickness. Its body is round and tubular, at one end of which is the head, surrounded with six, eight, ten, or more arms, with which it catches its prey; and at the other, the anus and tail, by which it fixes itself to any thing it pleases.

There have been many different species of it discovered, the most elegant of which, the Polype a pannache, or plumed Polype, of Mr. Trembley, seems much to resemble the wheel-animal, so called from having the appearance of two wheels in its head, which Mr. Leuwenhoek discovered living in a sheath or case, and affixed to the roots of duckweed.

All the species are found in clear and slowly running waters, adhering by the tail to sticks, stones, and water-plants, and live on small insects. They are easily kept alive a long time in glasses, often changing the water, keeping the glasses clean, and feeding them with a small red worm, common in the mud of the Thames, or with other small insects.

The creature has its name from the Greek πολὺς, many, and πȣ̃ς, a foot, signifying an animal with many feet; but a more apposite one might easily have been invented, since it has in reality no feet at all. What were originally taken for feet, are what have since been called its horns, and of late more properly its arms, their office being to catch its prey.

The several strange properties recorded of this animal, though very surprising, are, however, none of them peculiar to it alone. The Surinam toad is well known to produce its young not in the ordinary way, but in cells upon its back. Mr. Sherwood has very lately discovered the small eels in sour paste to be each, without exception, full of living young ones. And as to the most amazing of all its properties, the reproduction of its parts, we know the crab and lobster, if a leg be broken off, always produce a new one: and Mr. Bonet, Mr. Lyonet, Monf. de Reaumur, and Mr. Folkes, have all found on experiment, that several earth and water worms have the same property, some of them even when cut into thirty pieces. The *urtica marina*, or sea-nettle, has been also found to have the same: and the sea star-fish, of which the Polype is truly a species, though it had long escaped the searches of the naturalists, was always well known by the fishermen to have it also.

Cluster POLYPE, the name of a species of small insect of the Polype kind, called by the French naturalists Polype a bouquet.

There is found on several of the water-plants, and on other substances, as sticks, boards, and the like, accidentally fallen into

into the water, a whitish substance that at first sight appears to be only a sort of mouldiness; but if the bodies on which this is found, be put into a vessel of clear water, and the matter examined with a magnifying glass, it is soon seen that this whitish substance is really a vast number of small animals, which are almost continually in motion. When this is brought before the microscope, the form and structure of the creatures is very evidently distinguished, and they are found to be minute roundish creatures, severally affixed to the end of a sort of stem or tail; and many of the stems are so interwoven and united together, that they form clusters, which have occasioned the name of the cluster-Polype to be given to the animal, though in itself it is really and properly single from the beginning. There are several species of Polype of this minute kind, that cluster themselves in this manner together; and according to these and other circumstances, the clusters are found larger or smaller, and more or less complex. *Phil. Transf.* N°. 474.

The smaller clusters should always be chosen for observation, as in the larger the bodies of the several animals that compose them are apt to hide and obscure one another; but the most beautiful and accurate of all observations is to be formed when they are single, as they are sometimes found; and this is the only opportunity of seeing distinctly in what manner the clusters are formed.

One of these single animals is not in length above the 240th part of an inch, and is of a shape nearly resembling that of a bell: the anterior part of this generally appears open when it presents itself properly; and the posterior part is fixed to the stem or pedicle, by the other extremity of which the creature fastens itself to any solid body that it meets with. The body is of a brownish colour, except at the smaller end, which, as well as the tail, is whitish and transparent; and, when the anterior part is open, there may always be perceived about its edges a very lively motion; and, when the creature presents itself in a better manner, there may be seen, on either side of the edges of the anterior part, somewhat resembling the wheels of a mill, continually moving with great velocity.

These creatures are able to contract their bodies, and often do it very suddenly, especially if any thing disturb the substance on which they are fixed: when they are thus contracted, the edges of their anterior parts are drawn just into their bodies; and, when the fright is over, it is a very agreeable sight to behold these edges turning out again, and putting themselves in motion as before. If the edges of the anterior parts of the bodies of these animals be strictly observed while in motion, the water about them will be found to be full of extremely minute round bodies, which are brought together by means of that motion, and serve the creature for its food: these may be often seen going down into the cavities of the body of the Polype, and that very suddenly, as if forcibly driven down; and, when swallowed too voraciously, are often thrown up again. These observations are best made when a small cluster of the Polypes are examined together.

If these Polypes are kept some time in the rain-water, they by degrees lose their brown colour, and become white and transparent throughout, except that a few spots of a dusky colour remain in their bodies; but if after this they are removed into other water of the same kind with the first, but newly taken out of the ditch, they in a little time recover their brown colour. When they become white, they plainly appear to be in a sickly condition, and cease to multiply; but, when they have fresh water and recover their colour, they immediately begin to multiply again.

These creatures are not absolutely and immoveably fixed to the bodies on which they are placed, but they can at pleasure quit them and swim about: in this swimming state they are always found single, and not in clusters; and they do not then appear in the same form as when they are fixed and open at their anterior ends. When they have swam about as long as they please, they either return to their clusters from which they separated themselves, or affix each singly to any thing they meet with: and this is a circumstance that merits to be carefully watched, because it is by means of this that we see in what manner the creature multiplies itself, and the clusters are formed.

As soon as a single animal of this kind is fixed to a stick, a stone, or any other substance, it begins to lengthen its stem or tail, which, though very short while swimming, and when first fixed, very soon becomes of its pristine length while in the cluster; and after this the creature begins immediately to multiply by the most amazing means in the world; that is, by splitting itself to pieces lengthways. The first motion towards this operation is the drawing in the lips or edges; this is soon done, and the body then loses its bell-like shape, and becomes round; the motion which was before perceived at the edges ceases, and there is only a slight tremulation to be seen within the body; after this the anterior part of the body becomes flat and broad, and the whole body shortens in proportion; and soon after this the whole body gradually splits itself regularly into two, from the center of the anterior part to the center of the hinder end, where it joins the tail or pedicle, and there soon appear two round and perfect bodies joined to that pedicle which before supported only one. The anterior parts of the two bodies soon begin to open, and gradually shew their edges, which perform the same motion the single one did before. The motion is at first very slow, but it grows quicker by degrees as they open; and, when they are perfectly expanded, it is as quick as it was in the original single body: it is at this time that the two bodies may be esteemed quite perfect. They are at first indeed less than the original Polype, from which they were formed, but they grow to the same size in a very little time: the whole operation of dividing itself takes up the creature about an hour; but, to form a true idea of the manner in which it is performed, there must be many observations made, and the creatures must be examined in all views and lights while about it.

The lips of these Polypes, when closely examined, appear to be composed of four or five transparent bands, all which have an undulatory motion. And, when the newly divided Polype is but slow in its motions, it is easy to discover that what afterwards appear to be like the wheels of a mill, are, in reality, only four or five oblong bodies, resembling a sort of fingers which alternately bend down, and extend themselves every instant. These are fastened to the band of the lips on each side of the mouth; and, when they are put into swift motion in the time of the full growth and vigour of the animal, they are not to be distinguished, as to form, nor can their motion be otherwise discovered than by its swiftness, which makes it resemble the quick turning of a wheel.

When the separation of the body of a single Polype of this kind is complete, one sees two regular and perfect bodies adhering side by side to the same pedicle, but soon after each of the new formed bodies begins to shew a pedicle of its own; these grow in a day's time to a moderate length, and unite at their bottoms to the end of what was the original single pedicle of the body while but one; they grow to this in the manner of the branches growing to the trunk of a tree. Twenty-four hours after the separation of the original body into two, these two begin to separate themselves in the same manner, each into two again; and these after a like time again separate: each of these separated animals has its own tail formed in a like period of time with the first; and the consequence is, that the first separation producing two, the second gives four, the third eight, and so the sixth sixty-four, the seventh 128, and so on; by which means a single animal, in a very few days, forms out of itself an immense cluster; each animal of which is perfect in itself, and independent of all the rest, and can, when it pleases, swim away and form a new cluster. They will multiply as fast in glass jars, as in their native free state in the waters; and clusters of them, begun near one another, will often join in such a manner as to form one complex cluster of an inch diameter: from these several clusters there detach themselves single Polypes from time to time, which go off, and fastening themselves to other bodies, become the authors of new progenies. *Phil. Transf.* N°. 474.

The original branch or stem of the first Polype remains always in the center of the cluster; but it is of no use, never afterwards having any body fixed to it.

There are, besides this species here described, four other known kinds of Polype, which divide themselves in the same manner by splitting into two lengthwise: those which come nearest to the first are slenderer, and their stems are more transparent. They are of a bluish colour, when many of them are seen together, and their stems or tails very aptly resemble spun glass. When this species is perfectly formed, the motion of its lips is less distinct than in the other; but it may be discovered in the same manner while they are newly separated and are but growing toward perfection, when it gradually becomes less and less distinct.

Another species of these Polypes is smaller than the last, but more open at the mouth, and deeper hollowed; and these are particularly distinguished from all the others, by having a motion in their stems and branches, which all the others want. The stems draw themselves up, and shorten all at once into the appearance of a spiral screw, and in a moment can dart themselves straight out to their full length again. All these multiply very speedily, but they have all enemies that destroy them in a very terrible manner, whole clusters making but single mouthfuls. The funnel Polypes are nearly allied to these creatures. *Phil. Transf.* N°. 474.

Funnel POLYPE, a name given by naturalists to a small water insect, in some respects approaching to the nature of the cluster Polype.

The funnel Polype nearly resembles a funnel, from which it has its name. It is long and hollow, and very wide at the anterior end. These little animals are of three species, a green, a blue, and a white one: they are all too minute for the observation of the naked eye, and must be viewed with great caution, and in several different directions and attitudes, before their true form can be discovered; and their anterior end, particularly, when carefully observed, is of a much more compound structure than might at first be imagined; there may be always be observed, round the edges of this part, a sensible motion, resembling that of an indented wheel, or rather that of a screw turned nimbly about. These, though they approach to the shape of the cluster Polypes, and resemble them in their having this

this motion about their mouths, yet never have any tendency to form clusters, but are ever found loose and single. There are always a number of little round bodies, which seem to be animals of a very minute size swimming about in the water in which these Polypes live, and these are continually drawn into the mouths of the Polypes, and serve them for food.

The manner of these creatures propagating themselves is very amazing; they do it by dividing their own body into two; but this is not done longitudinally, as in the cluster Polypes, nor transversly, but diagonally from the edge of the head to the opposite edge of the tail; so that, of the two thus formed out of one, the one has a head and no tail, the other a tail and no head; but these deficiencies are soon made up, and the head soon grows out of one, and the tail out of the other. Mr. Trembley, in his account of this insect, calls that of the two which has the old head, the superior Polype; that which has the old tail the inferior. The first particulars observable in a funnel Polype that is going to divide, are the lips of the inferior Polype, or those transparent edges that are so very conspicuous in the creature when perfectly formed. These new lips first discover themselves upon the Polype that is going to divide, from a little below the old lips to about two thirds of the length of the Polype, reckoning from the head: but these new lips are not disposed in a straight line, according to the length of the Polype, but run sloping near half-way round about. These lips are distinguished by their motion; but it is to be observed, that this motion is at first very slow, and requires an attentive eye and good glasses to discover it. *Phil. Transf.* N°. 474.

POLYTRI'CHUM, in botany, the name of a genus of mosses, the characters of which are these: the stalks are not much branched, and the capsules have calyptræ to cover them till mature. This calyptra is always hairy, and in many of the species is composed merely of long hairs, ranged lengthwise together, without any membrane; the others have membranaceous calyptræ, but covered with erect hairs. The leaves of those kinds are rigid, and have a membranaceous appendage, by which they touch the stalks and surround them; those of the others are softer, and have not this appendage. The basis of the pedicle which supports the head, is also in these surrounded by a sort of tube, round which there stand a number of membranaceous leaves; this is more visible in the larger than in the smaller species. The capsules in some of these mosses are square, in others they are roundish; and the square ones have usually an apophysis, by which they are joined to the pedicle, which the round ones never have, or at least very seldom.

POMGRA'NATE (*Dict.*)—These plants may be easily propagated by laying down their branches in the spring, which in one year's time will take good root; and may then be transplanted where they are designed to remain. The best season for transplanting of these trees is in the spring, just before they begin to shoot: they should have a strong rich soil, in which they flower much better, and produce more fruit, than if planted on a dry poor earth: but, in order to obtain these in plenty, there should be care taken in the pruning of the trees; for want of which, we often see these trees very full of small shoots, but do not find many flowers produced upon them; therefore, I shall set down directions for pruning of these trees, so as to obtain a great quantity of flowers and fruit.

The flowers of this tree always proceed from the extremity of the branches which were produced the same year: this therefore directs, that all weak branches of the former year should be cut out, and that the stronger should be shortened in proportion to their strength, in order to obtain new shoots, in every part of the tree: these branches may be laid in against the wall about four or five inches asunder; for, as their leaves are small, there is not a necessity of allowing them a greater distance. The best time for this work is about Michaelmas, or a little later, according to the mildness of the season: but, if they are left until spring before they are pruned, they seldom put out their shoots so early; and, the earlier they come out, the sooner will the flowers appear, which is of great consequence where fruit is desired. In summer, they will require no other dressing, but to cut off very vigorous shoots, which grow from the wall, and never produce flowers (for they are the middling shoots only which are fruitful;) and, when the fruit is formed, the branches on which they grow should be fastened to the wall to support them, otherwise the weight of the fruit, when grown large, will be apt to break them down. See (*plate* XXXVI. *fig.* 7.) where *a* is the flower, *b* the fruit, and *c* the fruit open.

Though, as I said before, the fruit of this tree seldom arrives to any perfection in this country, so as to render it valuable; yet, for the beauty of its scarlet-coloured flowers, together with the variety of its fruit, there should be one tree planted in every good garden, since the culture is not great which they require: the chief care is, to plant them upon a rich strong soil, and in a warm situation. Upon some trees which had these advantages, I have obtained a great quantity of fruit which have arrived to their full magnitude; but I cannot say they were well flavoured; however, they made a very handsome appearance upon the trees. *Miller's Gard. Dict.*

PO'MUM, *the apple.* See APPLE.

POPE (*Dict.*)—The spiritual monarchy of Rome sprung up soon after the declension of the Roman empire; and one great, though remote, instrument in promoting the increase of this monarchy, so pernicious to the supreme civil power, was the barbarity and ignorance, which from that time spread itself over the western parts.

Rome was chosen for the place of residence of the ecclesiastical monarchy, because this city had the particular prerogative of being the capital city of the Roman empire, where the Christian religion had its first rise and increase. For what is related concerning St. Peter's chair, is nothing but a vain pretence. So that here are no footsteps of divine institution to be found, the Papal power being purely human, and an usurpation upon the rights of other sees.

The bishops of Rome did not extend their power over the western parts all at once; but it was introduced from time to time, by degrees, by various artifices, and under various pretences. What chiefly contributed to its growth, was, first, the emperors chusing other places of residence besides Rome; for by their constant presence there they might easily have kept under the ambitious designs of the bishops. In the next place, the western empire was divided into several new kingdoms, erected by the several barbarous and pagan nations; and these, having been converted to the Christian faith by the direction of the Romish church, thought themselves obliged to pay her the profoundest respect.

The spiritual monarchy of Rome could not have been established, had its bishops continued dependent on any temporal prince; and therefore the Popes took their opportunity to exempt themselves from the jurisdiction of the Greek emperors, whose authority was greatly decayed in Italy.

The Pope, having freed himself from the authority of the emperors of Constantinople, and being in danger from the Lombards, who endeavoured to make themselves masters of Italy, had recourse for protection to the kings of France. Pepin, and afterwards Charles the Great, having entirely subdued the Lombards, these princes gave to the papal chair all that tract of land, which had been formerly subject to the Greek emperors. When the Romans mutinied against Leo III, he was forced to seek for assistance from Charles the Great, who restored the Pope. On the other hand, the Pope and people of Rome proclaimed Charles emperor; whereby he was put in possession of the sovereignty of that part of Italy, which formerly belonged to the governors of Ravenna, and the other remnants of the western empire; so that the Popes afterwards enjoyed these countries under the sovereign jurisdiction of the emperor, who therefore used to be called the patron and defender of the church, till the reign of the emperor Henry IV.

The Popes at length began to grow weary of the imperial protection, because the emperors consent was required in the election of a Pope, and, if they were mutinous, the emperors used to check them, and sometimes turn them out of the chair. The Popes, therefore, for a long time employed various artifices, to exempt themselves from the power of the emperors; which being at length effected, the Pope, not satisfied with this degree of grandeur, quickly set on foot a pretension of far greater consequence. For now he pretended to an authority over princes themselves, to command a truce among such as were at war together, to take cognizance of their differences, to put their kingdoms under an interdict, and, if they refused submission to the see of Rome, to absolve their subjects from their allegiance, and to deprive them of their crowns. This has been attempted against many crowned heads, and put in execution against some of them. And for this abominable pretension they plead their fictitious decretals, which grant to the Popes an unlimited power over all Christians whatever. Pope Boniface VIII. gave the world clearly to understand his meaning, at the jubilee kept in the year 1300, when he appeared sometimes in the habit of an emperor, and sometimes in that of a Pope, and had two swords carried before him, as the ensigns of the ecclesiastical and civil power.

But the Popes could not long enjoy this intolerable usurpation in quiet: for it was often called in question, till they were obliged to desist in part from their pretensions.

But, when the ecclesiastical monarchy seemed to be come to the pinnacle of its grandeur, when all the western parts were either in communion with, or in obedience to the church of Rome; there happened a revolt from the papal chair, which, though first started from a trifling occasion, came to such a head, that a great part of Europe withdrew itself from the obedience to the Pope, who was thereby put in danger of losing all. We mean the defection of Luther, which gave rise to the protestants.

The popish sovereignty, however, has pretty much recovered itself since this grand defection. As to those things, which Luther upbraided the church of Rome with, they are either quite abolished, or at least are transacted in a more decent manner: 'Si non caste, tamen caute.' Nor do the Popes now-a-days insult with so much haughtiness over princes; neither has the papal chair, of late years, been filled with such debauchees as Alexander VI, or such martial popes as Julius II.

In point of power, the Pope is able to send 50,000 men into the field, in case of necessity, besides his naval strength in gallies. We read how Paul III. sent Charles III. 12,000 foot and 500 horse; Pius V. sent a greater aid to Charles IX. and for riches, besides

PLATE XXXVI. *Engraved for the Supplement.* *Facing* Pomgranate

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besides his temporal dominions, which are extended above 300 miles in length, and 200 in breadth, he has the datary or dispatching of bulls. The triennial subsidies, annates, and other ecclesiastic rights, amount to an unknown sum; and it is a common saying at Rome, that, whilst the Pope can finger a penny, he can want no pence.

Policy exacts all her arts, and sets every spring she has in motion at the election of a Pope; nor do they always wait for the death of the present chief or head of the church, to begin those cabals and intrigues which are proper for advancing him, whom they esteem a fit person to fill the pontifical throne: And although the college unanimously invoke the assistance and aid of the Holy Ghost, to direct them in the choice of a vicar of Jesus Christ, yet their eminencies use all the artful precautions imaginable, one would think, to prevent him from being any way concerned in the election. There are several ways of electing a Pope, viz. by scrutiny, access, adoration, inspiration, and compromise. The election by scrutiny is the only way that has been used for a long while, and contains all the formality that appears most essential for the making the election of a Pope canonical. And yet the scrutiny is no more than a mere ceremony, since the several factions of the cardinals must unite before-hand in the choice of the person. This harmony and agreement is brought about by the most refined and delicate strokes of policy, and for the most part comes on after their eminencies have found out, by several scrutinies, the disposition of the sacred college. Then, if the votes for any of the candidates come near the number required, it is a very common practice for the other factions to fall off, and swim down the stream, and thereby contribute to the Pope's election, fearing to draw on them his hatred by a fruitless and unseasonable opposition. These are the policies which the common people ascribe to the Holy Ghost, at the election by scrutiny.

Each cardinal writes the name of him, whom he votes for, in a scroll of five pages. On the first is written (by one of his servants, that the cardinal may not be discovered by his hand) 'Ego eligo in summum pontificem reverendum dominum meum cardinalem.'— On this fold two others are doubled down, and sealed with a private seal. On the fourth the cardinal writes his own name, and covers it with the fifth folding. Then sitting in order on benches in the chapel, with their scrolls in their hands, they go up to the altar by turns, and, after a short prayer on their knees, throw the scroll into a chalice upon the table, the first cardinal bishop sitting on the right hand, and the first cardinal deacon on the left. The cardinals being returned to their places, the cardinal bishop turns out the scrolls into a plate, which he holds in his left hand, and gives them one by one to the cardinal deacon, who reads them with an audible voice, while the cardinals note down how many voices each person has; and then the master of the ceremonies burns the scrolls in a chafing-dish, that it may not be known for whom any one gives his voice. If two thirds of the number present agree, the election is finished, and he, on whom the two thirds fall, is declared Pope.

If the votes do not rise to a sufficient number, billets are taken in order to chuse the pope by way of accessus: and indeed there scarcely ever is a scrutiny without this accessus; it being scarce known that the holy father should be chosen by the former way alone. The accessus therefore is to correct the scrutiny. In this they give their votes by other billets, on which is written Accedo domino, &c. when they join their first vote to another's; or Accedo nemini, when they keep to their first vote. This practice is derived from the ancient method of debating in the Roman senate; when one senator was of another's opinion, he rose up and went over to his collegue, which was called pedibus ire in sententiam: when they kept their places, they said Accedo ad sententiam. The Pope is elected by compromise, when the cardinals, disagreeing in their choice, engage by mutual compromise to refer it to some particular cardinals of probity, and to acknowledge him whom they shall nominate, as duly elected. The election by way of inspiration is in some measure riotous and tumultuary. A select number of cardinals of different factions, who have determined to put every thing to the last push, begin to cry out, Such a one is Pope, as it were, by inspiration. They make their attempt this way, when they think they are strong enough to carry it. Adoration is the same as inspiration, which is, when two thirds of the conclave, being agreed in the person, go in a body, and adore and acknowledge the Pope they approve of, as head of the church. The elections by way of compromise, and inspiration, but seldom happen. The scrutiny and access are the methods generally observed.

When one of the cardinals is chosen Pope, the master of the ceremonies comes to his cell, to acquaint him with the news of his promotion. Whereupon he is conducted to the chapel, and clad in the pontifical habit, and there receives the adoration, or the respects paid by the cardinals to the Popes. Then, all the gates of the conclave being opened, the new Pope shews himself to the people, and blesses them, the first cardinal-deacon proclaiming aloud these words: 'Annuntio vobis gaudium magnum, papam habemus. Reverendissimus dominus cardinalis—electus est in summum pontificem, & elegit sibi nomen.' —After this, he is carried to St. Peter's church, and placed upon the altar of the holy apostles, where the cardinals come a second time to the adoration. Some days after is performed the ceremony of his coronation, before the door of St. Peter's church, where is erected a throne, upon which the new Pope ascends, has his mitre taken off, and a crown put upon his head, in the presence of all the people. Afterwards is a grand cavalcade from St. Peter's church to St. John's de Lateran, where the archbishop of that church presents the new Pope with two keys, one of gold, the other of silver; one of which is a sign of the power he has of giving absolution, and opening the gates of heaven to all believers; and the other of excommunicating sinners, and dooming them to purgatory. The first coronation, which is mentioned in the history of the Popes, was that of Damascus II. in 1048. In former times the Pope was crowned before the basilica of St. Peter. The reader may see all the ceremonies of the Pope's coronation particularly described in the Relig. Cerem. Vol. I. of which the above account is an abstract.

It is a general maxim, in the choice of a Pope, to elect an Italian; which is done, not only because they chuse rather to bestow this dignity on a native of Italy, than on a foreigner, but also because the security and preservation of the papal chair depends in a great measure on the balance which is to be kept between France and Spain; but this is not to be expected from a French or Spanish Pope, who would quickly turn the scale, and, by granting too great privileges to his countrymen, endeavour to exclude others from the papal chair. It is also a sort of maxim to chuse a Pope who is pretty far advanced in years, that there may be the quicker succession, and that it may not be in the power of a Pope, during a long reign, to alter their customs, or, by making his family too powerful, to entail, as it were, the papal chair upon his house. They also take care that he be not too near a kin to the deceased Pope, that the vacant church benefices may not be engrossed by one family. It often happens, that one is chosen Pope, of whom no body thought before; and this comes to pass, when the cardinals are tired out by so many intrigues, and are glad to get out of the conclave.

Ever since the time of Pope Sixtus IV, that is, since the year 1471, the Popes have made it their business to enrich their families out of the church revenues, of which there are very remarkable instances: for it is related, that Sixtus V, during a reign of five years, bestowed upon his family above three millions of ducats. The house of the Barbarini's, at the death of Urban VIII, was possessed of 227 offices and church-benefices, whereby they amassed thirty millions of scbudi's.

Sergius III or IV, who was before called os porci, i. e. swine's face, is said to have been the first Pope, who changed his name upon his exaltation to the pontificate. This example has been followed by all the Popes since his time, and they assume the names of Innocent, Benedict, Clement, &c.

When a Pope is elected, they put on him a cassock of white wool, shoes of red cloth, on which is embroidered a gold cross, a mantle of red velvet, the rochet, the white linnen albe, and a stole set with pearls. At home, his habit is a white silk cassock, rochet, and scarlet mantle.

The Pope's tiara, or crown, is a kind of conic cap, with three coronets, rising one above the other, and adorned with jewels. Paul II. was the first who added the ornament of precious stones to this crown. The jewels of Clement VIII's crown were said to be valued at 500,000 pieces of gold.

The Pope has two seals; one is called the fisherman's ring, and is the impression of St. Peter holding a line with a bait to it in the water: it is used for those briefs that are sealed with red wax. The other seal is used for the bulls, which are sealed with lead, and bears the figures of St. Peter and St. Paul, with a cross on one side, and a bust, with the name of the reigning Pope, on the other. Upon the decease of a Pope, these seals are defaced and broken by the cardinal Camerlengo, in the presence of three cardinals.

The custom of kissing the Pope's feet is very ancient; to justify which practice, it is alledged, that the Pope's slipper has the figure of the cross upon the upper-leather; so that it is not the Pope's foot, but the cross of Christ, which is thus saluted.

There are but few instances of the papal power, in England, before the Norman conquest: but the Pope, having been favoured and supported by William I, in his invasion of this kingdom, made that a handle for enlarging his incroachments, and, in that king's reign, began to send legates hither. Afterwards, he prevailed with king Henry I. to part with the right of nominating to bishoprics; and, in the reign of king Stephen, gained the prerogative of appeals. In the reign of Henry II, he exempted all clerks from the secular power. This king, at first, strenuously opposed this innovation: but, after the death of Becket, who, for having violently opposed the king, was slain by some of his servants, the Pope got such an advantage over the king, that he was never able to execute the laws he made. Not long after this, by a general excommunication of the king and people, for several years, king John was reduced to such streights, that he surrendered his kingdoms to the Pope, to receive them again, and hold them of him under a rent of a thousand marks. In the following reign of Henry III, partly ly from the profits of our best church benefices, and partly from the taxes imposed by the Pope, there went yearly out of the kingdom seventy thousand pounds sterling. But, in the reign of Edward I, it was declared by the parliament, that the Pope's taking upon him to dispose of English benefices to foreigners was an incroachment not to be endured; and this was followed by the statute of provisors against popish bulls, and disturbing any patron, in presenting to a benefice.

But the Pope's power received a mortal blow, in England, by the reformation in religion, begun in the reign of Henry VIII; since which time, to maintain the Pope's authority here, by writing, preaching, &c. is made a premunire upon the first conviction, and high-treason upon the second.

PO'PLAR, *populus*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the amentaceous kind, being composed of a number of small leaves, furnished with a great quantity of apices; but these are barren. The embryo fruits are produced on those trees which produce none of these flowers; these are spiked, and consist of many leaves, under which there lies a sort of bell, which contains the embryo seed vessel, which finally becomes a membranaceous pod of a compressed figure. These are disposed in a spiked form, and open into two parts, containing seeds winged with down. To this it is to be added, that the Poplar has a peculiar and appropriated general appearance, by which it is obviously distinguished from the willow.

The species of Poplar, enumerated by M. Tournefort, are these: First, the common white Poplar, with large leaves. Secondly, the common white Poplar, with smaller leaves. Thirdly, the common black Poplar. And, fourthly, the Poplar with trembling leaves, called the aspen-tree. *Tourn. Inst.*

The Poplar, whether black or white, may be easily propagated, either by layers, cuttings, or suckers, of which the white kind always produces a great many from the root. The best season for the transplanting these suckers is in October, when the leaves begin to decay; and they should be removed into a nursery for two or three years, at the end of which time they will have got strength enough to be transplanted into the places where they are to remain.

When they are to be propagated by cuttings, it is best to do that in February, cutting off large truncheons of eight or ten feet long; which, being thrust down a foot deep in the ground, will take root very quickly, and, if the soil be moist, will grow to a considerable size in a few years.

The black Poplar is not so easily raised from these large truncheons, but should be planted in cuttings, of about a foot and a half long, planting them a foot deep in the ground. This will grow on almost any soil, but does much better on a moist one than on any other. They are the fittest of all trees for raising a shade quickly, as they will grow fourteen feet in height sometimes in one season, and in four or five years will be large trees.

A considerable advantage may be obtained by planting these trees upon moist boggy soils, where few other trees will thrive: many such places there are in England, which do not, at present, bring in much money to their owners; whereas, if they were planted with these trees, they would, in a very few years, over-purchase the ground, clear of all expence: but there are many persons in England, who think nothing, except corn, worth cultivating: or, if they plant timber, it must be oak, ash, or elm; and, if their land be not proper for either of these, it is deemed little worth; whereas, if the nature of the soil was examined, and proper sorts of plants adapted to it, there might be very great advantage made of several large tracts of lands, which at this time lie neglected.

The wood of these trees, especially of the white, is very good to lay for floors, where it will last many years; and, for its exceeding whiteness, is, by many persons, preferred to oak; but, being of a soft contexture, is very subject to take the impression of nails, &c. which renders it less proper for this purpose: it is also very proper for wainscotting of rooms, being less subject to swell or shrink, than most other sorts of wood: but, for turnery ware, there is no wood equal to this for its exceeding whiteness, so that trays, bowls, and many other utensils, are made of it; and the bellows-makers prefer it for their use; as do also the shoe-makers, not only for heels, but also for the soles of shoes: it is also very good to make light carts; the poles are very proper to support vines, hops, &c. and the lopping will afford good fuel, which, in many countries, is much wanted.—For the method of making the ointment from the buds of the Poplar, see POPULEUM in the Dictionary.

POPLAR-*Galls*. The black Poplar is famous among naturalists for producing a sort of galls, or protuberances, of various shapes and sizes, on its leaves and branches, which have been usually mistaken for the lodgment of worms hatched from the eggs of an ichneumon fly; but they are in reality produced by the operation of a viviparous insect, called the puceron, for the bringing up of its off-spring. See PUCERON.

PO'PPY (*Dict.*)—We have many species of this plant cultivated in gardens for the beauty of the flowers. They are all easily propagated by sowing the seeds in autumn. When the young plants come up, they are to be cleared from weeds, and thinned to a proper distance by pulling some up, where they stand too thick; for they never thrive well, if they are to be transplanted. They are to be left, according to their sizes, at six, eight, or ten inches distance.

They are very showy flowers, and make a splendid appearance in gardens; but they are but of a short duration, and are of an offensive smell, which makes them less valued at present than they have been.

Some sow these plants in spring, but it is not so well; because they then have not time to get strength before autumn, when they are to flower; and, for that reason, those sown in spring usually flower weakly. *Miller's Gard. Dict.*

Red POPPY.— The common wild red Poppy is one of the most mischievous weeds the farmers are plagued with among their corn, and it is the most difficult to thoroughly destroy of almost any other. Its seed will lie a long time in land unploughed, without ever shooting; but they will be sure to grow with every crop of corn. Mr. Tull gives an instance of the seeds of this plant being buried four and twenty years in a field of saint-foin, and at the end of that time, the land being ploughed for wheat, they all grew up among the corn, though, they had lain dormant so long before. *Tull's Horse-hoeing Husbandry.*

Yellow POPPY.— The yellow horned Poppy, called by authors papaver corniculatum luteum, is one of those vegetable poisons of our own growth, which may be very mischievous by their not being generally known, or suspected to be so. We have an account of the effects of this plant in the Philosophical Transactions, in an instance of a family in Cornwall, who eat of a pye made of the roots of this instead of eryngo, or sea holly, which it is the custom of the poorer people there to make into a coarse sort of pye for their food.

The man of the house, on eating of this pye while hot, was seized immediately with a violent delirium, one effect of which was his thinking every thing he saw was of a yellow colour, and taking every utensil of the house to be made of gold. The man and maid-servant eat after their master, and were soon after as mad as he, coming into the room where his friends were attending him, stripped naked and danced together. These people also took every thing they saw to be gold; and a child in the cradle, to whom a small piece of the pye had been given, was thrown into a drowsy disorder, and convulsed about the mouth; but, after a few days, it recovered.

The grown people were all seized with most violent purgings, and by that means escaped, after being miserably worn down by this complaint.

The symptom of supposing every thing gold, which ran thro' the whole family, and went even so far as to the supposing their stools gold, and ordering them to be saved, may possibly be in some measure owing to the idea they had of the plant whose roots they had been poisoned by; its flowers being as large as a rose, and of a fine yellow, and the juice of the whole plant being also yellow. *Philos. Trans.* N°. 242.

POPULA'GO, *marsh marigold*, in botany, a genus of plants, whose characters are:

The flower consists of several leaves, which are placed circularly, and expand in form of a rose; in the middle of which rises the pointal, which afterwards becomes a membranaceous fruit; in which there are several cells, which are, for the most part, bent downwards, collected into little heads, and are full of oblong seeds.

This plant is said to be of a refrigerating quality, like the nymphæa; but it is really, of a very caustic nature, so that cattle avoid it, though in the greatest want of grass; but, if they happen to eat it, they are first seized with an inflammation of the fauces, œsophagus, and stomach, and at last die. Hence, it appears to be a very acrimonious herb, and of the nature of hellebore. *Hist. Plant. adscript. Boerhaave.*

PO'RCELAIN (*Dict.*)—The most just and regular idea we can form of the Porcelain or China ware is, that it is an half vitrified substance or manufacture, in the middle state between the common baked earthen-ware of our vulgar manufactures and true glass. This is the essential and distinctive character of Porcelain, and it is only by considering it in this light, that we are to hope to arrive at the perfect art of imitating it in Europe.

This attempt is to be made on these principles in two different manners: the one by finding some appropriated matter on which fire acts with more than ordinary strength in the time of its passing from the common baked state of earthen-ware into that of glass. The other is, to compose a paste of two substances reduced to powder; the one of which shall be of force to resist a violent fire, so as not to become vitrified in it; and the other a matter very easily vitrifiable. In the first case, the matter is to be taken out of the fire at the time when it is imperfectly vitrified; and, in the other, the compound mass is to remain in the furnace till the one substance, which is the more easily vitrifiable, is truly vitrified; and being then taken out, the whole will be what Porcelain is, a substance in part vitrified, but not wholly so.

The first method is that by which the European Porcelain has generally been made, and, though that of St. Cloud, and some other places, has been very beautiful, yet it is always easy to distinguish even the finest of it from the China ware, and the nature of the two substances appears evidently different: these owing

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owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a very little longer continuance would have made them perfect glaſs; on the contrary, the China ware being made of paſte, part of which is made of a ſubſtance in itſelf ſcarce poſſible to be vitrified, bears the fire in a yet much more intenſe degree than ours, and is in no danger of running wholly into glaſs from it.

The two ſubſtances uſed by the Chineſe are well known by the names of petuntſe and kaolin, and on examining theſe it appears very evident, that we have in Europe the very ſubſtances, or at leaſt ſubſtances of the very ſame nature, and capable of being wrought into a Porcelain equally beautiful and fine. *Mem. Acad. Scienc. Par.* 1739. See the articles KAOLIN and PETUNTSE.

Theſe are the two different ſemi-vitrifications, on one or other of which all the European manufactures, by which of the two proceſſes it is eaſy from the knowledge of theſe principles to determine, on breaking a piece of china of our manufactures, by which of the two proceſſes it is made. If it is made by ſeizing the half vitrified maſs of a ſubſtance which would ſoon after have been wholly vitrified, then the putting it in a crucible, into an equal degree of fire, will ſoon turn it wholly into glaſs. This is the caſe of moſt of our European Porcelain; but, if it be made of two ingredients, the one of which is not vitrifiable, or at leaſt not by ſuch fires, then the matter will melt, but will not vitrify: this is the caſe with the Chineſe Porcelain, which, if kept in fuſion a long time, yet when cold is China-ware ſtill; ſo that this is evidently made of two ſuch different ingredients.

Beſides theſe methods, there is yet another, of late invention, which makes a very beautiful china; and which, if it does not afford veſſels equal to thoſe of china, yet will afford them nearly approaching to theſe, and at a conſiderably ſmaller price. This method conſiſts in reducing glaſs to china. See the article GLASS *Porcelain.*

The fine deep blue of the old Porcelain ware of China is much valued by the curious; and it is much lamented, that the ſame colour is not uſed at this time. The art ſeems at preſent to be loſt; but perhaps it might be recovered by trials. It is certain, that the Chineſe have cobalt among them, and very probably they uſed a blue colour prepared from this before they had any commerce with us: notwithſtanding all the conjectures about their materials for colouring, this ſeems the moſt probable ſubſtance; and there is a way of preparing a colour from this, much ſuperior to that now in uſe, which we call ſmalt.

Cobalt is a mineral containing arſenic and a blue vitrifiable earth. The common way of preparing ſmalt is, by roaſting the cobalt in a reverberatory fire. This diſpoſes it to vitrify, and drives off the arſenic it contains in fumes, which collecting at the top, form true flowers of arſenic. It is very certain, however, from experiments, that, if this arſenic could be preſerved in the cobalt, the ſmalt would be of a much finer colour; for there are ſome kinds of cobalt which yield ſmalt without previous roaſting; and as the arſenic is in a great meaſure contained in theſe, the ſmalt are much finer coloured. Arſenic added to ſmalt, while in fuſion, greatly exalts its colour alſo; and there is a way of procuring ſmalt from cobalt, without fire, only by diſſolving it in an acid, and precipitating that ſolution with oil of tartar. The ſmalt, thus precipitated to the bottom, is of a much finer colour than any prepared by fire; but it is much more expenſive, and prepared in leſs quantity. It is very poſſible, that the Chineſe might have the art of making this kind of ſmalt before they knew us, and that to this was owing the fine blue of their Porcelain ware: but, when we traded with them, and they purchaſed ſmalt ſo much cheaper of us than they could make it themſelves, they naturally diſcontinued the manufacture of their own finer kind, without conſidering how greatly inferior the colour was which the other yielded. If this be the caſe, it will be eaſy to revive this art, and the adding the true old china blue to an European manufactures, in imitation of Porcelain, may give them a value which they have not at preſent.

The Chineſe had once a method of painting the figures of fiſhes and other things on the inſides of their veſſels, in ſuch a manner that they did not appear till the veſſels were filled with water, or ſome other clear liquor. This ſort of China-ware was called kiatſim, that is the concealed blue china. The art is now in a great meaſure loſt; but there may be ſome gueſs made as to the manner in which it might be done at this time. The veſſels which are to be made, muſt be very thin: the colours muſt be laid on in form of the fiſh, or other animals or figures, on the inſide, after the veſſel has been once baked. After this colour has had time to dry, the inſide of the veſſel muſt have a ſecond coat of the ſame earth, or ſtone ware, of which the veſſel is made; and over this a varniſh of the common kind. The conſequence of this will be, that the figures of the fiſh, in a very ſtrong colour, will be buried between two coats of the ware, which together form a complete veſſel. The outſide is then to be ground down almoſt to the figures, and, when they begin to appear, a new coat of the varniſh is to be laid over this. The figures will then be obſcured, and ſcarce, if at all perceivable; but, on filling the veſſel with water, the tranſparence of the ſides will be taken off, and the liquor will make a ſort of foil behind, which will throw out the figures of the fiſh. This might be done in any ware tolerably clear and tranſparent. The Porcelain of china would ſucceed beſt with it; but the pains and nicety required are too great, and all the attempts lately made by them have miſcarried. See the article STAINING *of Porcelain.*

The Chineſe make a great variety of figures on the ſurfaces of the vaſes of white China ware, and there is one kind of this greatly in eſteem among them, in which there are flowers and other figures; yet, the ſurface is quite ſmooth, and the ſubſtance extremely thin. The manner of making it is this: they firſt form the veſſel of the fineſt materials, as thin as they can; then, when they have poliſhed it inſide and out at the wheel, they put into it a ſtamp of its own ſhape, but cut with all theſe figures: they preſs this down ſo firmly on the yet moiſt veſſel, that the impreſſion is received in a very perfect manner; and, if the ſhape of the veſſel be at all hurt, they take it to the wheel again to reſtore it. They then finiſh it with the knife and ſciſſars; and, when they have made it as perfect as can be, they cover it with the fine white varniſh within and without. This fills up all the cavities of the impreſſion, and gives a perfectly ſmooth and even ſurface; yet the thickneſs of this varniſh in the traces of the figures gives it a different white, and the whole figures are as finely and accurately ſeen, as if painted on the outſide. This is an artifice that might eaſily be brought to bear among us, and ſeveral of our finer wares would make a pretty figure with it.

There is a current opinion among the Chineſe themſelves, that the Porcelain ware of former times was greatly ſuperior to that which they make at preſent; and that the burying china in the earth, for a long time, adds to its beauty; but all this is founded on error. The truth is, that our merchants beat down the price of the ware, and thereby compel them to make a worſe kind in general; but they are as able to do as fine things now as ever. What gave birth to the opinion, that burying Porcelain made it good, was, that finer pieces than ordinary are ſometimes found buried. Theſe are all precious vaſes, which the poſſeſſors buried, by way of ſecurity, in the times of civil war; and it is no wonder, that there are none but of the fineſt kind found buried on theſe occaſions. *Obſerv. ſur les Coutum. de l'Aſie.*

PORCELLA'NA, in natural hiſtory, the porcelain ſhell, or concha venerea, the name of a genus of ſhell-fiſh, the characters of which are theſe: they are of the univalve kind, and have for their mouth a long narrow ſlit, dentated on each ſide, and are of a conglobated, oblong, gibboſe, or umbonated form.

PO'RCUPINE, *hyſtrix*, in zoology, a creature of the ſize of the larger monkies, and is covered all over, except its noſe, the lower part of its legs, and the extremity of the tail, with ſpines of two or three inches long, and has no other hair but theſe. Theſe are yellowiſh for that half next the body, whence they are of a deep blackiſh brown, and at the very extremity they are white: they are hollow in the manner of quills; and Hernandez affirms, that the creature has a power of throwing them from its body to a conſiderable diſtance. The body is about a foot long, the tail ſomewhat longer than that, and its farther half covered thinly with hairs much reſembling hog's briſtles. The ears are ſmall, and are hid by the ſpines which cover the head. It has two long teeth in each jaw before; the noſtrils are very wide, the eyes round, prominent, and very bright and ſparkling, the feet are like thoſe of the monkey kind, and divided into four toes.

It climbs trees, but ſlowly and with difficulty, for want of a heel or hinder toe. It uſually twiſts its tail about a bough, to keep it ſafe from falling. It makes a grunting like that of a hog. It feeds on poultry, and its fleſh is very well taſted. *Ray's Syn. Quad.*

PORE'LLA, in botany, the name of a genus of moſſes, the characters of which are theſe:

The capſules contain a powder like thoſe of the other moſſes; and they have neither operculum, calyptra, nor pedicle; and their manner of ſhedding their powder is not by ſeparating into two parts, like thoſe of the ſelago and lycopodium, but by opening into ſeveral holes on all ſides.—It is not uſed at all in medicine.

POR'PESSE, an Engliſh name given indiſcriminately to two different fiſhes, the phocæna and the dolphin.

Artedi, who has been very careful in bringing together the ſynonyma of authors, tells us, that this is properly the Engliſh name only of that ſpecies of the dolphin, the character of which, according to this ſyſtem, is, that the body is almoſt of a conic form, the back broad, and the body ſubacute. This ſpecies is the phocæna of Ariſtotle, and the turſio or turſio of Pliny and Rondeletius. Schoneveldt calls it the ſmall northern or oriental dolphin, and the Swedes the marſuin. See the article DELPHINUS.

POR'PHYRY-*ſhell*, in natural hiſtory, a name given by authors to a ſpecies of ſea-ſhell of the purpura kind, with a ſhort clavicle and beak.

PO'RTABLE *Laboratory*.—Dr. Shaw, who has taken great pains to bring the ſtudy of chemiſtry more into uſe in England than it has hitherto been, has explained the eaſineſs of its operation in general, and attempted a means of making its

 practice

practice less expensive, by introducing, in the place of that vast number of furnaces, and other contrivances, figured and described by the generality of authors on that subject, a Portable laboratory, by means of which alone all the chemical operations may be commodiously performed. This laboratory, fitted for its several purposes, is figured on *Plate* XXXVII. *fig.* 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

Its contrivance is such, that not only complete courses of chemical experiments and operations may be commodiously performed by its means, but all the medicines may be prepared, in such quantities, as to supply not only the demands of a family, but of an apothecary's shop, in moderate business. The first person who planned out this sort of furnace was Becher, and the scheme executed by Dr. Shaw is an improvement on that attempt.

The furnace has four principal parts: 1. The cover. 2. The ring. 3. The body, and 4. The foot. The general office and use of the cover is to check, suppress, and throw back the heat and flame, that the fuel may not waste itself too fast, as it otherwise would do to very little purpose in in many of the operations; for, the action of the fire being not momentary but successive, the more it is kept in, and directed upon the subject, the more it is able to perform its effect, and that with the less expence or destruction of it. In order to increase the draught to the fire, and squeese the air more forcibly through the body of the fuel, there is a moveable funnel or chimney, which may occasionally be fixed to the orifice, in the top of the cover left for that and many other uses. See the *Figure*, *ubi supra*.

The ring is the place or seat of many operations. The body to be worked upon by the fire is frequently lodged in it; and, in other cases, it helps to enlarge the furnace, and renders it capable of operations it could not otherwise perform. The body of the furnace serves to contain the fuel, and is the common seat of the operations by the fire, in the running metals from their ores; and, in these and many other the like cases, it performs the office of crucible as well as fire-place, and contains the subject mixed along with the fuel, as is practised at the smelting-houses. To this body there belong three several grates, which may be placed at different heights therein, according to the nature of operation, and the distance required between the subject and the fire. Lastly, the foot is of two kinds, and is not only of use in supporting the rest of the parts, but it receives the ashes of the fuel, and the melted matter that may, in any of the operations, run down from the ores of the metals, or on other the like occasions, when the fire liquates any thing above. The more immediate appurtenances of this furnace are fuel and bellows. The general fuel is to be charcoal; or, as there is a contrivance for a vent or flue in the body of the furnace, common sea-coal may be employed, and the smoak directed up the chimney of the room, in which the furnace is to stand. The structure of this furnace is also very well fitted for a lamp, which is a sort of heat, highly convenient for some curious digestions and calcinations; and by this means these operations, which would otherwise require an athanor, may be conveniently performed, and that in the most accurate manner.

The number of chemical processes that may be performed by this furnace is not easily reckoned up; but it may not be improper to add an account of the several states, into which it is to be put for the performing them.

The most simple state of the furnace is a combination of its two lower parts, the body and the foot. When these are put together, it is fit for fusion by the naked fire, where the matter to be melted is to be mixed among the fuel; as, for instance, in the running the ores of lead, tin, or iron, which may thus, in the quantity of many pounds at a time, be separated from their dross, and purged for use, as exactly as at the mine works, or smelting-houses, either with the assistance of the bellows, or without, as the nature of the ore requires. By barely placing a grate in the middle of the body, the instrument becomes a melting furnace for a crucible, wherein all the operations that require a fire of fusion, animated either by the air, or bellows, are performable with such advantages as cannot be had in the common wind or blast furnaces made for this purpose. When only the body of the furnace with its middle grate is set upon the foot, it answers all the purposes of a shop furnace used by the apothecaries for decoction, inspissation, extraction, and the like purposes, where a naked fire only is required, and certain distillations and sublimations may also be performed conveniently by it.

It may in this state also be conveniently made to serve the purposes of a balneum mariæ, an ash heat, a sand heat, or a still stronger one for digestion and sublimation, by only setting on it in this state a vessel of water, or one filled with ashes, sand, or iron-filings; and thus several operations requiring the same kind of heat may be carried on at the same time. If instead of a common pan or vessel to hold water, sand, &c. the ring or third part of the furnace, be set on furnished with its set of pots, the whole is then a furnace fitted for that sort of distillation called distillation in capella vacua, where the retorts are contained in the cavity of the pots, and locked down therein without any visible medium between. By this means many operations may be performed in the distillation and separation of bodies, that could not be worked upon to so much advantage by any other method. Particularly the rectification of the strongest acid spirits is very easily and conveniently performed, this way, at very little expence.

If an iron pan be placed in the room of the ring just mentioned, the instrument is then a calcining furnace, where ores of metals may be roasted, and lead, antimony, and the like bodies may be conveniently reduced to ashes.

If the lowest grate be used instead of the middle one, then either a cold still, or, as it is generally called, a hot one, may be put into the body, and worked in the common manner with its head and refrigeratory. Thus all the cordial waters may be made, spirits may be rectified, and the essential oils distilled by the same means, as well as by the common fixed stills.

The last part, or cover of the furnace, may sometimes be applied to the ring, sometimes only to the body of the furnace without the ring. The instrument in this case becomes a proper reverberatory furnace, and is useful for cementation, cupellation, and the essaying of ores, and for distilling with a fire of suppression, that is, where the fire is placed above as well as below the subject, and the vessel that contains it.

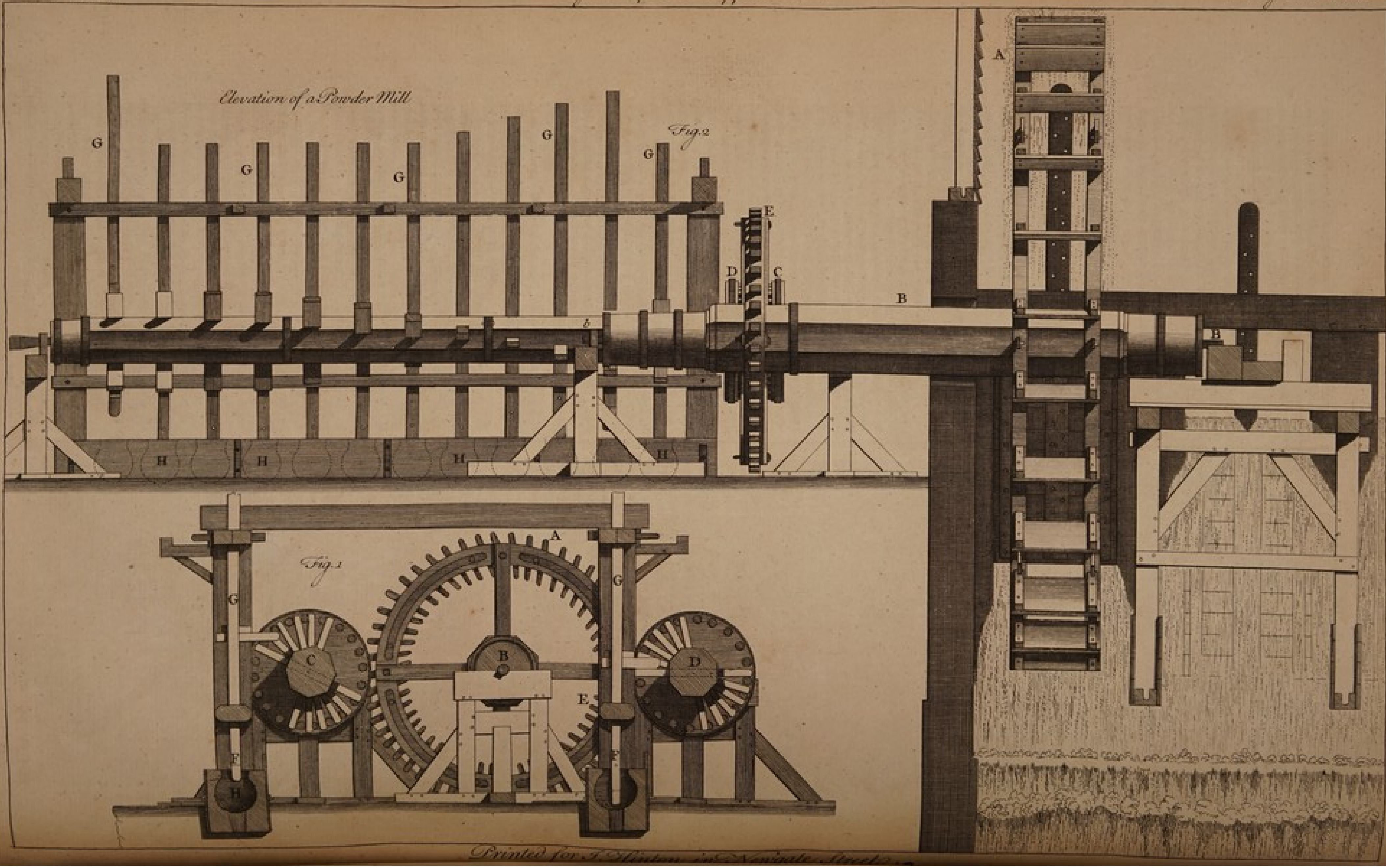
A furnace of this nature has numerous advantages, not only over all the chemical furnaces in common use, but even over those of the most celebrated structure and contrivance, described by authors on particular occasions, not excepting those of Glauber and Vigani. Those nicely contrived furnaces are generally adapted to some few particular purposes, and yet this easy kind answers in experiment those very purposes better; and at the same time is of general use on all the other occasions of chemistry. Experience has shewn, that it is better for the various uses of Glauber's philosophical furnaces, than those very furnaces themselves, though made for these very purposes; and for the higher operations as they are called of metallurgical chemistry. For example, to obtain a pure spirit of salt in plenty, Glauber orders the salt to be thrown upon the fire, and has contrivances to catch the rising vapour; but this is a tedious way, and turns to very little account in practice; nor is the matter much improved by quenching the coals in a brine of sea-salt, and afterwards burning them for their fume; but all that can be expected from these aukward contrivances, may be had commodiously from the furnace here described, where the fire, being animated by bellows, causes the fire to burn more free, and the fuel to yield the spirit it was impregnated with, much more quickly and easily than in the furnace contrived by that author for the purpose, while the fuel is supplied by the door without any disturbance to the operation. *Shaw's Ess. on a Portable Laboratory.*

There are many other curious philosophical experiments, which can be no way so well done as with this kind of furnace, and many scarce at all without it; it is excellently fitted also for enamelling, making of pastes, staining of glass, and making the artificial gems. And, besides these and a number of other curious uses, it is extremely well fitted for all the common purposes of fires. Any artizan who requires fire in whatever manner in his business, may contrive to apply it in this manner as he will; the offices of a common stove in a kitchen may also be very well supplied by it, and the warming a room, or vault, is as well done by it as by any of the common contrivances of stoves, ovens, and other things, made purposely for that use.

The outer case of the furnace is to be made of good plate iron of a considerable thickness, formed in separate pieces of the figures expressed in the plate, and its size may be such as the operator chuses; observing only a due proportion in its several parts. The inner sides of all the parts must be lined at least an inch thick with a proper luting, which must be carefully laid on and gently dried, the cracks, which happen in the drying, being filled up with more of the same luting. Windsor loam alone may be used to this purpose, but the author himself recommends the following mixture: take a bushel of Windsor loam, four quarts of brick-dust, two quarts of powdered green glass, two quarts of iron filings, four handfuls of cow hair, and eight handfuls of horse dung; these are all to be beat together, and a sufficient quantity of bullocks blood added, to make the whole into a stiff and uniform paste, which is to be carefully spread over every part of the furnace that the fire can touch.

PO'RUS *cervinus*, in natural history, a name given by authors to a species of sea plant, found among the rocks in the coral fisheries, and in other places. It grows at different depths, and seems to adhere to the rocks by a simple base, having no root, nor any thing in the place of one. It is branched in such a manner, that, with the help of a little imagination, it has been forced into the resemblance of a stag's horn. Its height is about an inch an half, often less when newly taken out of the sea; it is of a fine snow white colour, but, when it has lain some time to dry, it becomes of a dusky yellow. It is very thin, perfectly transparent, and seems composed of several fine membranes. When examined by the microscope, an admirable structure is discovered in it; the whole being composed of a membranous matter, in which are an infinite number of holes, and all these arranged into regular lines.

PLATE XXXVIII. *Engraved for the Supplement.* *Facing* Powder *Mill.*



Printed for J. Hinton in Newgate Street.

POSIDIUM, Ποσειδεών, in chronology, the seventh month of the Athenian year. It consisted of thirty days, and answered to the latter part of our December and the beginning of January.

POT-ASH (*Dict.*)—The art of reducing vegetables to this state is a very valuable one; the soap-maker, fuller, scowerer, dyer, and glassman, as well as the chemist and apothecary, depending greatly on it in many particulars.

The authors who are farther to be consulted in this case, are Glauber, in his Prosperity of Germany; but the chemical foundation of the whole appears in Boerhaave's Chemistry, and the papers of Stahl on this subject.

This salt has been made in New England in considerable quantities from rotten wood. What gave the occasion of knowing it, was, that a white oak in that province decayed, and a third part of its substance became rotten. This rotten part was tried to burn, and was found to turn almost wholly into a fine alkali salt, or Pot-ash, much stronger than that which is made in the usual way. What was most observable in the making of this salt was, that, while the wood was burning, it would melt of itself, and run down into hard lumps of salt; and this none of the wood of the same tree, which was found, would do, but only the rotten part: and what was most rotten of all, yielded the greatest quantity of salt, and that the most readily; whereas all the common alkali salts of wood, made by incineration, are blackish at first; and the lixivium made of them, although often filtred, will still be of a brown colour, occasioned by some of the charcoal of the wood so closely united to the salt as not to be easily separated from it. This alkali made from rotten wood was very white, even before solution; and the lixivium made with it was not at all tinged with brown, but clean like pure water, only a very small quantity of ashes subsided to the bottom. The lixivium was easily decanted from this, without the trouble of filtration, and, when evaporated to a driness, left the salt perfectly fine and pure. In the making this salt, as the fire grows more intense, the wood is seen to run together into great lumps, and bubble with a hissing noise.

The weight of the Pot-ash prepared in the common way is very considerable, in proportion to the wood used; but, in this, the salt nearly equals the whole weight of the wood. In the common way of making the Pot-ash, the salt is never distinguished by the eye among the ashes, nor even causes them to run into lumps; but in this case the salt always runs into large lumps, and is as easily distinguished from the rest of the ashes, though white, as salt of tartar of the purest kind would be.

It is very certain, that rotten wood in many places has been found, on trial, to yield much less salt than found wood; but the found wood of this tree, being tried, was found to yield no more salt than other wood, and consequently much less than the rotten part of it. On examining this tree on the spot, it was thought by good judges, that it had been at some distance of time struck with lightning, it being evidently torn from the top to the bottom: on that side where the decayed part separated from the found, there had been a channel of about five inches wide all the way down; but this was closed over by succeeding bark, and shewed no trace of the accident till on examining underneath, where the tree was found black for such a space, and the bark not of a piece with the rest.

From this it may be conjectured, that the wood, having been for so long a time, as till the growth of this bark, exposed to the wind and weather, naturally became rotten from the wet it received; and that the lightning, having penetrated the wood, had so altered and disposed the parts and pores of it, that they attracted and retained the nitrous salts of the air in great abundance, even as salt of tartar, and other the like salts, do; which, as Glauber observes, will be reduced, in continuance of time, to an absolutely nitrous salt, and the quantity also considerably increased,

The parts of this rotten wood were of a very different structure from those of ordinary wood in this condition; and, though the lightning had not calcined it into a salt, yet it had, as appears, sufficiently altered it to give that tendency to imbibe, and a power to retain the nitrous particles from the air, as well as the alkalies of vegetables perfectly calcined will do. If it should be objected, that nitre alone will not calcine into an alkali, it is easily answered, that nitre with charcoal will; and the remaining wood might very well serve as charcoal in this process. *Phil. Transf.* N°. 366.

POTATOE. The most advantageous way of propagating Potatoes is, the planting them at large distances, and digging or horse-hoeing the ground several times between them.

Mr. Tull gives an example of this, in which the hoeing succeeded much better than dung, and without the expence of it. A piece of ground was planted with Potatoes, the greater part of it in the common way; but in one part, worse than the rest, they had been set at a yard distance every way. The rest of the ground was dunged; this poor part had no dung, but was ploughed deep at several times four different ways, so that the ground was stirred and broken thoroughly every-where about the Potatoes. The consequence was, that though no dung was used here, and though the plants appeared much weaker than in the dung part, yet the crop was greatly better than that of the other part of the field. The roots here were all large, and in the other parts of the field, where the dung had been used without ploughing, they were so small, that the crop was scarce worth taking up.

This is one of many instances of the no great use in dunging land, without properly stirring it up, and serves to prove, what the crops of corn and every thing else confirm upon trial, that the stirring the earth sufficiently, without any farther trouble, will answer better without any other manure, than all the manure in the world without it. *Tull's Horse-hoeing Husbandry.*

POWDER-*flasks*, in artillery, are most commonly made of horn, of any convenient size and figure, to carry powder for priming of cannon: this is their chief use in armies.

Sometimes they are so made as to have a measure for the charge of the piece at top, but this is of more use to gentlemen in fowling, &c. than to soldiers, who have the charges of their piece put into cartridges, which they bite off, and first prime, and then load.

POWDER-*room*, in a ship, that part of the hold wherein the Powder is stowed.

POWDER-*mill*, a mill for pounding, mixing, &c. the ingredients of which gunpowder is composed.

Gunpowder is composed of salt-petre, sulphur, and charcoal. The sulphur must be well purified. Salt-petre is a salt extracted by different liminations from several sorts of broken stones, pieces of old and dry plaister, or rubbish of old buildings, especially cellars, and generally all earths which have been long in sheep-folds, stables, pigeon-houses, and other places where are gathered, either by a regular course or transpiration, the drainings of dunghills, manufactures, urines, and all salts proceeding from animals. These three matters, pulverised separately, are incorporated afterwards into one mass of a fixed weight, whereof the salt-petre makes three quarters, the sulphur half a quarter, and the charcoal the other half quarter. The sulphur serves to inflame the whole. The charcoal hinders its too sudden extinction. The salt-petre makes its strength, by the great dilatation it receives from the fire, and hardness of the parts it shoots. What we can discover in the terrible action of gun-powder is extremely confined, though we have learned by several Experiments to make it and manage it. See the article GUNPOWDER, in the Dictionary. The ingredients, which enter its composition, are harmless, while they remain separate; and it could be wished, for the repose of sailors, and those who have gun-powder in their neighbourhood, that all those matters could be exported, or kept separate, till a present occasion should require to join them together. This would be an important service to society: I ask it of them who want nothing else for the formation of the world but matter and motion. But, till they be pleased to favour us with it, we will continue to make the incorporation of the three matters gun-powder is composed of, in the mortars of the mill, with the assistance of the pestles and sprinkling. The mortar is a piece of wood made to receive twenty pounds of paste of the composition abovementioned.

There are twenty-four mortars in each mill; where are made at once, and in one day, four hundred and eighty pounds of gun-powder, by sprinkling each mortar with two pounds of water, taking care to repeat the sprinkling, from time to time, lest the matter should take fire. The paste having been pounded during three hours successively, it passes from one mortar into another. The mortar is pierced at bottom, and stopped with a cork or piece of wood in the form of a cone, to receive the strokes of the pestles, and reserve the mortar. The pestle is a piece of wood ten feet high, and four inches and a half broad, armed at bottom with a round piece of metal. The pestle weighs sixty-five pounds. The inspection of the pieces will make us conceive the effect thereof.

Plate XXXVIII. *fig.* 1. The profile of the wheel and cog-wheel.

A. The wheel.

B *b*. The arbor of the great wheel. It places one trunnion in *b*, and the other in B. See *fig.* 2.

C. The arbor of the trundle-head C seen beyond the cog-wheel.

E. The cog-wheel, from before which the trundle-head D has been taken off here.

F. The pestles.

G. The tails of the pestles; which are two pieces of wood, pierced with as many holes as there are pestles, to keep them even in the same row, while they go up and down.

H. The outside of the mortars.

Fig. 2. The plan of the whole machine.

A. The wheel.

B. The arbor.

C D. The two trundle-heads, each with its proper arbor, called here canting-wheel. The axis which makes the trundle-head turn is called canting-wheel, being environed with twelve small pieces of wood jutting out; these pieces are called lifts, because they are designed to raise the pestles; they catch them by the meeting of another piece of wood fastened laterally to each pestle. These fastenings are called stays.

E. The cog-wheel.

G. The tails of the pestles.

H. The bottom of the mortars.

If water be given to the wheel, the cog-wheel muſt march and drive contrary ways the two trundle-heads and their canting-wheels. Each, lift turning with the canting-wheel, meets at its return with the ſtay of a peſtle, and lets it fall into its mortar. Theſe twelve lifts are diſpoſed in ſuch a manner that there are always four of them up, and four peſtles unequally ready to fall. There is but one of them that falls at a time. From that diſpoſition of the peſtles depends the equality of the trituration of the peſtle. Which ſucceeds ſtill better, by making it paſs through the twenty-four mortars at regular times.

POWER (*Dict.*) — We find in ourſelves a Power to begin or forbear, continue or end, ſeveral actions of our minds, and motions of our bodies, barely by a thought or preference of the mind. This Power which the mind has thus to order the conſideration of any idea, or the forbearing to conſider it, or to prefer the motion of any part of the body to its reſt, and vice verſa, in any particular inſtance, is what we call the will.—And the actual exerciſe of that Power, is that which we call volition, or willing.

The forbearance or performance of that action, conſequent to ſuch order or command of the mind, is called voluntary: and whatſoever action is performed without ſuch a thought of the mind is called involuntary.

The Power of perception is what we call the underſtanding. Perception, which we make the act of the underſtanding, is of three ſorts: the perception of ideas in our minds; the perception of the ſignification of ſigns; and the perception of the agreement or diſagreement of any diſtinct ideas.

Theſe Powers of the mind, viz. of perceiving and preferring, are uſually called by another name; and the ordinary way of ſpeaking is, that the underſtanding and will are two faculties or powers of the mind. A word proper enough, if uſed ſo as not to breed any confuſion in men's thoughts, by being ſuppoſed (as there is room to ſuſpect it has been) for ſome real beings in the ſoul, that perform thoſe actions of underſtanding and volition. From the conſideration of the extent of the Power of the mind over the actions of the man, which every one finds in himſelf, ariſe the ideas of liberty and neceſſity.

So far a man has a Power to think, or not to think; to move or not to move, according to the preference or direction of his own mind; ſo far is a man free.

Wherever any performance or forbearance are not equally in a man's Power; wherever doing or not doing will not equally follow upon the preference of his mind; there he is not free, though perhaps the action may be voluntary.

So that the idea of liberty is the idea of a Power in any agent to do or forbear any action, according to the determination or thought of the mind, whereby either of them is preferred to the other: where either of them is not in the Power of the agent to be produced by him according to his volition, there he is not at liberty: that agent is under neceſſity. So that liberty cannot be where there is no thought, no volition, no will: but there may be thought, there may be will, there may be volition, where there is no liberty. Thus a tennis-ball, whether in motion by the ſtroke of a racket, or lying ſtill at reſt, is not by any one taken to be a free agent; becauſe we conceive not a tennis-ball to think, and conſequently not to have any volition, or preference of motion to reſt, or vice verſa. So a man ſtriking himſelf or his friend by a convulſive motion of his arm, which is not in his Power by volition, or the direction of his mind, to ſtop or forbear; nobody thinks, he has liberty in this; every one pities him, as acting by neceſſity and conſtraint. Again, ſuppoſe a man be carried, whilſt faſt aſleep, into a room, where there is a perſon he longs to ſee, and be there locked faſt in, beyond his Power to get out; he awakes, and is glad to ſee himſelf in ſo deſirable company, which he ſtays willingly in; that is, he prefers his ſtaying to going away: is not this ſtay voluntary? Nobody will doubt it; and yet, being locked faſt in, he is not at liberty to ſtay, he has not freedom to be gone.

Liberty, therefore, is not an idea belonging to volition, or preferring; but to the perſon having the Power of doing, or forbearing to do, according as the mind ſhall chuſe or direct. As it is in the motions of the body, ſo it is in the thoughts of our minds, where any one is ſuch, that we have Power to take it up, or lay it by, according to the preference of the mind, there we are at liberty.

A waking man is not at liberty to think, or not to think, no more than he is at liberty, whether his body ſhall touch any other or no: but whether he will remove his contemplation from one idea to another, is many times in his choice; and then he is, in reſpect of his ideas, as much at liberty, as he is in reſpect of bodies he reſts on. He can at pleaſure remove himſelf from one to another.

Yet ſome ideas to the mind, like ſome motions to the body, are ſuch, as in certain circumſtances it cannot avoid, nor obtain their abſence, by the utmoſt effort it can uſe: thus a man on the rack is not at liberty to lay by the idea of pain, and entertain other contemplations.

Wherever thought is wholly wanting, or the Power to act or forbear according to the direction of thought, there neceſſity takes place. This, in an agent capable of volition, when the beginning or continuation of any action is contrary to the preference of his mind, is called compulſion; when the hindering or ſtopping any action is contrary to his volition, it is called reſtraint. Agents that have no thought, no volition at all, are in every thing neceſſary agents.

POWER, in algebra.— If any Power of a quantity be divided by a greater power of the ſame quantity, the quotient muſt be negative. For the rule for dividing any Power of a quantity by another Power of the ſame, is to ſubtract the exponent of the diviſor from the exponent of the dividend, and make the difference the exponent of the quotient.

For inſtance, $\frac{a^6}{a^4} = a^{6-4} = a^2$ and $\frac{a^m}{a^p} = a^{m-p}$. Hence if p be greater than m, the exponent $m-p$ muſt be negative.

Thus if $p = m + n$, then $\frac{a^m}{a^p} = \frac{a^m}{a^{m+n}} = a^{-n}$.

It is obvious that $\frac{a}{a} = a^{1-1} = a^0$. But $\frac{a}{a} = 1$; and therefore $a^0 = 1$. In like manner $\frac{1}{a} = \frac{a^0}{a^1} = a^{-1}$; $\frac{1}{aa} = \frac{a^0}{a^2} = a^{0-2} = a^{-2}$; $\frac{1}{aaa} = a^{0-3} = a^{-3}$, ſo that the quantities a, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^4}$, &c. may be expreſſed thus, a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-4}, &c.

This change of expreſſion is often of great uſe in the computation of fluxions and infinite ſeries.

When the quantity to be raiſed to any power is poſitive, all its powers muſt be poſitive. And, when the radical quantity is negative, yet all its Powers, whoſe exponents are even numbers, muſt be poſitive. For $- \times -$ gives $+$.

The Power then can only be negative, when the exponent is an odd number. Thus the Powers of $-a$ are $-a$, $+a^2$, $-a^3$, $+a^4$, $-a^5$, &c. Thoſe whoſe exponents are 2, 4, 6, &c. are poſitive, but thoſe whoſe exponents are 1, 3, 5, 7, &c. are negative. *Mac Laur. Algebr.*

Hence, if a Power have a negative ſign, no root of it, denominated by an even number, can be aſſigned; ſince no quantity multiplied into itſelf an even number of times can give a negative product. Thus the ſquare root of $-aa$ or $\sqrt{-aa}$ cannot be aſſigned, and is what mathematicians call an impoſſible, or imaginary quantity or root. See ROOT.

Obſerve, that every Power has as many roots, real and imaginary, as there are units in the exponent of the Power. This holds true of unity itſelf. *Mac Laur. Algebr.*

Imperfect POWER, in algebra, is uſed for a Power that has a fractional experiment; thus $a^{\frac{1}{2}}$ $a^{\frac{1}{3}}$ $a^{\frac{2}{3}}$ $a^{\frac{1}{5}}$, &c. are imperfect Powers. *Mac Laur. Algebr.*

Theſe are otherwiſe expreſſed by placing the given Power within the radical ſign $\sqrt{}$, and placing above the radical ſign the number that denominates what kind of root is required.

Thus, $a^{\frac{1}{2}} = \sqrt[2]{a^1}$; $a^{\frac{5}{3}} = \sqrt[3]{a^5}$; $a^{\frac{m}{n}} = \sqrt[n]{a^m}$.

Theſe imperfect Powers are alſo called ſurds.

POW'TER, *or Engliſh Powter*, the name of a peculiar ſpecies of pigeon, called, by Moore, the columba gutturoſa Anglica. It was firſt bred in England, and is a mixed breed, between what is called the horſeman and the cropper. It is a very beautiful ſpecies, and is valued for its length of legs and body, neatneſs of crop, and ſlenderneſs in girth, added to the beauty of its feathers. This ſpecies is often eighteen, ſometimes twenty inches long from the end of the bill to the extremity of the tail. Its legs, from the upper joint of the thigh to the toe nail, is ſometimes ſeven inches; the crop is large and round, eſpecially towards the beak, filling alſo behind, and making almoſt a perfectly orbicular figure. They are either blue-pied, black-pied, red-pied, or yellow-pied; the laſt colour is moſt valued. *Moore's Columbarium.*

Pariſian POWTER, a ſpecies of pigeon called, by Moore, columba gutturoſa Pariſiorum.

It was firſt bred at Paris, and thence ſent to Bruſſels, whence it was afterwards brought into England. It reſembles the Engliſh Powter, but is ſhort-bodied, ſhort-legged, thick in the girth, and long-cropped. It is admired for the beauty of its feathers, which is peculiar to itſelf; it reſembles in this a fine piece of that ſort of needle-work which the ladies call the Iriſh ſtich, being chequered with various colours in every feather, except the flight, which is white. It has generally a good deal of red intermixed with other colours, and, the more it has of this, the more it is eſteemed.

Horſeman POW'TING, a name given to a mixed breed of pigeons, produced between thoſe two kinds known by the names of the cropper and the horſeman, according to the number of times that the young are bred over from the cropper. They are diſtinguiſhed by the names of the firſt, ſecond, or third breed.

Small POX. See SMALL *Pox, Dictionary and Supplement.*

PRA'MNION, in natural hiſtory, the name of one of the ſemipellucid impellucid gems, so distinct from all the others as to make properly a peculiar genus of fossils. It is called by many of the antients morio, or morion, and by our lapidaries the black agate.

It is a stone of a very great concealed beauty. Our lapidaries, who know it by the name of the black agate, are very indeterminate in the application of that name, calling by it not only this, but every black stone capable of a good polish by the same name, and never looking for its great character, its hidden colour. It is found in the shape of our common flints and pebbles, but seldom larger than an egg; it appears, on a slight inspection, to be of a fine deep black, but held up against the sun, or the light of a candle, it discovers itself to be of a fine strong red, without the least admixture of any other colour. It is most frequently of a purplish tinge, like the amethyst, but is at times found of all the degrees of red, from the pale flower colour of the hyacinth to the deep red of the carbuncle. It is of great hardness, and capable of an elegant polish.

It is produced only in the East-Indies; and we sometimes have it thence among other stones, but it is not much regarded with us. The Romans were fond of it for engraving on, as we find by Pliny, and by a much more undeniable proof, many of the valuable antiques being cut on it. *Hill's Hist. of Foss.*

PRA'SIUS, in natural history, the name of a gem, much approaching to the nature of the emerald, but of a coarser green, and wanting its hardness, and having in its green a cast of yellow.

It is the stone which the antients called prasites; and, when of a greater than ordinary admixture of yellow, the chrysoprasus, and of which the gem, distinguished by later authors under the name of the smaragdoprasius, is only one of the varieties.

The Prasius, even in its most perfect state, is much less beautiful than most of the other gems: it is found of various sizes, and not unfrequently considerably large: it is seldom met with smaller than a pea; from that to the size of a horse bean is its most usual standard, from this to the size of a nutmeg it is more rarely found; and the larger specimens are coarser and less frequent than these.

PRA'YER, (*Dict.*)—We shall not here amuse the reader with a critical enquiry into the origin of words that express that duty which men have in all ages thought themselves indispensably bound to pay unto the deity, of what nature soever he be. It is almost needless too bserve that to adore and adorare are derived from ad and orare; as if we should say, ad os referre manum, to pray with the hand before the lips. We shall only observe, that men have extremely multiplied the terms designed to express a religious act, imagining, perhaps, that the same idea expressed in their prayers in different terms, attended with certain ceremonies which they thought most acceptable to God, might prove more successful, and in a more effectual manner secure the divine assistance. The Greeks and Romans thought there was a sort of magic charm in some particular words and superstitious forms, which they made use of in their Prayers, and were even persuaded, that, by the prevailing power of them, they could compel the deity to be favourable to them. As all mankind in general have the same favours to beg of God, it is no wonder that their forms of Prayer should be almost the same, or at least alike in many respects. They all tend to the same end, and their necessities are the same; but as man by degrees began to lose the true idea of the divine being, and took upon him to attribute corporeal qualities, or human frailties, to him, he likewise lost the true spirit of Prayer. He added superstition to his worship, served God under corporeal notions, and, being no longer capable of contemplating him in spirit, was pleased to represent him by images, statues, &c. Hence arose so many extraordinary ceremonies, such extravagant acts of devotions, and such an infinite number of forms used in Prayer; such, among the antients, was the Io Pæan, which made a part of their pompous addresses to Apollo, &c.

With regard to Prayers, Jesus Christ forbids his disciples to lengthen them by vain and impertinent repetitions. Doubtless a repetition of the same thing in Prayer proceeds neither from zeal nor respect. It is very probable, that the Prayers of idolaters might be very tedious; but it is surprising that Christians should have fallen into the same error. Surely, to repeat the same Prayer to God fifty times, in the space of an hour, is as impertinent as to present fifty copies of the same petitions one after another to a prince. Among the Turks there are a sort of bigots who affect to repeat the name of God with an irreverent volubility, which rather resembles madness than devotion. The antients were very fond of using the number 3 in their Prayers; for instance, Tibullus says, Ter cane, ter dictis respice carminibus; and Ovid, Ter tollit in æthera palmas, &c. They imagined also that the gods delighted in a long train of titles of pompous appellations, to express their supremacy and power; and lest they should unhappily distinguish thereby any nature that might give offence, they took peculiar care to mention those attributes with a salvo, or some modest restriction, such as, Sive deus, sive dea es; not presuming to ascertain the sex of the deity whom they worshipped.

When they prayed aloud, a minister of the gods rehearsed the Prayer to the people, who repeated it in the very same terms; and the same thing is now practised among the Roman Catholics and Protestants, as well as among the Turks.

The piety of the ancient Greeks, and the honourable opinion they entertained of their deities, is in nothing more manifest than in the continual Prayers and supplications they made to them; for no man of the least prudence would undertake any thing of moment, without first asking the advice and assistance of the gods: and we are told by Plato, that, 'at the rising both of the sun and moon, one might every-where behold the Greeks, as well those in prosperity, as those in afflictions and distresses, prostrating themselves, and hear their supplications'.

The Lacedæmonians had a peculiar form of Prayer; for they never used, either in their public or private devotions, to make any other request, than that the gods would grant what was honourable and good for them.

There were several ceremonies attending the manner of their supplicating the gods. The petitioners were usually crowned with garlands, and carried boughs of laurel or olive in their hands; laurel being an emblem of success or victory, and olive of peace and good-will. With these boughs they touched the knees, or head of the statue, to which they addressed themselves. Sometimes they prostrated themselves at the entrance of the temples, and kissed the sacred threshold.

The postures they used were different; sometimes they prayed standing, sometimes sitting, but most commonly kneeling, that being expressive of the greatest humility. The poets furnish us with innumerable examples of prostration before the images, altars, and thresholds of the temples. They turned their faces to the east, when they prayed to the gods; and to the west, when they addressed themselves to the heroes or demi-gods.

It was also an usual gesture, in praying, to lift up their hands, and is sometimes therefore used to signify praying; as in Horace:

Cœlo supinas si tuleris manus.

When they lay prostrate, or kneeled upon the earth, it was customary to beat it with their hands.

It was a common opinion, that their Prayers were more prevalent and successful when offered up in a barbarous and unknown language. The reason assigned for this was, that the first and native languages of mankind, though barbarous and uncouth, yet consisted of words and names more agreeable to nature. If they obtained their request, and it was a matter of consequence, they presented to the god some rich gift, or offered a sacrifice. Sometimes the favour received was registered in the temple, as a memorial of the goodness of the god.

Under the article of Prayer may be included that of imprecations. These were extremely terrible, being thought so powerful, when duly pronounced, as to occasion the destruction, not only of single persons, but of whole families and cities.

The most terrible imprecations were those pronounced by parents, priests, kings, or other sacred persons.

Among the Hebrews, it is certain, that Prayers were daily put up, together with their offerings. For this purpose they had liturgies, or prescribed forms, which may be proved to be used in the very infancy of the Hebrew nation. The forms of Prayer that belonged to the worship of the synagogue were very few at first; but they are since increased to a large number, which makes the service very long and tedious.

The most solemn part of the Jewish Prayers is that which they call the eighteen Prayers, composed, as they say, by Ezra, with the assistance of the great synagogue. To these eighteen another was added, a little before the destruction of Jerusalem, in the time of rabbi Gamaliel. It was designed against the Christians, who are meant in it under the names of heretics and apostates.

These nineteen Prayers are, in the Jewish liturgies, no other than as the Lord's Prayer in ours, being but the fundamental and principal part; for, besides these, they have many others, some going before, others intermixed with them, and others following after: but these alone, on account of their great excellency, are at this day used, without any the least difference, by the Jews in all parts of the world; and that, not only in their synagogue, but also in their private houses.

The Jews, anciently, when they went to pray, covered their head and face with a veil, as a mark of humility and confusion, when they appeared before the divine presence. The postures they used were, either standing, according to the example of holy men recorded in scripture, or bowing, or kneeling, or prostrating; which three last were used upon the great day of expiation, and other solemnities of confession and humiliation. They always turned their faces towards the temple, if they dwelt at Jerusalem; and towards the holy land, if they lived elsewhere. They were obliged to appear clean and neat in their cloaths, when they came to public worship, and not to eat, drink, or sleep, in their synagogues, in which every thing was to be done with decency and order.

The duty of Prayer is constantly and strongly enforced in the Koran of Mahommed. The mussulmans are directed to 'remember God (that is, to pray to him) standing, sitting, and lying on their sides'; viz. at all times, and in all postures.

The Turks perform their devotions, in their mosques, five times every day. When they come to the mosques, they pull off their shoes, and go in bare-footed; then they kneel down, laying their shoes before them, and resting their back-parts on their heels. At the conclusion of their Prayers they take out their beads, which are ninety-nine in number. After this, they lift up their hands at a little distance from their faces, and repeat a certain Prayer to themselves; then they smooth down their faces with their hands, take up their shoes, and go out of the mosque. These public prayers last but about a quarter of an hour.

PRE'BEND (*Dict.*)—The term Prebend is usually confounded with canonicate, or canonica; yet there is a real difference. A Prebend is properly a right which an ecclesiastic has in a cathedral, or collegiate church where he officiates, to receive certain ecclesiastical revenues, and to enjoy certain dues, either in money or in kind; (so called à præbendo, q. d. afforded or allowed him; not à præbendo auxilium or consilium episcopo) whereas canonica is a mere title, or spiritual quality, which a person enjoys independent of any præstation, or any temporal revenue: so that the Prebend may subsist without the canonicate; but the canonicate is inseparable from the Prebend.

For it is not to the Prebend that the right of suffrage and other spiritual rights are annexed, but to the canonicate; and, when the Prebend is joined to the canonicate, it becomes spiritual by virtue of the canonicate because it is absolutely attached to it.

Anciently the pope created canons with a right of having place in the choir, a deliberative voice in the chapter, and an expectation of the first Prebend that should become vacant; but this was prohibited by the council of Trent: yet the pope still confers the canonicate without any Prebend, when he would confer a dignity in a church, for the obtaining whereof, it is required the candidate be a canon.

This they call a canonicate ad effectum, and sometimes jus ventosum, which is no more than an empty title, conferred purely to qualify a man for a dignity restrained to the capacity of canon.

In some churches there are double Prebends, and in others semi-Prebends.

Originally the Prebend was only a livery, or portion of things necessary to life, given daily; at present the rents and profits of the church are divided into fixed portions, called Prebends, which are enjoyed independently. The nomination to Prebends is in the king. In France it is one of the honorary rights of the king, on his joyful accession to the crown, to nominate to the first Prebends vacant by death in the cathedral and collegiate churches.

Prebends are either simple, or with dignity.—The latter are such as, besides their Prebends, have some jurisdiction annexed to them.

Theological, or *divinity* PREBEND, is a Prebend appropriated to a doctor in divinity, in each cathedral and collegiate church throughout France, for preaching on Sundays, and making a public lecture thrice a week.

Preceptorial PREBEND, is that Prebend whose revenues are destined for the support of a preceptor or master, who is obliged to instruct the youth of the place gratis.

The canonicate is not here necessary to the Prebend.

Panorm. observes, that in the cathedral church of Chartres there are Prebends appropriated to laymen, and for the subsistence of some persons of birth and distinction.

PREDETERMINA'TION (*Dict.*)—*Physical Predetermination, or promotion*, if there be any such thing, is that action of God, whereby he excites a second cause to act; or by which, antecedently to all operation of the creature, or before it could operate in consequence either of the order of nature or reason, he really and effectually moves and occasions it to produce all its actions: that is, whatever the creature does or acts, is really done and acted by the agency of God on the creature, who is all the time passive. So that, without such Predetermination of God, all creatures must remain in an eternal state of inactivity; and, with such Predetermination, it is impossible but they should do what they are thus put upon doing.

It is strongly controverted, whether or no such a physical Predetermination be necessary to the action of natural causes? The Scotists maintain the negative; urging, that all natural causes are, of their own nature, determined to a certain action; whence it should seem needless to call in a new Predetermination of God, e. gr. to fire, to make it warm the hand. For if an object be, by the course of divine providence, applied to fire; what need a second application of the fire, to make it warm the object applied thereto, since beings are not to be multiplied unnecessarily?

And such Predetermination some philosophers hold still less requisite to produce the acts of the will: at least, say they, the human mind must be allowed the common power and privilege of a second cause, and therefore be intitled to produce its own acts, as well as other strictly natural agents.

The Thomists, on the other hand, stand up strenuously for the physical Predetermination: one of their principal arguments is drawn from the subordination of second causes to the first. Where there are several subordinate agents, say they, the lower agents do not act, unless first moved and determined thereto by the first; this being the very essence of subordination.

Again, the like they argue from the dominion of God over all his creatures: it is of the essence of dominion, say they, to apply and direct things subject thereto to its own operations; and this, if the dominion be only moral, morally; but if it be also physical, physically. And that this is the case in respect of God, and his creatures, is confessed.

PREMONSTRATE'NSES (*Lat.*) in French Premontrés; a religious order, founded by St. Norbet, descended from a noble family in the diocese of Cologn, who embraced the rule of St. Austin, and retired with thirteen companions to a place called Premonstratum, in the diocese of Leon, in Picardy, where he began his order, about the year 1119. The place was called Premonstratum, because it was pretended the blessed virgin herself pointed out (premonstravit) this place for the principal house of the order, and at the same time commanded them to wear a white habit.

The religious of this order were, at first, so poor, that they had nothing they could call their own, but one poor ass, which served them to carry wood, which they cut down every morning, and sent to Leon, where it was sold to purchase bread: but, in a short time, they received so many donations, and built so many monasteries, that, thirty years after the foundation of this order, they had above an hundred abbeys in France and Germany.

The popes and kings of France have granted many privileges, and been very liberal to the Premonstratenses. Besides a great number of saints, who have been canonized, this order has had several persons of distinguished birth, who have been contented with the humble condition of lay-brother, as Guy, earl of Brienne; Godfrey, earl of Namur, &c. It has likewise given the church a great number of archbishops and bishops.

The order of Premonstratenses increased so greatly, that it had monasteries in all parts of Christendom, amounting to a thousand abbeys, three hundred provostships, a vast number of priories, and five hundred nunneries. These were divided into thirty cyrcaries or provinces. But this number of houses is greatly diminished; for, of sixty-five abbeys it had in Italy, there is not one remaining at present; not to mention the loss of all their monasteries in Sweden, Norway, Denmark, England, Scotland, and Ireland.

These monks, vulgarly called white canons, came first into England in the year 1146, where their first monastery, called New-house, was built in Lincolnshire, by Peter de Saulia, and dedicated to St. Martialis. In the reign of Edward I, when that king granted his protection to the monasteries, the Premonstratenses had twenty-seven houses in this kingdom.

PRESBYTE'RIANS (*Dict.*)—The Presbyterians, as to doctrine, agree with the church of England: their chief difference lies in the point of discipline, viz. who shall appoint the governors of the church, and what subordination there shall or shall not be between them.

The Presbyterians allow of no hierarchy, no subordination in the persons of their ministers; bishops and priests, they maintain, in the times of the apostles, were the same; and therefore, though they allow episcopacy as now settled in the church of England to be very ancient, yet they deny it to be jure divino.

In lieu of a series of ministers one over another, in quality of priests, bishops, and archbishops, their polity consists in a series of assemblies, or synods: thus every minister is to be obedient to the classis under which he lives; and that class to a synod, provincial, classical, or œcumenical.

The power of ordination, with them, resides in a classis; and none are admitted to administer the sacrament, but those ordained by the imposition of hands of other ministers.

They make use of elders or lay-men to take care of their poor; and likewise in the government of the church, whence their name, from the Greek, πρεσβύτερος, signifying senior, elder.

This is now the reigning discipline in the church of Scotland; as it was, during the interregnum, in England.

Elders take care of the collections made on Sundays for the poor; each elder in a parish has a distinct district which he superintends, as is were, and acquaints the kirk session of any irregularities that are committed therein, as fornication, drunkenness, &c. and he recommends any person who is an object of charity, for a weekly allowance, &c. from the session, out of the said weekly collections.

PRESENTA'TION (*Dict.*)—PRESENTATION *of the virgin* is a feast of the Romish church held on the twenty-first of November, in memory of the holy virgin's being presented by her parents in the temple, to be there educated.

It is pretended, that there were young women brought up in the temple of Jerusalem; which some endeavour to prove from the second book of Maccabees, Sed & virgines quæ conclusæ erant, procurrebant ad Oniam; which is the sentiment of Eutochius on this passage. And Lyranus adds, that other more ancient authors observe, that young women were educated till marriage, either in the temple, or at least, in buildings contiguous thereto.

Emanuel Comnenus, who began to reign in 1143, makes mention of this feast in his constitution. Some even imagine it to have been eſtabliſhed in the eleventh century, among the Greeks; and think they ſee evident proofs of it in ſome homilies of George of Nicomedia, who lived in the time of Photius: ſo that it ſeems a miſtake in ſome modern critics to refer its inſtitution to Gregory XI. in 1372.

Some take it to have been inſtituted in memory of the ceremony practiſed among the Jews for their new-born females, correſponding to the circumciſion on the eighth day for males.

PRESENTATION *of our lady* alſo gives the title to three orders of nuns.

The firſt, projected in 1618, by a maid named Joan of Cambray. The habit of the nuns, according to the viſion ſhe pretended to have, was to be a grey gown of natural wool, &c. but this project was never accompliſhed.

The ſecond was eſtabliſhed in France about the year 1627, by Nic. Sanguin, biſhop of Senlis. It was approved by Urban VIII. This order never made any great progreſs.

The third was eſtabliſhed in 1664, when Fred. Borromeo, being apoſtolical viſitor in the Valteline, was intreated by ſome devout maids at Morbegnobourg to allow them to live in community in a retired place; which he granted, and erected them into a congregation, under the title of congregation of our lady. They live under the rule of St. Auguſtin.

PRETOR (*Dict.*)—For the better underſtanding the dignity of the Pretors, it will be proper fully to examine the reaſon of their name, inſtitution, number, dignity, and what their power and charge was. The word Pretor was peculiarly applied to this new magiſtrate, for before it belonged to the conſuls, and all perſons in authority, whether in civil or ſacred things; hence it is that we read, in ſome ancient epitaphs, Prætor ſacrorum, Prætor juventutis, &c.

The ancients not only called thoſe Pretors who commanded the armies, but alſo ſuch as had the charge either of ſacred or civil things. The occaſion of creating this magiſtrate, was a multiplicity of buſineſs upon the conſul's hands, and this was anno 388, and the neceſſity the republic found itſelf under of granting to the people a conſul of their own order; for the ſenate did not allow it, but upon condition that a new magiſtrate ſhould be created, that is, the Pretor, who was taken out of the patrician order: but, in the year 416, Q. Philo, a plebeian, got himſelf advanced to the office of Pretor, notwithſtanding the oppoſition made by the conſul Sulpicius againſt him.

There was no more than one of them from the year 388, till 510, according to Lipſius; but buſineſs coming to increaſe ſo much by reaſon of the great number of citizens and ſtrangers that came to live in Rome, and one being not enough, they thought it proper to conſtitute another, and their buſineſs was diſtinct; for one adminiſtered juſtice to the citizens of Rome, and for that reaſon was called Pretor urbanus; and the other took cognizance of the ſuits that happened between the citizens and ſtrangers, and he was called Prætor peregrinus: the firſt was more honourable than the other, and ſo he was intitled Prætor honoratus, and his edict named jus honorarium, as the lawyers ſay. But towards the year 520, they appointed two new Pretors: Livy informs us, they made ſix Pretors for one year. Tiberius afterwards named twelve Pretors, the number eſtabliſhed by Auguſtus, and as the ſenate preſſed him to increaſe them, he ſwore he would not do it: however he increaſed them to fifteen, in the year 786, according to Dion. The emperor Claudius enlarged the number to eighteen; but upon the declenſion of the empire, they were reduced to three only, as we may ſee by the laws of the emperors Valentinian and Macrinus, ſet forth, *L.* II. *C. de Off. Præt.*

The pretorſhip was the ſecond office for dignity in Rome, ſince it was conferred by the ſame auſpices as the conſulſhip, and that the Pretors were in hiſtory called collegæ conſulum, as Livy obſerves, L. I. Decad 1. The exterior enſigns of this office were the robe called prætexta, the curule chair, and ſix lictors. This office was annual, and he who diſcharged the ſame with honour, and without any diſgrace, had a right for all his life-time to wear the prætexta and white trabea; but ſuch as were guilty of male-adminiſtration were forced to lay it down. All their buſineſs in general conſiſted in three things, viz. to adminiſter juſtice to citizens and ſtrangers, to preſide over games, and to take care of the ſacrifices: they took care of the ſacrifices offered to the goddeſs called Bona Dea, as Plutarch ſays in Cæſar's life, and Cicero, L. I. Ep. 10. *ad Atticum.*

PRICKLE-*back*, in natural hiſtory, a ſmall fiſh ſo called from the Prickles on its ſides and back. Vaſt numbers of theſe little fiſh are to be found in almoſt all freſh waters, wherever it is poſſible for fiſh to live, as Mr. Arderon informs us, Philoſophical Tranſactions N°. 482, who gives us ſome account of theſe creatures. They are very deſtructive to the ſpawn of all ſorts of fiſh; and they themſelves are tormented to death by a kind of louſe of an oval figure, with eight legs and a very tranſparent body. This louſe has little fins always in motion, whether it be ſwimming about or fixed on the fiſh.

PRIDE *of the Iſis*, a name given by Dr. Plot to the common lampern, from its being found very plentifully and very delicate in that river.

PRIEST (*Dict.*)—Religious worſhip being once confined to temples, the appointment of miniſters for the deities became neceſſary: God himſelf inſtituted thoſe whom he deſigned for the ſervice of the true religion, and mankind eſtabliſhed thoſe who propagated that which was the falſe. Both the one and the other, from the mercenary views of worldly intereſt, have been multiplied to an infinite number. The Prieſts found means to hinder men from action, till they had been firſt conſulted. They ſet all the ſprings of the paſſions in motion, were at the head of all intrigues, and made themſelves maſters of the courts of princes; ſo great has the authority of Prieſts ever been in all religions. We know the power of the augurs, ſoothſayers, and Prieſts, among the Greeks and Romans; of the Magi among the Perſians; of the Druids among the Gauls, &c. The Mufti, and other doctors of the Mahometan law, are too often the grand engines in the moſt important debates of the Divan. Among the Germans, the Prieſts gave ſentence of life and death upon criminals. Many nations formerly choſe their Prieſts for kings. In the Eaſt and Weſt-Indies, China, Japan, &c. the Prieſts and monks have an unlimited power. Men are ſo formed by nature that there is an abſolute neceſſity that Prieſts ſhould have reſpect paid them, in order to maintain the dignity of religion; but the main point is, to ſet ſeaſonable bounds to that reſpect, ſo as not to fall into the exceſſes of thoſe, who give themſelves up blindly to the paſſions of Prieſts.

Among the ancient Greeks, the dignity of prieſthood was eſteemed ſo great, that, in moſt of their cities, and eſpecially at Athens, it was joined with that of the civil magiſtrate. In Egypt, the kings were all Prieſts; and, if any one, who was not of the royal family, uſurped the kingdom, he was obliged to be conſecrated to the prieſthood, before he could mount the throne.

But, beſides theſe royal Prieſts, there were others, taken from the body of the people, and conſecrated to the ſervice of religion. Theſe all were accounted the miniſters of the gods, and by them commiſſioned to diſpenſe their favours to mankind.

The Prieſts were differently appointed to their office; ſome obtained the prieſthood by inheritance, others by lot, others by the deſignation of princes, and others by popular elections. Whoever was admitted to this office, it was neceſſary he ſhould be found and perfect in all his members, it being thought a diſhonour to the gods to be ſerved by any one that is maimed, or any other way imperfect: and therefore, at Athens, before their conſecration, they were examined, whether they were ἀφελεῖς, perfect, having neither defect, nor any thing ſuperfluous. They were likewiſe obliged to be upright in mind, as well as perfect in body; to live chaſtely and temperately, abſtaining from thoſe pleaſures, which were allowed to other men: ſome were ſuch rigid obſervers of chaſtity, that they diſmembered themſelves. But, though moſt of them were obliged to ſtrict chaſtity and temperance, yet there are inſtances of married Prieſts among the Greeks.

It is not eaſy to give an exact account of the different orders of Prieſts among the Greeks; for not only every god had ſeveral ſorts of Prieſts conſecrated to him, but even the Prieſts of the ſame God were different, according to the diverſity of places and circumſtances.

What has been ſaid concerning the Grecian Prieſts is applicable likewiſe to thoſe of the Romans.

Among the Hebrews, the prieſthood was not annexed to a certain family, till after the promulgation of the law of Moſes. Before that time, the firſt-born of every family, the fathers, the princes, and the kings, were Prieſts. Cain and Abel, Noah, Abraham, and Job, Abimelech, and Laban, Iſaac and Jacob themſelves, offered their own ſacrifices. But, after the giving of the law, the prieſthood was annexed to the family of Aaron, of the tribe of Levi. However, we find the judges and kings of the Hebrews, on ſeveral occaſions, offering ſacrifices to the Lord, eſpecially before a conſtant place of worſhip was fixed at Jeruſalem.

The high-Prieſt was at the head of all religious affairs, and was the ordinary judge of all matters concerning the juſtice and judgment of the Jewiſh nation.

It was required, as neceſſary qualifications for the high-Prieſt, that he ſhould be born of one of his own tribe, that his father had married a virgin, and that he ſhould be exempt from all corporal defects and infirmities. When he was inveſted with that high dignity, and clad in pontifical ornaments, he was conſidered as the oracle of truth, and gave anſwers to the queſtions propoſed to him.

The high-Prieſt was forbidden to mourn for any of his relations, even for his father or mother; or to enter into any place where a dead body lay, that he might not contract any uncleanneſs. The habit of the high-Prieſt was much more magnificent than that of the other Prieſts. He wore a long robe of an azure-colour, at the bottom of which was a border adorned with little golden bells and pomegranates, and made of wool of different colours, and ranged alternately to equal diſtances. This robe was girded about with the ephod. Upon his breaſt he wore a pectoral, or breaſt-plate, and upon his head a tiara or bonnet, from whence hung down a plate of gold, on which were engraven these words, Holiness to the Lord. The ordinary or inferior Priests served immediately at the altar, offered the sacrifices, killed and flead them, and poured their blood at the foot of the altar.

The common habit of the Priests was, a kind of surplice, or linen tunic, without seam, with a sash of several colours, hollow, like the skin of a serpent. It went twice round the body, was tied before, and the ends hung down to the feet. When they were in the act of sacrificing, they threw this girdle over the left shoulder, that they might perform their office with the greater freedom. The Rabbins made this sash to be two and thirty cubits long. They wore a cap, or bonnet, of fine linen, folded several times round the head.

The age at which they entered upon the sacred ministry, was fixed by Moses to twenty-five or thirty years, and they were to end it at fifty. But, in David's time, the rule was changed; and they were permitted to attend the service of the temple at twenty years of age, and to dedicate themselves to the priesthood, during life.

The Lord had given no lands of inheritance to the tribe of Levi, in the distribution of the land of promise; but they were to be supported by tythes, first-fruits, and offerings. In the peace-offerings they burnt upon the altar the fat that covers the bowels, the liver, and kidney; the rest belonging to the Priest. The skin or fleece of every sacrifice was the Priest's; and this article alone was no inconsiderable allowance. When an Israelite killed any animal for his own use, he was to give the Priest the shoulder, the stomach, and the jaws. He had also a share in the wool, when the sheep were shorn. All the first-born, both of man and beast, belonged to the Lord, that is, to the Priests. The men were redeemed for five shekels. The first-fruits of trees likewise belonged to the Priests, as also of the land, and of animals. God also provided houses for the Priests, by appointing them forty-eight cities for their habitation.

Next to the service of the temple, the Priests were employed in instructing the people, deciding controversies, and distinguishing the several sorts of leprosy, the causes of divorce, vows, and all causes relating to the law. They publicly blessed the people in the name of the Lord. In the time of war, their business was to carry the ark of the covenant, to consult the Lord, to sound the holy trumpets, and encourage the people.

The consecration of Aaron and his sons to the priesthood was performed by Moses, in the wilderness, with great solemnity. Whether the same ceremonies were repeated at the consecration of every new high-Priest, is uncertain; and as to the inferior Priests, it does not appear that any particular ceremony was used for their consecration; but they seem to have been admitted to the priesthood only by performing the functions of the order.

PRI'MULA *veris, the primrose*, in botany, a genus of plants, whose characters are:

The root is perennial, the leaves are oblong and wrinkled, the calyx is quinquefid, pentagonal, and soft: in this calyx is seated a monopetalous flower, shaped somewhat like a salver, with its margin divided into five heart-shaped, bifid, segments; this flower is furnished with five stamina, which arise from the inside of its tubulous part. The seminal vessel is an oblong shell, concealed in a calyx, furnished with a long tuble, and gaping at its apex; the seeds are roundish.

The flowers are commended by some, as good against disorders arising from melancholy, and phlegmatic humours; the juice of the root is sometimes used as an errhine to purge the head of the tough slimy phlegm. *Miller's Bot. Off.*

PRI'NCES *Feather*, in botany, a name given to the amaranth. See AMARANTH.

PRINCES *Metal.*—Copper, though one of the less precious metals, yet has been found of so great use in the common affairs of life, that scarce any other has been subject to so many trials for its improvement, or the rendering it either more beautiful or more fit for certain purposes.

One of the first discoveries in these attempts was the making it into brass, by means of an addition of lapis calaminaris; and, though it was not at that time known to be a stone which contained any metal, yet the brass was always found to weigh one third more than the copper which had been used in the process. This yellow metal gave many people hopes of making copper approach yet nearer to gold, and, without knowing that zink was the separated metalline part of lapis calaminaris, the experimenters soon found, by happy accident or repeated chance mixtures, that it would give copper a yet finer and purer yellow; but it was also found, that this mixed metal was much more brittle than brass made in the common way. This, however, did not prevent the world from still valuing it for such works as were to be finished by casting, and did not require the hammer: and we, who first had it in perfection, called it Princes metal, from Prince Rupert, whom some suppose to have been the inventor of it; but the greatest perfection this metal was ever brought to, was by two Frenchmen, Mr. La Croix, and Mr. Le Blanc. Their methods of making the composition, though both beautiful, were very different. Mr. Le Blanc's was the brightest, and of the most elegant and lively colour; but Mr. La Croix's was greatly superior to that in ductility and softness, so that it was very easily malleable.

Mr. La Croix invented a sort of varnish or lacquer for his metal, which added a somewhat deeper tinge to it, as it was naturally rather too pale; and had this farther advantage, that, while it remained on the metal, it preserved it from rust or decay. This is a very material point in regard to a metal of which copper is the basis, since that is, of all other metals, most subject to be injured by the air, or by the contact of liquids of almost any kind. Mr. Le Blanc's metal is of a deeper, yet lively colour, and remarkably bright; and is of such a temper as to be admirably fit for working. The whole history of these metals is certainly, that they are composed of zink and copper in different proportions the one to the other; but it is not easy, without the help of numerous experiments, to determine what is to be the true proportion for either.

The microscope, however, shews a manifest difference, which may lead somewhat towards it; for the metal of La Croix is seen to be composed merely of a number of irregular striæ, while the other is discovered to consist of always two regular beds of them, which meet in the center of the piece; hence it is that this is always brittle, and will not well polish. The fabric of these metals was long kept a secret; but it was always to be discovered by melting it in a crucible in a strong fire, when it always sent up plain flowers of zink, and the remaining metal appeared no other than copper altered by calamine; that is, common brass. *Mem. Acad. Par.* 1732.

PRI'NCIPLE, in chemistry (*Dict.*)—*Fire considered as a* PRINCIPLE.—We reckon elementary fire the first Principle of bodies, as being that, from whence all the rest receive their activity. It is a simple and most subtile body, in a continual swift motion, filling, and easily permeating, the pores of all other bodies. Its immense subtility is evident from this, that it penetrates all bodies whatsoever; and its swift motion, from that rapidity which it is capable of communicating to them. Its force is in proportion to the quantity of it any where collected. In the sun, which may be looked upon as a vast congeries of this substance, its motion is most violent. In culinary fires, the quantity and motion of it are not so great, but still greater, than in spirituous and volatile liquors, where it is hardly to be perceived, except when they are set on fire. Not only all motion, but, also, heat proceeds from it, which, as it exists in bodies, is nothing but the excessive motion of their parts. It is, also, too subtile and active ever to be collected pure in chemical analyses; wherever it is found, it is always united with water and earth, in salts and sulphurs; and is sometimes concentered with bodies in so great quantities, as considerably to increase their weight, as is evident in calcined antimony, in which there is an addition made of almost a fifth part.

Water considered as a PRINCIPLE.— Elementary water is a simple, liquid, insipid, inodorous, pellucid substance. Its fluidity is owing entirely to the action of fire, and when that action is very great, its parts are actually divided, and the whole turned to vapour; but, when it is very small, they cohere strongly, and turn to ice. This element the chymists call phlegm, and it may be conceived to consist of small, smooth particles, of an oblong or oval figure, and perfectly rigid or inflexible. From the minuteness of its particles, it easily penetrates the pores of almost all bodies. An oval figure seems more agreeable to the fluidity and motion of the water, than a spherical, and, likewise, to the solidity we observe in ice; the points of contact being too few, in spherical bodies, to form so strong a cohesion. Were its particles angular and flexible, they would be too weak to penetrate and dissolve salts, and would, likewise, be too much resisted; but, as their surface is smooth, they can easily enter the pores of salt, and afterwards they easily separate their parts, that is, dissolve them by their rigidity and oval figure. The want of taste or smell in water seems to proceed from the smoothness, obtuseness, and smallness of its particles, which cannot vellicate the nerves of the tongue and nostrils. The fluidity of water arises from the smallness, smoothness, and figure of its particles, and from the easy motion thereof by the fire contained in their interstices. Without the action of fire separating these particles, and keeping them in continual motion, their fluidity would presently be lost, how much soever their structure may dispose them to it, and they would become one solid mass. On the other hand, if the action of fire upon them be very great, they are farther separated from one another, and fly off in vapour and smoke. In fine, water is transparent, because its pores are so disposed, as readily to transmit the rays of light.

Earth considered as a PRINCIPLE.—Elementary earth is the same with the terra damnata, or caput mortuum of the chymists; being a simple, friable, porous substance, without smell or taste, consisting of particles of no regular figure, and altogether unfit for motion. The porosity of earth seems to arise from the irregular figure of its particles; and as these particles often touch one another only by their angles, the whole mass must necessarily be friable. The want of taste and smell seems to be owing to their inaptitude for motion.

In the analyses of bodies, the last thing is always this Principle of earth; and, in their composition, it seems to serve as a basis or foundation for the other parts of the mixture; and to it the dryness, solidity, and hardness of bodies, are in a great measure, to be ascribed.

Salt,

Salt, as has been said, is a mixed body; but I chuse to introduce it immediately after the Principles, because, in all the common analyses of bodies, it is obtained entire, and a great deal of pains and accuracy is required to decompose it, or reduce it to its principles. It is, also, the sole origin of the taste, smell, and many other properties of bodies. It may be defined to be a mixed body, formed by the concretion of fire, water, and earth, into a solid rigid substance, soluble in water, and fusible by fire. As its particles may be conceived to cohere by large surfaces only, salt cannot be friable like earth; but requires a considerable force to separate its parts, which fly off from one another, like those of glass, with a sensible noise. It becomes the cause of taste and smell, because its particles terminate in strong points, which vellicate the nervous membranes of the tongue and nose.

Salt is of three kinds, acid, acrid, or alcaline, and a third, compounded of the other two, called, in Latin, sal salsus.

Acid salt is a congeries of inflexible solid parts, of an oblong figure, and pointed at both ends. That its particles are rigid and hard, appears from the force, with which it divides and dissolves solid bodies; and its sharpness and pungency are evident from the effect it has on the tongue, different from the corrosion of acrid salts. Acid salt is easily dissolved by water, and after this solution, its particles are equally dispersed through that fluid, and have the same motion with it. Hence it appears, that the particles of both substances have nearly the same specific gravity; and, likewise, that the motion of the aqueous parts is great enough to overcome the cohesion of the parts of salt.

Concerning the manner, in which the particles of acid salt are compounded of fire, water, and earth; nothing can with certainty be determined. It may be conjectured however, that several particles of water, being collected into one little mass, are cemented together by some particles of fire and earth, lodged in the interstices left between them; and that all these, taken together, are disposed in an oval form, or that of two cones joined by their basis. This configuration, however, is not the same in all acid salts; but the differences may all be reduced to three; the nitrous acid, the muriatic, and the vitriolic.

The word alcali is derived from cali, the Arabic name of a plant, from the ashes of which a salt is obtained, proper for making glass: and thence it came to be used for all salts got from the ashes of plants, and afterwards for all salts, and other substances whatever, that ferment with acids.

Acrid or alcaline salt seems to be a congeries of spherical particles, with rough, prickly surfaces, because of their great disposition to motion, and their corrosive burning taste, the points of the surfaces acting on the nervous papillæ of the tongue, like so many files, whereas acid salt is only pungent. But then, by these points, a larger surface is exposed to the action of fire, than could otherwise; and thus the particles of alcaline salt are very volatile, and easily raised by a gentle heat. The origin of this salt is probably from a certain connection of acid points and terrestrial particles; because, in many operations of chymistry, such salts arise from the mixture of acid salts and earth; as we see particularly in the preparation of fixed nitre, and fermentation of urine. Nitre, being distilled, leaves a compound fixed salt behind, of the same nature with the sea-salt, out of which, by a nicer distillation, an acid liquor may be extracted, without any volatile salt, or, at least, but a very small quantity; but if the same fixed salt be previously fermented, and then distilled, it yields a large quantity of volatile salt, and very little fixed salt, or acid; because, by fermentation or calcination, the acid and terrestrial particles are intimately mixed, the acid spicula entering the pores of the earth, and so forming new molecules, which are dense and close towards the center, and prickly on the surface, by the acid points sticking out. Such are the particles of volatile alcalies, of which, if a great number be joined together, they must cohere very strongly, by means of their points, and form molecules of irregular figures, in the pores of which watery, earthy, sulphureous, or acid particles may be received and absorbed. Hence it is that acid salts are seldom pure; and, as they are very often filled with particles of earth, they resist the most violent degree of fire, and will sooner melt than be raised by it. This is the true nature of fixed alcaline salt, such as salt of tartar, or the salts got from the ashes of plants called lixivial salts. If they be impregnated with sulphureous particles, they continue very volatile, and are raised by a small degree of fire; as we see in salt of urine, hartshorn, and others got from animals. Acrid salts easily melt, when exposed to a moist air, because the particles of water contained in it readily enter their pores. When thus melted, they become properly lixivia, and are commonly termed oils, as oil of tartar per deliquium. Volatile alcaline salts, diluted with water, are called volatile urinous spirits; such as the volatile spirit of urine, of hartshorn, blood, and others.

The sal salsus, or third kind, is compounded of acid and alcaline molecules united together; and the figure of its particles is principally produced by the kind of acid that enters its composition. The impression these particles make on the tongue is more dull and languid, than that made by acid or acrid parts alone; because the molecules formed by the union of these are larger in bulk, and consequently less disposed for motion; and, therefore, though there is a greater quantity of alcali, or points, in one of these molecules than in the former, yet their bulk makes them less capable of entering the pores of the skin, and vellicating the nervous papillæ, than when they are in a disjointed state. The taste of these salts is termed saline, and varies according to the thickness of the spicula, their number, and the other parts that may be mixed with them. That this is the true original of this kind of salts, is evident, both from the artificial composition thereof, from acid and acrid particles blended together, and from the resolution of them into the same. Thus, by pouring spirit of nitre, of sea-salt, or of vitriol, on salt of tartar, new salts are produced exactly of the same appearance with nitre, sea-salt, or vitriol; and, by analysing these three salts, the essential salts of plants, sal ammoniac, and others, an acid and alcaline salt may be obtained, in some fixed, in others volatile.

What the chymists call oil, or sulphur, is not a simple substance, but a body compounded of fire, water, earth, and salt; but we chuse to introduce it here, as it is most commonly separated in the operations of chymistry, and is not resolved without difficulty into its component Principles. It may be defined to be a fluid, viscid, inflammable, transparent body, without taste or smell, though by mixing it differently with salts these sensible qualities are produced, compounded of fire, water, earth, and salt; and it may be conceived to consist of many flakes or flocculi, each of which is again made up of very small flexible filaments, formed of the four Principles before-mentioned, by fermentation, as well in the bowels of the earth, as in the bodies of vegetables and animals: thus, an aromatic plant, growing in water, will, by distillation, yield an oil, which could never have been obtained from the water, in which it stood; and all oils may by art be resolved into water, earth, and salt. From these filaments variously concreted arise the flakes already mentioned, which are of different thicknesses; and in the pores thereof is lodged the element of fire, which, also, runs in rivulets through their interstices. Upon these depend the specific levity, inflammability, and fluidity of oil; but, as, notwithstanding the intestine motion caused by the element of fire, the small flakes still adhere, in some measure, together, this fluid must be more viscid than any other.

From what has been said concerning the nature of alcaline salts, and the figure and structure of the oily flocculi, it is easy to conceive, why all alcalies dissolve sulphurs; for, since the alcaline particles are spherical and prickly, they cannot enter the interstices of the flakes, without carrying away some of them from the rest; and thus, by degrees, thoroughly dissolving them. But the dense, rigid, and pointed molecules of acids, being forced into these interstices, increase the density, and strengthen the texture of the flocculi; and from the diversity of these, and of the acid spicula mixed with them, arise the different kinds of sulphurs. Sulphurs formed in the earth by fire, acid salt, water, and a very fine earth, are termed bitumens. Thus bitumens dissolved in a large quantity of water form the mineral oils, or petrolea. But, if they are mixed with earth and salt, the solid bitumens are produced, differing from one another in degrees of purity, according to the quantity or grossness of the earth, or different degrees of mixture. Thus fossil coals, jet, amber, and the common bitumens, and bituminous earths, are produced. If there be but a small quantity of earth, and much acid salt, the common mineral sulphur of brimstone is formed. If the mineral original bitumen is joined to a fusible earth, capable of vitrification, it communicates to it a metallic form; that is, the sound, brightness, softness, ductility, malleability, and all the other sensible qualities of metals.

This origin of mineral bitumens may be confirmed by many experiments: if a mixture of equal parts of oil of vitriol and oil of turpentine be digested together, for a considerable time, in a very gentle heat, and afterwards distilled in a retort, there will come over first a yellowish liquor, resembling petroleum, both in smell and consistence. What remains in the retort, is, at first, a soft bitumen, and afterwards turns into an hard black mass, easily inflammable, and, when burnt, smelling exactly like a fossil coal. But, if the distillation be continued, a white acid liquor will next be obtained, which, by standing, lets fall a grey powder, which is true common brimstone, a yellow substance of the like nature adhering likewise to the neck of the retort; what is left behind being a black, shining, light substance, disposed in thin disgregated strata, like talc, in which, by the help of the load-stone, iron may be discovered. Thus, therefore, all these bitumens may be artificially produced; and the analysis of the natural ones further confirms the manner of their formation. Thus the chymists have shewn, that metals are nothing but bituminous substances, which have undergone a long digestion; for, by depriving of them of their sulphur, they are reduced to ashes, and then to glass. This is easily seen in the imperfect metals; for, if any of them are exposed to a long heat, and especially to the rays of the sun, collected by a large burning-glass, the sulphureous principle flies off, and only a calx or ashes will be left behind, which, in a more vehement degree of fire, are presently vitrified;

fied; and, by restoring the sulphur, this glass may be again reduced to metal.

The inflammable substances in animals and vegetables consist of a different combination of the Principle of sulphur and acid salt; for the oil, or sulphur, in these, is formed by a small portion of earth joined to the elementary fire, acid salt, and water: this oil, when joined to an acrid salt, produces gums; when joined to a fine acid, and a new accession of fiery particles, it produces essential oils and inflammable spirits; but, if the acids are more gross, by reason of a larger quantity of earth joined to them, it forms resins, as we learn from the artificial composition of all these substances. By mixing spirit of wine with volatile spirit of urine, we obtain a mucilaginous concretion, or thin gum. Oil of olives and salt of tartar, melted together, make a kind of soap, or thick gum; and if spirit of wine be digested for a long time with oil of vitriol, and then distilled, an inflammable oil is obtained, resembling, in smell, and other qualities, the essential oils of plants, a true resin being left behind in the retort.

In animals this same oleaginous Principle forms the fat, and other glutinous or gelatinous substances; these last being composed of an acrid volatile salt and oil, as appears from their analysis: but fat is made of the same oil and acid salt; for, if oil of olives and spirit of nitre be mixed together and digested, a substance will be found in every thing resembling the fat of animals.

Sulphureous substances found in bodies are either fixed or volatile. The fixed sulphurs are either solid, such as fat, resin, and the bitumens; or fluid, as oils. Volatile sulphurs are such as fly off with a small degree of fire, and have an appearance compounded of that of oil and water. Such are inflammable spirits obtained from the flowers and fruits of plants.

All bodies consist of the five Principles above-mentioned; and the diversity of bodies arises entirely from the different combination of them. These combinations, or mixtures, of the five Principles are produced by motion, and that motion entirely by the element of fire. This motion is sometimes slow and insensible, as in the growth and maturation of fruits; more lively and quick, as in the fermentation of must; or very vehement, as in the deflagration of bodies. All these motions go by the general name of fermentation; and, if they tend to the destruction or dissolution of bodies, they are termed corruption.

The most simple, or least compounded, mixture of Principles is seen in the fermentation of salts, which consists principally of water and earth; next of sulphur, made up of water, earth, and salt; then of the acrid salts, both fixed and volatile, with the essential salts of plants, and sulphureous bodies, whether solid or liquid. The manner how these mixtures are brought about, and the changes arising from thence, will best be understood by examples.

The fruit of the vine, just beginning to put on the form of grapes, is insipid, or, at least, tastes only like grass. As it grows, a certain acidity is discovered in it, which at first produces an austere taste; then an acerb one, in which state the juice is termed omphacium, which, in distillation, yields a great quantity of water, some acid liquor, and a small portion of oil, a large proportion of earth being left behind. In this juice, therefore, the austere and acerb tastes are owing to the acid spicula, just breaking out through the earthy parts, but not wholly disengaged from them. When the grapes come to be fully ripe, the austere taste is changed to a sweet one, because the juice, being more thoroughly penetrated by the element of fire, is rarefied, and put in a more violent motion, by which the salts throw off their earthy involucra entirely, and by a new combination of these salts, water, and earth, are formed sulphurs, or oils. But, if any of the acid salts remain after the composition of the sulphurs, they continue still entangled by the filaments thereof; and their sharp points, vellicating the nervous papillæ of the tongue, create that agreeable taste which is perceived in must. The must in distillation affords a quantity of phlegm, next a pretty large portion of an acid water, some acrid or volatile urinous salt, and a quantity of thick oil, much beyond what was gained by the former distillation. Lastly, from the mass that remains in the retort, an acrid fixed salt may be obtained by the common method. However, even in this juice of ripe grapes, or must, the salts and oils are not carried to the greatest degree of fineness, and part of them remain still involved in the earthy involucra. But, if a large quantity of it be set to ferment, the igneous particles begin to act again, and by them this intestine commotion is is continued, till all the gross parts are either attenuated, or thrown out from the liquor, and the salts and sulphurs perfectly set free from the earthy parts, and intimately mixed with one another. The liquor in this state is wine, and the gross parts, that fall to the bottom of the vessel, are termed lees. The briskness and penetrating quality of the wine seems to be owing to the large proportion of the element of fire, which harbours among the filaments of the sulphureous flocculi; and, this liquor being distilled, we obtain, first, a great quantity of inflammable spirit, then a copious phlegm, next an acid liquor with some portion of an oily spirit, a thick oil, and, lastly, a small quantity of caput mortuum, which will yield a little fixed salt.

In this distillation a far less quantity of acid liquor is obtained than from must, which, on the other hand, yields no inflammable spirit. If the lees of wine be well dried, and then distilled, they yield a very large quantity of volatile urinous salt, the acid salts, combined with the sulphureous and earthy particles, being, by fermentation and heat, converted into alcaline salts.

In the same manner, if green peas or beans be distilled, they yield a great deal of acid liquor and phlegm, with a small proportion of oil. If they are first fermented with common water, an inflammable spirit is got from them in the same manner as from wine; and, if they are kept for some months in a dry place, they yield a volatile alcaline spirit, without any acid liquor, or, at least, but very little. Whence it is evident that acid salt, by its union with other particles, is changed into sulphur; and, by its union with earthy and sulphureous particles, becomes an alcaline volatile salt; and by being driven into earthy particles, becomes an alcaline volatile salt; as, by being driven into earthy particles, alone, by the force of fire in calcination, it is changed into a fixed alcali.

It may be proper, upon this occasion, to observe, that the salts of all plants are not entirely alike, but differ from one another, not only as the quantity of sulphur, water, or earth, which is joined to the acid, is greater or less; but, also, according to the original nature of the acid which enters their composition. Acid salts, as we have already said, are of three kinds, muriatic, nitrous, and vitriolic. Muriatic salts, such as sea-salts and sal-gemmæ, being crystallised, put on a cubic figure, the particles thereof appearing to be formed of two quadrilateral pyramids, joined together by their bases. Nitrous crystals represent prisms with six sides formed by the juxta-positions of two triangular pyramids; and crystals of vitriol seem to consist of two hexagonal pyramids, as far as can be judged by the particles thereof, when carefully separated from all metals. These original salts, combined with others, form compound salts, of almost all kinds. Thus, in the vegetable kingdom, the different sorts of vinegars are nothing but some original acid salt dissolved in phlegm. The essential salts of plants, obtained without fire, consist of some acid joined with particles of earth, or of the other Principles. Sal ammoniac arises from the union of acid and volatile alcaline salts. Fixed alcalies are only the acid spicula struck into earthy molecules; and volatile alcalies consist of the same acid joined to very fine particles of earth and sulphur, so as to form prickly globules. Moreover, the same varieties of acid salts are to be met with in vegetables, that are found in minerals. Thus, the essential salts of pellitory of the wall, borage, wild cucumber, and the like, are nitrous; and, when thrown upon burning charcoal, they fulminate like nitre. The fixed salts of carduus benedictus, glass-wort, and spurge, are like sea-salt, their particles having the same cubic figure; and, when thrown upon burning charcoal, they decrepitate. The crystals of tartar are like those of vitriol; and that they are formed by a vitriolic acid, appears from the sulphureous smell of tartar, when artfully calcined.

Besides the saline compounds already mentioned, other mixtures are formed in plants, such as gums, resins, honies, and the like. Gums are something between acid and oil, being an acid salt, so fixed in the earth, as that the greatest part of it is changed to an alcali, the other into oil; so that the mixture arising from thence is an oily salt, resembling the saponaceous concretes of the chymists, made of oil of olives, and a lixivium of tartar, or the mucilaginous bodies formed of spirit of wine and the volatile spirit of urine. And thus we see, that all seeds which are oily, when ripe, are in the beginning only a mucilage, or imperfect oil. Resins consist of oil and acid, and accordingly are artificially produced by mixing spirit of vitriol with spirit of wine, or of turpentine. They are either solid, or liquid; but these differ from one another only in the proportion of earth, that enters their composition. Melleous juices, which either exude spontaneously from plants, such as manna, or are obtained by art, as sugar, are essential salts, consisting of a mixture of acid and alcali, with a large proportion of oil.

The mineral kingdom furnishes us with a great variety of instances of the way how the Principles of bodies may be combined together. The lime-stone and parget are so framed, that, by being calcined, a vast number of cells are opened by the fire, into which water easily enters, with an hissing or collision of the included igneous particles. If the water remains long in these little receptacles, nitrous parts are formed, as we see in old walls, built with these materials, from which nitre may always be obtained. The greatest part of this nitre, by distillation, is changed into an acid spirit; but, by calcination, turns to an alcaline salt. And it may be, that the nitre of the ancients, or that alcaline mineral salt, which was dug out of the earth in Egypt, and other countries, and is obtainable by art from mineral waters, was nothing but nitre calcined by the heat of the earth, and so converted into a fixed alcaline salt. The vitriolic acid, joined with different metallic substances, produces all the kinds of vitriol; with an astringent earth, it forms alums; and, with the Principle of fire, common brimstone, which, by deflagration, may again be converted into oil of vitriol, the other Principles flying off. Brimstone may, likewise, be artificially produced by uniting the Principle of fire to any vitriolic acid.

The like mixture of the Principles of bodies may be observed in the animal kingdom. Chyle and milk contain a latent acid; which easily discovers itself by putrefaction, but this acid salt, having undergone a due fermentation, or some other action analogous to that in the animal body, is changed into a volatile alcali, obtainable in great plenty from the blood, serum, bile, urine, and other juices

In a healthful body, however, these volatile alcalies are never perfectly formed, the animal salts being more of the nature of sal ammoniac, with a mixture of earthy and oily parts, to which mixture the glutinous quality of the blood and serum is owing. By putrefaction, or calcination, all animal liquors are changed, so as to afford perfect volatile alcalies, has has been evidently shewn by experiment. *Geoffroy.*

Original PRINCIPLE, *principium originale*, a name, given by Tachenius and some other authors, to salt, without considering it as acid, alcali, or of any other particular kind, or any mode of existence: the salt of wood, or vegetables, not being alcali till after burning, and so on; but salt, that is the base of these, being evidently existent in the bodies, and, in regard to wood, seeming indeed to constitute its character as such, since the evaporation of it causes the wood to lose all its strength and to decay; for we find that in rotten wood there is no alcali at all; and the Venetians, who sink their timber for ship-building into water, while it is green, prevent, by that means, the evaporation of those salts, and leave the wood little less durable than stone. On these and the like principles, Tachenius supposes salt to be the true original Principle of bodies; but many others allow this name only to water, or at least that water is, in almost all natural bodies, the most copious, the most active, and the most influencing part; yet even this is found to agree much better with some bodies than with others. The birch and elder feed more kindly on a thin uliginous moisture; the elm, the pine, the fir, and cedar, chuse a stronger liquor; yet these and many more, the most widely different that can be from one another, are often seen to draw their whole substance and bulk, whether annual or perennial, from the same piece of ground, impregnated, so far as is possible to be judged of, with the same sort of juices, and from the ambient air and dews, when as yet by our best diligence we cannot distinguish the liquors or salts approaching closely to their several roots; and, if we wholly take away and exchange all the earth from the roots of trees whose barks, sap, and fruit, have very much differing salts, and are of very different kinds, yet we shall find each tree to prosper better by the exchange, instead of being injured by it.

Hence, we may suspect, that the very contextures of the bodies of plants, from the first germination of the seed, and as they form gradually from the invisible Principles of their seeds, are, however and imperceptibly, the natural alembics, where the common water and air are changed into the different juices, gums, resins, &c. as the animal organisation in the body of the cow changes the juices of every sort of grass and esculent vegetable into one and the same milk.

The sea plants growing on shells, or affixed to yet harder stones, taking no nourishment from the thing they grow on, but being as it were all root, and taking the whole from the ambient water; yet, that water giving to different species of them, though itself the same to all, the different textures of herbaceous to some; tough and horny to others; and to some absolutely stony; as the corals, many of which have been esteemed, by the generality of authors, absolute stones.

Trees of several different kinds are found in America growing out of the same dry and hard rock, and the various kinds of succulent plants; the poisonous ones and their opposites, or remedies, as the euphorbium and the antieuphorbium; the most acid pungent, and the most soft and emollient, out of the same barren lands of Arabia, where it could not be expected that any plants could grow at all. Hence, it is easy to apprehend, how the seeds in their time, and after them the roots, stems, and leaves of trees, may be the proper strainers to separate and prepare the several saps and juices, and to ferment the liquors into their several particular salts. See the articles VEGETATION and SALT.

PRISMA'TIC *Antennæ*, in natural history, a term used to express the horns or antennæ of a peculiar genus of butterflies. As these of the common kind are slender and buttoned at the end, those become very thick a little way from their origin, and continue of that diameter through their whole length, till just at the extremity they turn a little and terminate in a sharp point. The anterior part of these is rounded, as in the other kinds; but behind they are made up of two planes meeting in an angle, and each of these has a row of hairs on it: these meeting at their summits, form an angular vacant space or alley below. *Reaumur's Hist. Inf.*

PRI'STIS, *the saw-fish*, a fish of a very large size, and armed with a very remarkable weapon like a saw, at his nose, from whence he has his name. See *plate* XXXV. *fig.* 5.

This fish, from its large size, is generally reckoned a kind of whale, but erroneously; for it is truly of the same genus with the galei or hound fishes. It is ash-coloured on the back, and white on the belly; its head is of a heart-like shape, and flatter; its mouth is placed far below the end of the snout, and in the under part of the head, as in the zygæna; its lips are rough and sharp, like a file, but it has no other teeth; its head is terminated by a long and flat bony substance, furnished on each side with jags or points like deep teeth of a saw. There are from twenty to thirty of these teeth on each side. The body is round, and grows small towards the tail. The sword of this fish is sometimes five feet long. It is found in the Western Ocean.

PRI'VET-*fly*, in natural history, the name of a species of fly, very common on the shrub from whence it has its name. It is called the erinopterus, and is remarkable for having its wings deeply divided into segments, so that they seem composed of feathers like birds wings. The creature, as it sits, looks like a small feather.

PROBABI'LITY (*Dict.*)— In the doctrine of Probability, one important observation may be made, viz. that, if one premiss only of an argument be probable, the conclusion is necessarily probable. But, if two or more premisses be probable, the conclusion will not be necessarily probable. Thus, for instance, supposing the Probability of each premiss expressed by $\frac{9}{10}$, the Probability of the conclusion will be but $\frac{81}{100}$, which shews it to be improbable. For we may call any thing improbable, if the measure of the chance for its happening is less than $\frac{1}{2}$. If there had been three premisses, and the Probability of each equal to $\frac{9}{10}$, the Probability of the conclusion would be $\frac{729}{1000}$, which is considerably improbable. Again, supposing the Probability of the truth of each premiss be 2 to 1, or expressed by $\frac{2}{3}$, the Probability of the conclusion, in the case of the two premisses, would be $\frac{4}{9}$. Where three premisses are assumed to infer a conclusion, this would be $\frac{8}{27}$; and, in case of four premisses, the Probability of the conclusion would be but $\frac{16}{81}$, which is less than $\frac{1}{5}$; so that one might with advantage lay four to one against the truth of a conclusion founded upon four probable premisses, for the truth of which, separately taken, two to one might be laid. It is to be observed, in all these cases, that the premisses are supposed independent, that is, not necessarily connected with each other.

Hence, it is easy to account, how it happens, that the most plausible political and physical reasonings lead so often to conclusions false in fact.

Mr. de Moivre has solved two problems, tending to establish the degree of assent that ought to be given to experience. He determines from his solutions, that after taking a great number of experiments, it should have been observed, that, if the happenings or failings of an event have been very near in a ratio of equality, it may safely be concluded, that the Probabilities of its happening or failing, at any one time assigned, are very near equal.

And if, after taking a great number of experiments, it should be perceived, that the happenings and failings have been nearly in a certain proportion, such as two to one, it may safely be concluded, that the Probabilities of happening or failing, at any one time assigned, will be very near in that proportion; and, that the greater the number of experiments has been, so much the nearer the truth will the conjectures be, that are derived from them.

Chance very little disturbs the events which, in their natural institution, were designed to happen or fail according to some determined law. For, if in order to help our conception, we imagine a round piece of metal, with two polished opposite faces, differing in nothing but their colour, whereof one may be supposed to be white and the other black; it is plain that this piece may with equal facility exhibit a white or black face; and we may even suppose that it was framed with that particular view of shewing sometimes the one face, sometimes the other; and that consequently, if it be tossed up, chance will decide the appearance.

But, although chance may produce an equality of appearance, and that a greater inequality, according to the length of time in which it may exert itself, still the appearance, either one way or the other, will perpetually tend to a proportion of equality. This is, in like manner, applicable to a ratio of inequality; and thus in all cases it will be found, that, although chance produces irregularities, still the odds will be infinitely great, that in process of time, these irregularities, will bear no proportion to the recurrency of that order which naturally results from original design. *De Moivre's Doctrine of Chances.*

Kepler's PRO'BLEM (*Dict.*) — As to the solution of this Problem, the late excellent mathematician, Mr. Machin, observes, that many attempts have been made, at different times, but never yet with tolerable success, towards the solution of the Problem proposed by Kepler: to divide the area of a semicircle into given parts, by a line from a given point of the diameter, in order to find an universal rule for the motion of a body in an elliptic orbit. For, among the several methods offered, some are only true in speculation, but are really of no service. Others are not different from his own, which he judged improper. And, as to the rest, they are all some way or other so limited and confined to particular conditions and circumstances, as still to leave the Problem in general untouched. To be more particular, it is evident, that all constructions by mechanical

chanical curves are seeming solutions only, but in reality unapplicable; that the roots of infinite serieses are, upon account of their known limitations in all respects, so far from affording an appearance of being sufficient rules, that they cannot well be supposed as offered for any thing more than exercises in a method of calculation. And then, as to the universal method, which proceeds by a continued correction of the errors of a false position, it is, when duly considered, no method of solution at all in itself; because, unless there be some antecedent rule or hypothesis to begin the operation, (as suppose that of an uniform motion about the upper focus, for the orbit of a planet; or that of a motion in a parabola for the perihelion part of the orbit of a comet; or some other such) it would be impossible to proceed one step in it. But, as no general rule has ever yet been laid down to assist this method, so as to make it always operate, it is the same in effect, as if there were no method at all. And accordingly in experience it is found, that there is no rule now subsisting, but what is absolutely useless in the elliptic orbits of comets; for, in such cases, there is no other way to proceed but that which was used by Kepler: to compute a table for some part of the orbit, and therein examine, if the time to which the place is required, will fall out any where in that part. So that, upon the whole, it appears evident, that this Problem (contrary to the received opinion) has never yet been advanced one step towards its true solution.

Mr. Machin afterwards proceeds to give his own solution of this Problem, which is particularly necessary in orbits of a great excentricity; and he illustrates his method by examples, for the orbits of Mercury, of Venus, of the comet of the year 1680. All which shew the universality of that method.

PROBOU'LEUMA, Προβούλευμα, among the Athenians, a decree or vote of the Areopagus, or senate of Athens.

PROCHARISTE'RIA, Προχαριστήρια, in antiquity, a solemn sacrifice which the Athenian magistrates yearly offered to Minerva, when the spring first began to appear. *Potter, Archæol. Græc.*

Marine PRODUC'TIONS.—To investigate the nature of marine Productions, Count Marsigli moistened in sea water some branches of coral, newly taken up, and found that the tubercles so frequent on its branches, after a little time, all opened themselves into regular flowers, each terminated by eight points. These were white, and were sustained by a cup divided into the same number of segments; and, on the taking the branches again out of the water, he found these flowers all immediately close themselves up again, and only make red irregular tubercles; and the vigorous branches of coral retained this property of opening and closing their flowers for seven or eight days after they were taken out of the sea. The tubercles, when wounded, yield a milky juice, in which, doubtless, there is contained the seed of the coral.

When this curious naturalist had found coral to be a true plant in its organisations, it appeared a very desireable thing to enquire whether it would yield vegetable principles, or those of another kind, in a chemical analysis. This experiment he carefully tried, not only on coral, but on many other of the stony plants, and found all of them yielded the same principles with vegetables. All of them yielded on this trial a phlegm, a volatile urinous spirit, with always more or less of a sea-water smell, and a thick reddish black fœtid oil; and the remainder in the retort being calcined, always yielded a fixed alkaline salt like that of plants.

The sea productions all afforded more or less of every one of these principles; but those of which ever kind that had been kept a long time after they were taken out of the sea, afforded always much less fluid matter than those which were fresh. Mr. Geoffroy was very desirous of following the count in these researches; and, as he had no opportunity of procuring any fresh coral from the sea, he put into the retort a pound of the common red coral, sold by the druggists, which is what wants the outer bark, and has usually been a long time out of the sea. This yielded two drachms and six grains of a reddish volatile urinous spirit, and two or three grains of a fœtid oil; and the remainder in the retort, by the common treatment, yielded afterwards near two drachms of a lixivial salt of a saline taste: the matter remaining after the lixiviation appeared a sort of lime.

The spirit appeared to Mr. Geoffroy to be wholly the same with that which the count had himself sent to the academy under the title of the spirit of old coral; and it appeared scarce at all different from spirit of harts-horn. It turned syrup of violets green, and made a white coagulation with a solution of corrosive sublimate. Though this was much the same with the count's spirit, the salts drawn from the caput mortuum were, however, different; that made by Mr. Geoffroy making a white coagulation with a solution of corrosive sublimate, and that of count Marsigli having no such effect; both the salts, however, turned the syrup of violets green, and Mr. Geoffroy judged the difference in the other trial to be only from the count's salt having been less carefully made, and containing some quantity of earth, which weakened its power and prevented this effect from it. It follows from all this, that the corals and all the other sea productions of that class are properly plants, though of the hardness of stones: and, in the internal use of coral, it may be proper to consider it not as a mere absorbent, but as a substance which contains also a volatile spirit and oil, which may well be supposed to possess virtues above those of mere absorbent earth; and that there is great difference between the virtues of such coral as has been long kept, and such as is newly taken up from the sea. The count, after analysing coral in this manner, tried the same process on several parts of the rocks on which the coral grew; but he found this to yield none of these active principles; so that, although the hardness of corals and of stones seems the same, there is great difference between them in their principles, their nature, and effects.

There is yet one question remaining to be determined in this point, which is, what is the nature of this milky juice contained in the tubercles of flowers, and perhaps not less in the other parts of coral. The count has said nothing as to its qualities, but Boccone says it is hot, acrid, and almost caustic; whence perhaps it is the natural sap of the plant, and is analogous to the milky juice of the spurges and some other plants. It were to be wished that this liquor could be tried with acids and alkalies, and in other ways, and its analysis known: this perhaps would make our knowledge of the nature of this stony vegetable perfect. *Mem. Acad. Par.* 1708.

PROGRE'SSION (*Dict.*)—As a right line, or figure, may increase continually, and never amount to a given line or area; so there are Progressions of fractions which may be continued at pleasure, and yet the sum of the terms be always less than a given number. If the difference between their sum and this number decrease in such a manner, that by continuing the Progression, it may become less than any fraction, howsmall soever, that can be assigned, this number is the limit of the sum of the Progression, and is what is understood by the value of the Progression, when it is supposed to be continued infinitely. These limits are analogous to the limits of figures, and they mutually assist each other. The areas of figures can, in many cases, be no otherwise expressed than by such Progressions; and, when the limits of figures are known, they may sometimes be advantageously applied for approximating to the sums of certain Progressions.

PRONG-*hoe*, in husbandry, a term used to express an instrument used to hoe or break the ground near, and among the roots of plants.

The ordinary contrivance of the hoe in England is very bad, it being only made for scraping on the surface; but, the great use of hoeing being to break and open the ground, besides the killing the weeds, which the ancients, and many among us, have thought the only use of the hoe, this dull and blunt instrument is by no means calculated for the purposes it is to serve.

The Prong-hoe consists of two hooked points of six or seven inches long, and, when struck into the ground, will stir and remove it the same depth as the plough does, and thus answer both the ends of cutting up the weeds and opening the land. The ancient Romans had an instrument of this kind, which they called the bidens; but they were afraid of its use in their fields and gardens, and only used it in their vineyards. The Prong-hoe comes into excellent use, even in the horse-hoeing husbandry; in this the hoe-plough can only come within three or four inches of the rows of the corn, turneps, and the like; but this instrument may be used afterwards, and with it the land may be raised and stirred, even to the very stalk of the plant. *Tull's Husbandry.*

PROOF, in the sugar trade, a term used by the refiners of sugar for the proper state of the dissolved sugar when it should be set to harden.

The process in the bringing sugar to this state may be understood by performing the whole work in miniature in this manner: take six pounds of coarse, or unrefined sugar; dissolve it over the fire in six pints of lime-water; add to this the whites of four eggs beat up to a froth, stir the whole together; then boil the liquor to a higher consistence than syrup, or till, when exposed to the cold, it will concrete into grains. This is what the sugar-bakers call proof. Pour this syrup into an earthen mould, with a hole at its bottom; stop the hole, and set the vessel in a moderately warm place.

The sugar in a few days will set and harden; then open the hole at the bottom, and lay over the top of the sugar some tobacco pipe clay, made into a soft pap with water. The clay must be afterwards wetted at times, and the water from among it will gradually be soaked up by the sugar, and, running thro' it, will wash away the treacle, without dissolving the grained part. And thus all the treacle will by degrees be drained out of the mass, and a loaf of white sugar procured. *Shaw's Lectures.*

PROPAGA'TION (*Dict.*) — The number of vegetables that may be propagated from an individual, is very remarkable, especially in the most minute plants.

It has been recorded, that, in so large a plant as the common mallow, the annual product of one seed was no less than 200,000; but it has been since proved, by a strict examination into the more minute parts of the vegetable world, that so despised a plant as the common wall moss produces a much more numerous

merous off-fpring. In one of the little heads of this plant, there have been counted 13824 feeds. Now allotting to a root of this plant eight branches, and to each branch fix heads, which appears to be a very moderate computation, the produce of one feed is $6 \times 13824 = 82944$; and 8×82944 gives 663552 feeds, as the annual produce of one feed, and that fo fmall that 13824 of them are contained in a capfule, whofe length is but one ninth of an inch, its diameter but one twenty-third of an inch, and its weight but the thirteenth part of a grain. *Philofophical Tranfactions*, N°. 478.

PRO'PHECY (*Dict.*— A late author obferves, that the Chriftians have this in common with the Pagans, that they equally build their religions upon Prophecy and divination.

He adds, that divination was an art learned by the Romans in fchools, or under difcipline; as the Jews did prophefying in the fchools and colleges of the prophets.

In thefe fchools, as the learned Dodwell obferves, the candidates for Prophecy were taught the rules of divination practifed by the Heathens, who were in poffeffion of the art long before them. It is added, that the gift of Prophecy was not an occafional thing, but a conftant and ftanding matter of fact; and fome think they have difcovered an eftablifhment of an order of prophets in the Old Teftament, in analogy to the Heathen diviners.

This is certain, from many paffages of fcripture, that there were great numbers of prophets among them, who not only exercifed their talents in matters of government and religion, but even in the difcovery of loft goods, and in telling of fortunes.

One of the greateft difficulties in Chriftianity turns upon the completion of the fcripture Prophecies. In the prophets of the Old Teftament are frequent predictions of the Meffiah; which the writers of the New frequently urge to the Jews and Heathens as fulfilled in Jefus Chrift; and on this principle evince the truth of his miffion: but thefe texts thus urged from the Old, in the New Teftament, are fometimes not to be now found in the Old; and, at other times, not urged in the New in the literal and obvious fenfe which they feem to bear in the Old; whence moft of the Chriftian commentators, divines, and critics, ancient and modern, judge them to be applied in a fecondary, typical, allegorical, or myftical fenfe.

Thus, for inftance, St. Matthew, after an account of the conception of the Virgin, and the birth of Jefus, fays, 'All this was done, that it might be fulfilled which was fpoken by the prophet, faying, Behold a virgin fhall be with child, and fhall bring forth a fon, and they fhall call his name Emanuel.' But the words, as they ftand in Ifaiah, whence they are fuppofed to be taken, do, in their obvious and literal fenfe, relate to a young woman who was to bring forth a child in the days of Ahaz; as appears from the context, and is owned by Grotius, Huetius, Caftalio, Curcellæus, Epifcopius, Hammond, Simon, Le Clerc, Lamy, &c.

This Prophecy then being not fulfilled in Jefus, in the primary, literal, or obvious fenfe of the words, is fuppofed, like the other Prophecies cited by the apoftles, to be fulfilled in a fecondary, typical, or allegorical fenfe; i. e. this Prophecy, which was firft literally fulfilled by the birth of the prophet's fon in the time of Ahaz, was again fulfilled by the birth of Jefus, as being an event of the fame kind, and intended to be fignified either by the prophet, or by God, who directed the prophet's fpeech.

Grotius obferves this to be the cafe in moft, if not all the Prophecies and citations quoted from the Old in the New Teftament; and Dodwell, with Sir John Marfham, refer even the famous Prophecy in Daniel, about the feventy weeks, to the time of Antiochus Epiphanes; fhewing, that the expreffions taken thence by Chrift, and urged by him as predicting the deftruction of Jerufalem by the Romans, have only in a fecondary fenfe a refpect to that deftruction.

And even that famous Prophecy in the Pentateuch, 'A prophet will the Lord God raife up unto thee, like unto me; to him fhall ye hearken;' which St. Luke refers to as fpoken of Jefus Chrift, is, by Simon, Grotius, Stillingfleet, &c. underftood to fignify, in its immediate fenfe, a promife of a fucceffion of prophets.

It is allowed then, the apoftles applied the Prophecies they quote from the Old Teftament, in a typical fenfe: but unhappily the rules whereby they quoted are loft. Dr. Stanhope laments the lofs of the Jewifh traditions or rules for interpreting fcripture received among the rabbins, and followed by the apoftles. But this lofs Surenhufius, Hebrew profeffor at Amfterdam, thinks he has retrieved from the Jewifh talmud, and the ancient Jewifh commentaries; and has accordingly publifhed to the world the rules whereby the apoftle quoted the Old Teftament.

But the truth is, thefe rules are too precarious, ftrained, and unnatural, to gain much credit.

Mr. Whifton condemns all allegorical explanation of the Prophecies of the Old Teftament cited in the New, as weak, enthufiaftic, &c. and adds, that if a double fenfe of the Prophecies be allowed, and there be no other method of fhewing their completion, than by applying them fecondarily and typically to our Lord, after having been in their firft and primary intention long ago fulfilled in the times of the Old Teftament, we lofe all the real advantages of the ancient Prophecies, as to the proofs of Chriftianity.

He therefore fets up a new fcheme in oppofition thereto: he owns, that, taking the prefent text of the Old Teftament for genuine, it is impoffible to expound the apoftles citations of the Prophecies of the Old Teftament, on any other than the allegorical foundation; and therefore, to folve the difficulty, is forced to have recourfe to a fuppofition contrary to the fenfe of all Chriftian writers before him, viz. that the text of the Old Teftament has been greatly corrupted fince the apoftolical age by the Jews.

His hypothefis is, that the apoftles made their quotations out of the Old Teftament rightly and truly from the Septuagint verfion, which in their time was in vulgar ufe, and exactly agreed with the Hebrew original; and that, as they made exact quotations, fo they argued juftly and logically from the obvious and literal fenfe of the faid quotations, as they then ftood in the Old Teftament: but that, fince their times, both the Hebrew and Septuagint copies of the Old Teftament have been fo greatly corrupted, and fo many apparent diforders and diflocations introduced therein, as to occafion many remarkable differences and inconfiftences between the old Old and New Teftament in refpect to the words and fenfe of thofe quotations.

As to the manner wherein thefe corruptions were introduced, he fays, the Jews in the fecond century greatly corrupted and altered both the Hebrew and Septuagint, efpecially in the Prophecies cited by the apoftles, to make their reafoning appear inconclufive: that in the third century, they put into Origen's hand one of thefe corrupted copies of the Septuagint; which Origen, miftaking for genuine, inferted in his Hexapla, and thus brought into the church a corrupted copy of the Septuagint; and that, in the end of the fourth century, the Jews put into the hands of the Chriftians, who till then had been almoft univerfally ignorant of the Hebrew, a corrupted copy of the Hebrew Old Teftament.

The difagreement then between the Old and New teftament, in refpect to the faid quotations, he contends, has no place between the genuine text of the Old Teftament, now no-where exifting, but only between the prefent corrupted text of the Old and New Teftament: and therefore, to juftify the reafonings of the apoftles, he propofes to reftore the text of the Old Teftament, as it ftood before the days of Origen, and as it ftood in the days of the apoftles: from which text thus reftored, he doubts not it will appear, that the apoftles cited exactly, and argued juftly and logically from the Old Teftament.

But this fcheme of accomplifhing Prophecies labours under difficulties at leaft as great as the allegorical fcheme. Its foundation is incredible, and its fuperftructure, from firft to laft, precarious. In effect, it is inconceivable the Old Teftament fhould be fo corrupted; and it may even be made appear, that the Hebrew and Septuagint difagreed in the times of the apoftles: add to this, that the means whereby he propofes to reftore the true text, will never anfwer that end; nor has he himfelf, from all the means he was yet poffeffed of, able to reftore one prophetical citation, fo as to make that feem literally, which before only feemed allegorically applied.

PRO'PHET (*Dict.*)— Among the canonical books are thofe of fixteen Prophets; four of which are denominated the greater Prophets, viz. Ifaiah, Jeremiah, Ezekiel, and Daniel; fo called from the length or extent of their writings, which exceed thofe of the others, viz. Hofea, Joel, Amos, Obadiah, Jonas, Micah, Nahum, Habakkuk, Haggai, Zachariah, and Malachi; who are called the leffer Prophets, from the fhortnefs of their writings.

The Jews only reckon three greater Prophets; Daniel they exclude, as no more to be ranked among the Prophets than David: not but that both the one and the other foretold many important things: but becaufe their manner of life differed from that of the other Prophets, David being a king, and Daniel a peer.

In the Greek church, the leffer Prophets are placed in order before the great ones; apparently becaufe many of the leffer Prophets are more ancient than the greater.

Among the Greeks too, Daniel is ranked among the leffer Prophets.—In the 48th chapter of Ecclefiafticus, Ifaiah is particularly called the great Prophet, both on account of the great things he foretold, and the magnificent manner wherein he did it.

Spinofa fays, the feveral Prophets prophefied according to their refpective humours; Jeremiah, for inftance, melancholy and dejected with the miferies of life, prophefied nothing but misfortunes.

Dacier obferves, that among the ancients the name poet is fometimes given to Prophets; as that of Prophet is at other times given to poets.

PRO'POLIS, a name given by authors to a certain fubftance more glutinous and tenacious than wax, with which the bees ftop up all the holes or cracks in the fides of their hives. Befides the wax and the honey which the bees gather in their daily travels, they have occafion for this third fubftance at times, and that efpecially when they are placed in a new hive. They very well know that it is neceffary to their well-being, that

that they ſhould be kept perfectly warm in their hives, and ſtrongly defended againſt the injuries of weather: to keep out wind and rain they ſtop every little chink in the ſides of their habitations with this matter; nor is this the only reaſon for it, they have other enemies of the inſect tribe, which are on different occaſions eternally ſeeking a way into their habitations; ſome of them feed on their honey, others on the wax, and others on their young offſpring. To be guarded againſt theſe, they as firmly as poſſible block up all the accidental holes or cracks in the hive, and guard the principal opening, which ſerves as the gate of their city, by numbers, which are always placed round about it, ſo that no enemy can come in that way.

The Propolis itſelf is a ſubſtance perfectly different from wax; it is found to be ſoluble in ſpirit of wine, or in oil of turpentine, and is ſoft when laid on by the bees, but grows hard afterwards; it may, however, even in its hardeſt ſtate, be ſoftened by heat. By all theſe obſervations it appears very plainly, that the Propolis is a true genuine vegetable reſin, of the nature of many others which we have in common uſe. The authors who have treated of this ſubſtance, have deſcribed it very differently; George Pictorius, who has written of bees, ſays, that it is of a yellow colour and an agreeable ſmell, like that of ſtorax, and that it would ſpread when warmed properly. Pliny and the old writers deſcribe it as being of a rank and ſtrong ſmell, and being uſed as a ſuccedaneum for galbanum; and at preſent we uſually find it of an aromatic and agreeable ſmell, inſomuch that ſome rank it among the perfumes. The apothecaries, in ſome places, keep it as a medicine in their ſhops; but it is to be obſerved, that it is very various in its nature; for, according to the deſcription of authors, it is ſometimes ſweet and ſometimes ſtinking. The truth is, that the bees who collect it as a thing to be uſed for a cement, not for food, are not over curious of what plants they gather it from; and hence in different hives it is found of very different colours and conſiſtences. In general, the Propolis is of a browniſh red colour on the ſurface; the red ſometimes predominating, ſometimes the brown; but when broken it is yellowiſh, or approaching to the colour of wax. It very readily diſſolves in ſpirit of wine or oil of turpentine, and this ſolution is of a fine gold colour, and will ſerve extremely well as a varniſh to colour ſilvered picture frames, or other the like work, into the appearance of gold. It gives a fine gold-like appearance, indeed, to any white metal of a poliſhed ſurface; all that it wants is a little more brilliancy, which is eaſily given it by mixing a ſmall quantity of maſtich, or of ſandarach, in the ſolution. *Reaumur's Hiſt. Inſ.*

Mr. Reaumur was very deſirous of ſeeing the manner in which the bees collected this tenacious matter, but watched them in vain in the fields and upon the trees: although an accident gave him an opportunity of obſerving them at their work on this occaſion. He had taken off the cover of one of his glaſs hives on ſome occaſion, and as there was much of the Propolis ſticking to its edges, which the bees had uſed to ſtop the crevices when it was fixed in, the bees of a neighbouring hive ſoon found that here was this ſubſtance ready for them in large quantities together, and that they could have it at a very eaſy rate: they therefore immediately detached a party to bring it off; and, in conſequence of this, it was eaſy to obſerve any one of them, during the whole courſe of his work. The manner of ſeparating it from the ſubſtance it lay upon, was by detaching very ſmall pieces at a time with the teeth; theſe, when they had been with great labour looſened from the reſt, were delivered to the foot of one of the fore-legs: they were here moulded into a roundiſh lump, and, after a little working, delivered to the foot of a ſecond leg; and finally, by this to the flat triangular piece which makes the third joint of the hinder legs, the part deſtined in their common labours to receive the lumps of rough wax. It is here preſſed down with ſome violence, and afterwards fixed in its place by three or four ſtrokes from the ſame foot; and then another is ſeparated by the teeth in the ſame manner, and by the ſame means carried to the ſame place, and added to the firſt piece; and ſo on till the whole work is finiſhed. The bees which found this treaſure loaded themſelves to an immenſe degree, carrying off a lump larger than a pea on each leg; and the time to take up theſe large parcels was at leaſt half an hour: after carrying this load to the hive, and being relieved from it by the joint labours of ſeveral others, the bee which has been at all the pains of collecting it, joins a cluſter of others in ſome quiet part of the hive, where it reſts for the remainder of that day.

PROPO'RTIONALS, in geometry, are quantities, either linear or numeral, which bear the ſame ratio or relation to each other.

Thus, if 3, 6, 12, be Proportionals, then will 3 : 6 : : 6 : 12.

To find a fourth PROPORTIONAL *to three given lines*, A B, A C, and BD, *Plate* XXXV. *fig.* 6. draw an angle F A G at pleaſure; from A ſet off the firſt of the lines to B; from A, the ſecond, to C; and, from B to D, the third: draw BC; and in D make an angle equal to A B C: then is C E the fourth Proportional ſought; and A B : A C : : B D : C E.

If a third Proportional be required to two given lines, A B and A C; make B D equal to A C, i. e. let A C be repeated twice: then A B : A C : : A C : C E.

To find a mean PROPORTIONAL *between two given lines* A B and B E, *fig.* 7, join the two given lines into one continued right line, and biſect it in C. From C, with the interval of A C, deſcribe a ſemicircle A D E; and from B erect a perpendicular B D; this is the mean Proportional ſought; and A B : B D : : B D : B E.

The geometricians have been theſe two thouſand years in ſearch of a method for finding two mean Proportionals.

The ancients performed it mechanically, by the meſolabe deſcribed by Eutochius; and many of them attempted to give the demonſtration; ſome by the ſolid loci, as Menechmus; others by the plain loci, as Nicomedes, Diocles, and, in our times, Vieta; and others by implicit motions, as Plato, Archytas, Pappus, and Sporus; others tentatively, by the deſcription of circles, as Hero and Apollonius, &c. but all in vain.

To find a mean PROPORTIONAL *between two numbers*: half the ſum of the two given numbers is an arithmetical mean Proportional, and the ſquare root of their product a geometrical mean Proportional.

PROSLAMBANO'MENOS, in the ancient Greek muſic, was the firſt note of their ſcale, whether aſcending or deſcending. It was uſual among the Greeks to conſider a deſcending as well as an aſcending ſcale; the former proceeding from acute to grave preciſely by the ſame intervals as the latter did from grave to acute. The not diſtinguiſhing theſe two ſcales has led ſeveral learned moderns to ſuppoſe, that the Greeks, in ſome centuries, took the Proſlambanomenos to be the loweſt note in their ſyſtem; and in other centuries to be the higheſt. But the truth of the matter is, that the Proſlambanomenos was the loweſt or higheſt note, according as they conſidered the aſcending or deſcending ſcale. The learned author of this remark thinks this diſtinction of the aſcending or deſcending ſcales conducive to the variety and perfection of melody; but he ſays, he never met with above one piece of muſic, where the compoſer appeared to have any intelligence of that kind: and this piece was above 150 years old.

PRO'STYPA, Πρόστυπα, in the ſculpture of the ancients, images carved in ſuch a manner as to be only half raiſed above the ground, or plain, on which they were formed.

PRUNE'LLA, *ſelf-heal*, in botany, the name of a ſmall plant, uſed in medicine.

The roots of ſelf-heal are ſlender, creeping, and fibrous; the lower leaves grow on long foot-ſtalks, beſet with a few hairs, as is the reſt of the plant; they are broadeſt in the middle, and narrower at both ends, leſs than betony, and not at all indented about the edges. The ſtalks are ſquare, about a foot high, with two leaves ſet oppoſite at a joint, which are not many on a ſtalk; the nearer they grow to the top, the ſhorter are their foot-ſtalks. The flowers are ſet on the top of the branches in thick verticillated ſpikes, of a purple colour, having an hollow galea, and a three lipped labella, ſtanding in brown flattiſh calyces, ſix ſtanding round the ſtalk in a whorle; each flower is ſucceeded by four longiſh brown ſeeds growing in the bottom of the calyx. It grows every-where in meadows and paſture grounds, flowering all the latter part of the ſummer: the leaves and flowers are uſed. Self-heal is reckoned among the vulnerary plants, and is accounted ſerviceable for all ſorts of wounds, and putrid ulcers. It is reſtringent, and good for inward bleedings, and making bloody water; and is much uſed in gargles, for ulcers in the mouth, throat, or gums, either the juice or a ſtrong decoction. *Miller's Bot. Off.* Prunella abſterges and conſolidates: its principal uſe is in wounds, eſpecially of the lungs, and in coagulations of blood. It is alſo frequently employed outwardly in wounds, and in the quinſey, and other affections of the mouth and fauces, hæmorrhages, and dyſenteries, and in ſpitting or piſſing of blood. *Hiſt. Plant. adſcript. Boerhaave.*

PRU'NING (*Dict.*)— There is not any part of gardening, which is of more general uſe than that of Pruning; and, yet, it is very rare to ſee fruit-trees ſkilfully managed: almoſt every gardener will pretend to be a maſter of this buſineſs, though though there are but few who rightly underſtand it; nor is it to be learned by rote, but requires a ſtrict obſervation of the different manners of growth of the ſeveral ſorts of fruit-trees; ſome requiring to be managed one way, and others muſt be treated in a quite different method, which is only to be known from carefully obſerving how each kind is naturally diſpoſed to produce its fruit: for ſome ſorts produce their fruit on the ſame year's wood, as vines; others produce their fruits, for the moſt part, upon the former year's wood, as peaches, nectarines, &c. and others upon curſons or ſpurs, which are produced upon wood of three, four, or five, to fifteen or twenty years old, as pears, plums, cherries, &c. therefore, in order to the right management of fruit-trees, there ſhould always be proviſion made to have a ſufficient quantity of bearing wood in every part of the trees, and, at the ſame time, there ſhould not be a ſuperfluity of uſeleſs branches, which would exhauſt the ſtrength of the trees, and cauſe them to decay in a few years.

The reaſons which have been laid down for Pruning of fruit-trees, are as follow: firſt, to preſerve trees longer in a vigorous bearing ſtate; the ſecond is, to render the trees more beautiful to the eye; and, thirdly, to cauſe the fruit to be larger, and better taſted.

1. It preſerves a tree longer in an healthy bearing ſtate; for by Pruning off all ſuperfluous branches, ſo that there are no more left upon the tree than are neceſſary, or than the roots can nouriſh properly, the root is not exhauſted in ſupplying uſeleſs branches, which muſt afterwards be cut out; whereby much of the ſap will be uſeleſly expended.

2. By ſkilful Pruning of a tree, it is rendered much more pleaſing to the eye: but here I would not be underſtood to be an advocate for a ſort of Pruning which I have ſeen too much practiſed of late; viz. the drawing a regular line againſt the wall, according to the ſhape or figure they would reduce the tree to, and cutting all the branches, ſtrong or weak, exactly to the chalked line; the abſurdity of which practice will ſoon appear to every one who will be at the pains of obſerving the difference of thoſe branches ſhooting the ſucceeding ſpring. All therefore that I mean by rendering a tree beautiful, is, that the branches are all pruned according to their ſeveral ſtrengths, and are nailed at equal diſtances in proportion to the different ſizes of their leaves and fruit; and that no part of the wall, ſo far as the trees are advanced, be left unfurniſhed with bearing wood. A tree well managed, though it does not repreſent any regular figure, yet will appear very beautiful to the ſight, when it is thus dreſſed, and nailed to the wall.

3. It is of great advantage to the fruit; for the cutting away all uſeleſs branches, and ſhortening all the bearing ſhoots, according to the ſtrength of the tree, will render the tree more capable to nouriſh thoſe which are left remaining, ſo that the fruit will be much larger, and better taſted. And this is the advantage which thoſe trees againſt walls of eſpaliers have to ſuch as are ſtandards, and are permitted to grow as they are naturally inclined; for it is not their being trained either to a wall or eſpalier which renders their fruit ſo much better than ſtandards, but becauſe they have a leſs quantity of branches and fruit for their roots to nouriſh; and, conſequently, their fruit will be larger, and better taſted.

There are many perſons who ſuppoſe, that if their fruit-trees are but kept up to the wall or eſpalier, during the ſummer-ſeaſon, ſo as not to hang in very great diſorder, and, in winter, to get a gardener to prune them, it is ſufficient: but this is a very great miſtake; for the greateſt care ought to be employed about them in the ſpring, when the trees are in vigorous growth; which is the only proper ſeaſon to procure a quantity of good wood in the different parts of the tree, and to diſplace all uſeleſs branches, as ſoon as they are produced, whereby the vigour of the tree will be intirely diſtributed to ſuch branches only, as are deſigned to remain; which will render them ſtrong, and more capable to produce good fruit; whereas, if all the branches are permitted to remain, which are produced, ſome of the more vigorous will attract the greateſt ſhare of the ſap from the tree, whereby they will be too luxuriant for producing fruit, and the greateſt part of the other ſhoots will be ſtarved, and rendered ſo weak, as not to be able to produce any thing elſe but bloſſoms and leaves, as hath been before mentioned; ſo that it is impoſſible for a perſon, let him be ever ſo well ſkilled in fruit-trees, to reduce them into any tolerable order by winter Pruning only, if they are wholly neglected in the ſpring.

There are others, who do not intirely neglect their trees during the ſummer ſeaſon, as thoſe before mentioned; but yet do little more good to them by what they call ſummer Pruning; for theſe perſons neglect their trees at the proper ſeaſon, which is in April and May, when their ſhoots are produced, and only about Midſummer go over them, nailing in all their branches, except ſuch as are produced fore-right from the wall, which they cut out; and at the ſame time often ſhorten moſt of the other branches; all which is intirely wrong practice; for thoſe branches which are intended for bearing the ſucceeding year, ſhould not be ſhortened during the time of their growth, which will cauſe them to produce two lateral ſhoots from the eyes, below the place where they were ſtopped, which ſhoots will draw much of the ſtrength from the buds of the firſt ſhoot, whereby they are often flat, and do not produce their bloſſoms; and if thoſe two lateral ſhoots are not intirely cut away at the winter Pruning, they will prove injurious to the tree, as the ſhoots which theſe produce will be what the French call water-ſhoots: and in ſuffering thoſe luxuriant ſhoots to remain upon the tree until Midſummer, before they are diſplaced, they will exhauſt a great ſhare of the nouriſhment from the other branches, as was before obſerved; and by ſhading the fruit all the ſpring-ſeaſon, when they are cut away, and the other branches faſtened to the wall, the fruit, by being ſo ſuddenly expoſed, will receive a very great check, which will cauſe their ſkins to grow tough, and thereby render them leſs delicate. This is to be chiefly underſtood of ſtone-fruit and grapes; but pears and apples, being much hardier, ſuffer not ſo much, though it is a great diſadvantage to thoſe alſo, to be thus managed.

It muſt alſo be remarked, that peaches, nectarines, apricots, cherries, and plums, are always in the greateſt vigour, when they are the leaſt maimed by the knife; for, where theſe trees have large amputations, they are very ſubject to gum and decay; ſo that it is certainly the moſt prudent method carefully to rub off all uſeleſs buds when they are firſt produced, and pinch others, where new ſhoots are wanted to ſupply the vacancies of the wall; by which management trees may be ſo ordered, as to want but little of the knife in winter Pruning, which is the ſureſt way to preſerve theſe trees healthful, and is performed with leſs trouble than the common method.

The management of pears and apples is much the ſame with theſe trees in ſummer; but in winter they muſt be very differently pruned: for, as peaches and nectarines do, for the moſt part, produce their fruit upon the former year's wood; and therefore muſt have their branches ſhortened according to their ſtrength, in order to produce new ſhoots for the ſucceeding year; ſo pears, apples, plums, and cherries, on the contrary producing their fruit upon curſons or ſpurs, which come out of the wood of five, ſix, or ſeven years old, ſhould not be ſhortened, becauſe thereby thoſe buds which were naturally diſpoſed to form theſe curſons or ſpurs, would produce wood-branches, whereby the trees would be filled with wood, but never produce much fruit; and as it often happens, that the bloſſom-buds are firſt produced at the extremity of the laſt year's ſhoot, ſo, by ſhortening the branches, the bloſſoms are cut away, which ſhould always be carefully avoided.

There are ſeveral authors who have written on the ſubject of Pruning in ſuch a prolix manner, that it is impoſſible for a learner to underſtand their meaning: theſe have deſcribed the ſeveral ſorts of branches, which are produced on fruit-trees; as wood-branches, fruit-branches, irregular branches, falſe branches, and luxuriant branches; all which they aſſert, every perſon who pretends to Pruning, ſhould diſtinguiſh well: whereas there is nothing more in all this but a parcel of words to amuſe the reader, without any real meaning; for all theſe are comprehended under the deſcription already given of luxuriant or uſeleſs branches, and ſuch as are termed uſeful for fruit-bearing branches: and, where due care is taken in the ſpring of the year, to diſplace theſe uſeleſs branches, as was before directed, there will be no ſuch thing as irregular, falſe, or luxuriant branches, at the winter Pruning; therefore it is to no purpoſe to amuſe people with a cant of words, which, when fully underſtood, ſignify juſt nothing at all.

The following hints will be of great uſe in Pruning ſtandard trees.

Firſt, you ſhould never ſhorten the branches of theſe trees, unleſs it be where they are very luxuriant, and grow irregular on one ſide of the tree, attracting a great part of the ſap of the tree, whereby the other parts are unfurniſhed with branches, or are rendered very weak; in which caſe the branch ſhould be ſhortened down as low as is neceſſary, in order to obtain more branches, to fill up the hollow of the tree: but this is only to be underſtood of pears and apples, which will produce ſhoots from wood of three, four, or more years old; whereas moſt ſorts of ſtone fruit will gum and decay, after ſuch amputations.

But from hence I would not have it underſtood, that I would direct the reducing of theſe trees into an exact ſpherical figure, ſince there is nothing more deteſtable, than to ſee a tree, which ſhould be permitted to grow as it is naturally diſpoſed, with its branches produced at proportionable diſtances, according to the ſize of the fruit, by endeavouring to make it exactly regular at its head, ſo crouded with ſmall weak branches, as to prevent the air from paſſing between them; which will render it incapable to produce fruit. All that I intend by this ſtopping of luxuriant branches, is only when one or two ſuch happen on a young tree, where they intirely draw all the ſap from their weaker branches, and ſtarve them; and then it is proper to uſe this method, which ſhould be done in time, before they have exhauſted the roots too much.

Whenever this happens to ſtone fruit, which ſuffer much more by cutting than the former ſorts, it ſhould be remedied by ſtopping or pinching thoſe fruits in the ſpring, before they have obtained too much vigour; which will cauſe them to puſh out ſide branches, whereby the ſap will be diverted from aſcending too faſt to the leading branch, as hath been directed for wall trees; but this muſt be done with caution, as before.

You muſt alſo cut out all dead or decaying branches, which cauſe their head to look very ragged; eſpecially at the time when the leaves are upon the tree, theſe being deſtitute of them, have but a deſpicable appearance; beſides, theſe will attract noxious particles from the air, which are injurious to the trees; therefore, the ſooner they are cut out, the better: in doing of this, you ſhould obſerve to cut them cloſe down to the place where they were produced, otherwiſe, that part of the branch left will decay, and prove equally hurtful to the tree; for it ſeldom happens, when a branch begins to decay, that it does not die quite down to the place where it was produced, and, if permitted to remain long uncut, does often infect ſome of the other parts of the tree. If the branches are large which you cut off, it will be very proper, after having ſmoothed the cut part exactly even with a knife, chiſſel, or hatchet, to put on a plaiſter of grafting clay, which will prevent the wet from ſoaking into the tree at the wounded part.

All ſuch branches as run acroſs each other, ſhould alſo be cut out; for theſe not only occaſion a confuſion in the head of the tree, but, by lying over each other, rub off their bark by their motion, and very often occasion them to canker, to the great injury of the tree; and on old trees, especially apples, there are often young vigorous shoots from the old branches near the trunk, which grow upright into the head of the trees: these therefore should carefully be cut out every year, lest, by being permitted to grow, they fill the tree too full of wood; which should always be guarded against, since it is impossible for such trees to produce so much, or so good fruit, as those trees whose branches grow at a farther distance; whereby the sun and air freely pass between them, in every part of the tree. *Miller's Gard. Dict.*

PRU'NUS, *the plum*, in botany, a genus of trees, whose characters are:

The calyx is monophyllous and quinquefid; the flower rosaceous, pentapetalous, and furnished with thirty or more stamina. The ovary in the bottom of the calyx becomes an ovated or globous fruit, containing, under a thin, smooth membrane, or skin, a soft pulp, in the middle of which is inclosed an oblong or oval flattish stone, acuminated at both ends, and containing a single kernel; the pedicle of the fruit is of a good length. See PLUM.

PRU'SSIAN *Blue*. See the article *Prussian* BLUE.

PSE'UDO-*acacia*, *bastard acacia*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the papilionaceous kind, and from its cup there arises a pistil, surrounded by a fimbricated membrane. This finally becomes a flat pod, which bursts into two parts, and contains kidney-shaped seeds. To this it is to be added, that the leaves are placed in series over-against one another, on a middle rib, the end of which is terminated by a pod leaf.

PSEUDO-*pulex arboreus*, in natural history, the name of a genus of insects described by Mr. Reaumur, and somewhat approaching in their form to the pulex arboreus; but having their wings covered with a squammose case, which those creatures have not, and having broader and flatter bodies.

These principally live upon the fig-tree and the box; they pass through a sort of metamorphosis into a hopping fly, supposed by some of the nature of the grasshopper; but erroneously, for that animal has a case for its wings, and the other not.

PSEUDO-*tinea*, in natural history, the name of a very remarkable insect, described by Mr. Reaumur, approaching to the nature of the tinea, or cloaths moth, while in the worm state; but not making themselves coats of the substance of leaves, cloaths, &c. though they form a sort of cases for their defence against a very terrible enemy.

These creatures are truly of the caterpillar kind, and have, in the manner of any of these insects, sixteen legs. They feed on wax, and for food enter the bee-hives; where they boldly engage the bees, and are not to be prevented by them from feeding, though at the expence of their habitations and the cells of their reservoirs of honey: so that it is no uncommon thing for a swarm of bees to be forced to change their place of habitation, and make new combs elsewhere; leaving the old ones to this contemptible victor, whom they know not how to drive out or dispossess.

PSI'TTACUS, *the parrot*, in the Linnæan system of zoology, makes a particular and distinct genus of birds, of the order of the hawks; the distinguishing characters of which are, that the feet have two toes before and two behind.

The parrot is a very well known bird, of which there are several very beautiful species.

Its head is large, and beak and skull extremely hard and strong. It might seem a wonder why nature has destined to this, which is not naturally a bird of prey, but feeds on fruits and vegetable substances, the crooked beak allotted to the hawk and other carnivorous birds; but the reason seems to be, that the parrot being a heavy bird, and its legs not very fit for service, it climbs up and down trees by the help of this sharp and hooked bill, with which it lays hold of any thing, and secures itself, before it stirs a foot; and besides this, it helps itself forward very much, by pulling its body on with this hold.

Of all animals, the parrot and crocodile are the only ones which move the upper jaw; all creatures else moving the under only. As some particular animals besides are fond of particular foods, so the parrot loves nothing so much as the seeds of the carthamus, or bastard saffron; and eats them without any hurt, though they are a purge when given to other creatures.

The parrots are common both in the East and West-Indies: they are a very brisk and lively bird in the warmer countries, but with us lose much of their vigour. They lay two or three eggs in the hollow of a tree.

In all the known parrots the nostrils are round and placed very high upon the beak, and very near one another.

PSY'LLIUM, *fleawort*, in botany, a genus of plants, whose characters are:

It agrees, in all respects, with the plantago and coronopus; only the stalks are leafy and ramous, or divided into a multitude of branches.

Fleawort has round hairy stalks, a foot or more high, beset at the joints with two, and sometimes three, long, narrow, sharp-pointed, somewhat hairy leaves, often lightly cut in about the edges. From the bosom of these, towards the upper part of the stalks, arise pretty long slender foot-stalks, bearing at the ends round short spikes of small stamineous flowers, of four leaves apiece, with a-pices standing out, and somewhat resembling the heads of the long plantain; and are succeeded by round seed-vessels; containing two round shining reddish-brown seeds, that look like fleas, whence it takes its name. The root is stringy and fibrous; it grows in the southern parts of France, from whence we have the seed which only is used.

Some attribute a purgative quality to this seed, but we use it only to extract a mucilage for sore mouths and throats, and to help thrushes and quinseys. It is, likewise, useful to obtund sharp acrimonious humours, which corrode the bowels, and cause dysenteries. Outwardly it is good for sore, inflamed, blood-shot eyes. *Miller's Bot. Off.*

The salt of this plant resembles that of coral, but is mixed with a little of sal ammoniac, a great deal of sulphur, and terrestrial parts.

By the chymical analysis, it yields a great deal of oil and earth, no volatile concrete salt, a little urinous spirit, and several acid liquids.

Psyllium-seed is used in the electuary de psyllio; but its purgative virtue ought to be attributed to the scammony, and the other cathartics. The mucilage of Psyllium is very lenifying, and good to asswage the inflammation of the eyes: it is given in a clyster for the dysentery, and inflammation of the kidnies. *Martyn's Tournefort.*

PTI'LOSIS, πτίλωσις, from πτίλος, a person who has lost his eye-lashes. A baldness of the eye-lashes. Paulus Ægineta, Lib. 3. cap. 23, says, the Ptilosis and madarosis are disorders of the external margins of the eye-lids. The madarosis is only a falling off of their hairs, produced by a defluxion of acrid humours; whereas, in a Ptilosis, the margins of the eye-lids become thick and callous; so that it is a disorder complicated of a madarosis and an hard lippitude: for which reason the remedies proper for the one are, also, conducive to the removal of the other. For procuring the growth of the hairs, and preventing an itching and corrosion of the corners of the eyes, the best medicine is that of Philoxenes, distinguished by the epithet dry. For removing a dimness of sight, the following preparation is excellent:

Take of cadmia, eight drachms; of sal ammoniac, two drachms; of saffron and spikenard, each two drachms; and of white pepper, one drachm: mix all together for use. Antimony, also, answers the same purpose.

For a corrosion of the corners of the eyes and a Ptilosis:

Take of calcined antimony, extinguished in women's milk, thirteen drachms; of aloes, myrrh, and spikenard, each two drachms; and of calcined barley, carefully triturated, four drachms: mix, and use dry.

Another medicine for a Ptilosis, and corrosion of the eye-lids, is thus prepared:

Take of the marrow of an ox, a sufficient quantity; triturate it duly with soot, and use it.

The soot intended for this purpose is to be thus prepared: immerse a sufficient quantity of paper in the oleum sesaminum: put the paper in a lamp, kindle it, and hold above it a smooth shell, or brazen vessel, in order to collect the soot, which, when triturated, with the above-mentioned marrow, is to be used.

The rennet of a calf is, also, excellent for the same purpose.

For a milphosis, an increase of flesh in the corners of the eyes, and other inveterate disorders of them, Sosander directs the following medicine:

Take of cadmia, antimony, crude chalcitis, and crude misy, each eight drachms: bruise these, mix them with honey, and torrefy them, after extinguishing them in wine, and triturating them: add to them, of spikenard, two drachms; of torrefied saffron, two drachms; and of pepper, one drachm; all these, when triturated together, are to be used.

The more simple medicines contributing to the cure of a Ptilosis, and a corrosion of the eye-lids, are boiled amurca, Indian lycium, and Armenian stone, used by the painters; which last, when mixed with water, and used by way of ointment, consumes the peccant humours, and augments the natural hairs; the rust of iron, triturated for many days in the heat of the sun, and reduced to the form of a collyrium, with wine and myrrh; and spodium, mixed with the juice of onions, is all of service.

PU'CERON, the name given by naturalists to a small insect of a peculiar nature, frequently found on the young branches of trees and plants, and that often in such clusters, as wholly to cover them.

The Puceron is a small animal, but very numerous in the several genera and species; insomuch that Reaumur has observed that there is scarce a vegetable to be found, either in the fields or gardens, that has not its peculiar species of Puceron to feed on its juices. M. de la Hire, of the Paris academy, has left many curious particulars in regard to these animals, in the year 1703; and Mr. Lewenhoek, and others since, have given figures and descriptions of several of the species.

Pucerons are all viviparous animals, and that after a very singular manner. It is to be observed, that the name is scarce more expressive of the creature, than some of the others given of late to insects; that of the polype to a creature which has no no legs or feet at all, is very improper; and that of the Puceron hardly less so, as it would naturally lead us to imagine, that the creature thus called was able to hop like a flea, whereas, in reality, it is very slow in its motions, and seldom so much as walks.

These creatures have six legs, which are extremely small and slender; and which, when the animal is at its full growth, are loaded with a weight so large, that they seem scarce able to support it. Some of these species arrive at a tolerable bigness for common observation; but the greater number are too small to be accurately seen, without the assistance of glasses. Among these insects there are great numbers that in their full perfection have wings, and become a sort of little flies: these are distinguished from the others, by the name of luted Pucerons. *Reaumur's Hist. Inf.*

The elder is the tree, on which they are of all others the most plentifully produced, and on which they are observed in their several stages with the greatest accuracy and ease. They often cover the thick green roots of this tree for many inches together, and sometimes for many feet; and they are always placed so close together, that they touch in every part, and sometimes they lie two beds, one over another. These are of a greenish black. If they are observed on the branches undisturbed, they are always found to be perfectly quiet, and seem to pass their whole lives in inaction; but they are all this time doing the most necessary business of life, that is, sucking in the nourishment from the juices of the tree. They do this by means of a fine slender trunk, which easily escapes the naked eye, but is always found by the microscope; and it is by means of this that they pierce the bark of the tender parts of the vegetables, and get at their juices. The trunk is usually of two thirds of the length of the body; but, when they are moving on, it is always applied so closely under the belly, that it is not seen.

Bladder PUCERON, a sort of Puceron that lives in bladders on the leaves of trees.

We often observe, on the leaves of different trees, a sort of roundish bladders, which only adhere to the leaf by a short pedicle: these are a sort of small galls, and their figure varies much in the different kinds; some are less round than others, and many are very rough on the surface; and sometimes they are long, terminating in a point, and being broader at the base than in any other point, and sustained by no pedicle, but fixed immediately to the leaves.

The elm and ash afford us more frequent instances of these than any other trees, and very often, on the first of these, they grow to the bigness of a nut, and sometimes much larger; and, when they are grown to their full size, they often take up the whole surface of the leaf. When these bladders are opened, they are found to contain a large number of Pucerons.

If these bladders are examined at the time when they are newly risen, which usually is in the beginning of June, on opening them there is usually found in them only one Puceron, and that always a female big with young; and, in others more advanced, the parent insect is found surrounded with different numbers of her young ones. These bladders have all of them at first only one female Puceron; but afterwards they have more, as they become larger; and the largest of all are usually found filled with a prodigious number of young ones. The newly risen bladders are always found close and firm in every part, the aperture, at which the female had entered, being usually neatly and closely stopped up. The question is, how this bladder was formed?

We very well know, that winged insects of several kinds prick holes in the leaves and branches of vegetables, and deposit their eggs in them; and that thence arise all the various species of galls, the eggs hatching within these tumors into worms or maggots, and these finally become winged insects like their parents.

Malpighi has given an excellent account of the several species of these galls; but he has not mentioned any of them being produced by a viviparous insect, for the bringing up her numerous family: he has not omitted the bladders on the leaves of trees among the numbers of galls, but he has had no true idea of their origin; nor could this, indeed, have been any way found out, but by the observation that the creatures contained within them were of the same nature and origin with those on the surface of the same or other leaves.

There seems no doubt, but that each of the female Pucerons, found in the bladders of these leaves, has been herself the occasion and the maker of that bladder in which she is found so close shut up.

The female thus finds herself in a secure place, and the elevation she makes in the leaf is scarce perceivable, only appearing as an oblong small species of gall. The mark of the aperture at which she made her way in, is always to be seen at some distance behind her, though usually very neatly closed up: thus the whole continues till the creature produces her young. But, then, the scene is quite altered; the young ones begin to suck as soon as produced, and as they usually seize upon the sides of the small gall, already formed for that purpose, this derives more juices than otherwise would flow into it; and it begins to elevate itself much higher, and forms a tubercle of the shape of a nut or pear.

Its growth in this case is intirely analogous to that of the common galls on the branches of trees, &c. and all the difference, in the shape of the several bladders, is owing to the manner of the young Pucerons sucking: for, if they suck much at its base, that enlarges and becomes the broadest part, as is the case in the conic and pointed ones; but, if they let this alone, and suck only the sides and upper part, they swell while this does not, and consequently this forms a sort of pedicle to the growing bladder. *Reaumur's Hist. Inf.*

PUFF-*ball*, the common English name for the fungus pulverulentus, or lycoperdon.

The dust contained within this body, which, when it is crushed, flies out in an inconceivable fine powder, in form of a cloud of smoak, when examined by the microscope, appears to be a multitude of regular figured, though extremely small bodies. These require the most powerful magnifiers to distinguish them, and are found to be little globules of an orange colour, and somewhat transparent; and so small, that the cube of the diameter of a hair would be equal to an hundred and twenty-five thousand of them. In other species of this mushroom, the globules are evidently seen to be so many Puff-balls, being of a darker colour, and having each a little stalk or tail: by means of these stalks they penetrate into the ground, when shed from the parent plant.

The dust of these mushrooms is very hurtful to the eyes, and we have had instances of persons being blinded for a long time by it, with violent pain, swelling, and inflammation; and this is probably owing to the sharpness of these almost inconceivably minute stalks or tails. *Baker's Microscope.*

PUFFIN, *puffinus*, in zoology, the name of a water-fowl, with its three fore-toes connected by a membrane; but its hinder ones loose, and with a sharp and crooked beak. It is a sea bird, but not generally known.

It is larger than the tame pigeon: its head, neck, and back, are black: its breast and belly white: its beak is two fingers breadth long, and its base covered by a naked membrane, and has on each side a furrow, running from thence to the end of it: its wings are very long, and its tail a hand's breadth long, and black: it is extremely common in the Isle of Man, but is so fat, that its flesh is accounted unwholesome, unless it is salted: it is also common in the islands of Scilly. They breed only in the Calf of Man, an uninhabited part of the first mentioned island, and each female only lays one egg.

They lay in rabbit holes, and, as soon as the young are hatched, they follow their parents all day to sea, returning only in the evening. The people take them early in the morning, about the time of their going out; and, that every man may remember how many he takes, he always cuts off one of the legs, and keeps it in his pocket; hence they vulgarly obtained an opinion, that Puffins have but one leg. *Ray's Ornithol.*

PUGNI'TIUS, in zoology, the name of the common stickleback, or barnsticle, called also from its spines aculeatus, and by some authors spinachea, turonilla, and centiscus.

PULE'GIUM, *pennyroyal*, in botany, a genus of plants, whose characters are:

The flowers, which are very small, are disposed in close thick whorles, and their upper lip is intire: in other respects, this herb resembles the mentha or mint.

Pennyroyal has many creeping fibrous roots; from which spring a great many smooth roundish stalks, hardly able to support themselves, but leaning on the ground, and sending out small fibres, by which it roots itself in the ground: it bears two small, round, but yet pointed leaves, at a joint: the flowers grow towards the upper part of the branches, coming forth just above the leaves, in thick close whorles; they are of a pale purple colour, small and galeated, set in small and somewhat downy calyces, in which grow four small seeds. The whole plant has a very strong smell, and an hot aromatic taste: it grows frequently upon moist commons, and in places where water has stood all winter, and flowers in July. But what we use in the shops is generally cultivated in gardens, where it grows tall and large: the whole herb is used.

It is hot and dry, of very subtile volatile parts, and is peculiarly appropriated to the female sex, being a good uterine, provoking the menses and lochia, expelling the birth and secundines. It likewise warms and comforts the bowels, and helps the cholic and jaundice, and is good against coughs and shortness of breath: the juice, or a strong decoction of the leaves, sweetened with sugar, has been accounted a specific against a whooping cough.

Officinal preparations are only the distilled water and oil. *Miller's Bot. Off.*

This plant, which is very bitter, acrid, and of a very penetrating smell, gives a deep tincture of red to the blue paper; so that it is probable, it contains a volatile, aromatic, and oily salt, loaded with acid; whereas, in the artificial, volatile, and oily salt, this acid is detained by the salt of tartar.

Thus this plant is aperitive, hysteric, and good for the diseases of the stomach and breast; since it evacuates those glutinous sordes, which fill part of the bronchia, and vesicles of the

the lungs; especially if it is boiled with honey and aloes; for then, as Dioscorides observes, it purges, and procures expectoration. Tragus very much commends the decoction of pennyroyal in white-wine, for the suppression of the menses, and fluor albus. The juice of this plant, according to the same author, clears the sight, and removes lippitude. Montanus prescribed the powder of pennyroyal mixed with equal quantities of vinegar, honey, and water, for the diseases of the eyes. The conserve of its flowers and leaves is good for the dropsy and jaundice. Ray affirms, from Mr. Boyle, that a spoonful of the juice of pennyroyal is a good remedy for the chin-cough of children. Chesneau prescribes a glass of its decoction for hoarseness, and advises to take it before going to bed.— For the method of propagating pennyroyal; see the article PENNYROYAL.

PU'LEX, *the flea.*— It is to Signior Redi that we owe the true history of the generation of this common and troublesome animal. The flea lays its eggs, and from each egg is hatched a small worm: this worm spins itself a bag of silk, in the same manner that the silk-worm does, and out of this bag it comes at last in the perfect form of a flea, as the other does in its winged state.

The flea deposits its eggs on the bodies of dogs, cats, and other animals, and on the cloaths of men, or the beds, and other places where they sleep. These eggs, being round and smooth, slip easily down till they come into some fold of the cloaths, or some other place, where they are hatched. In this place each egg produces a small white worm of a silvery appearance; these worms feed on the white scurfy matter which is found in great plenty on the skins of dogs and other animals; and they are also found among the folds of linen in drawers, and other places: they are a fortnight in arriving at the full bigness of the worm state, and will roll themselves close up into a ball, in the manner of the wood-louse, when touched. They, soon after this, spin themselves their web, in which they lie a fortnight, and then come out perfect fleas.

The flea, if examined a day or two before its full growth in the bag, is found to have all its parts and lineaments; but it is soft and white. After this it gradually becomes hard and coloured, is as strong and large as it ever is to be.

PULEX-*eaters*, a name given by naturalists to a sort of worms, frequently found on the leaves of trees, where they devour the animals called pulices arborei.

Of these there are several species, which owe their origin to the eggs of different creatures; for they are none of them in their ultimate state in this their time of feeding. According to the different animals whose eggs they are hatched from, these are of different form and structure; some are hexapodes, or endued with six feet; these belong to the beetle tribe, and finally change into beetles like the parent animal from whose eggs they sprung: others have no legs, and are produced from the eggs of flies of various kinds: and, finally, others are genuine caterpillars, though small; but these are the most rare of all.

The two general kinds are the hexapodes, or beetle-worms, and the apodes, or fly-worms. The fly which gives origin to the last of these, is a four-winged one, and takes care always to deposit her eggs in a place where there are plenty of the pulices, usually on the stalk or young branches of a tree in the midst of large families of them. The worm, as soon as hatched, finds itself in the midst of abundance of food, preying at pleasure on these animals, which are wholly defenceless. The stalk of the elder and wood-bine are frequently found covered over with these Pulices, and among them there may usually be found one or more of these destroyers feeding at will, sucking in the juices from their bodies, and then throwing away the dry skins. Besides the worms of this four-winged fly, there is one of a two-winged wasp-fly, very destructive of these animals. *Reaumur's Hist. Inf.*

PULEX *arboreus*, in natural history, the name given by Mr. Reaumur to a very large genus of small animals. They are a kind of half-winged creature; they have granulated antennæ, and some of them, in their most perfect state, have perfect wings.

PU'LMO *marinus, sea lungs*, in natural history.—This substance floats in the sea; is of a pellucid bluish colour, resembling, in some measure, that of crystal; and is so tender, that it can hardly be taken out of the sea intire. When recently triturated, and used by way of ointment, it cures gouts and chilblains. *Dioscor. Dale.*

PULMONA'RIA, *sage of Jerusalem*, in botany, a genus of plants, whose characters are:

The calyx is like a tube, pentagonal and quinquefid. The flower is monopetalous, cylindrical in its lower part, and shaped like a bason above, with its margin cut into five round segments. From the sides of the internal cylindrical part, which are neatly fimbriated, arise five stamina.

This is accounted a pectoral, balsamic plant, and good for coughs, consumptions, spitting of blood, and the like disorders of the lungs. It is, likewise, put into wound-drinks, and traumatic decoctions; being agglutinating, and good to heal wounds and ulcers, and old sores. *Miller's Bot. Off.*

PU'LVIS *e bolo compositus*, a powder prescribed in the late London Pharmacopœia, and intended to be used in the place of the confectio Fracastorii or diascordium. It being supposed that this medicine was by its author meant as an alexipharmic, and being now principally used as an astringent, it was thought necessary to make this separate medicine. This powder is composed of bole armenic, half a pound; cinnamon, four ounces; and tormentil-root and gum arabic, of each three ounces, made together to a powder. *Pemberton's London Dispensatory.*

PULVIS *bezoarticus*, the name given in the late London Dispensatory to the powder commonly called Gascoign's powder.

This is now ordered to be made only of crab's claws, one pound; prepared pearls and red coral, of each three ounces; and oriental bezoar, an ounce. The amber and hartshorn are left out of the composition, as improper or inefficacious ingredients; and the whole ordered to be kept also without the bezoar, and called by the name of Pulvis e chelis cancrorum compositus, the name the Gascoign's powder used to be known by. *Pemberton's Lond. Disp.*

PU'LVIS *e cerussa*, a medicine prescribed in the late London Pharmacopœia, in the place of the white troches of Rhases or Razi.

The late compositions of that medicine had been much more complex than the original receipt of the author, and the college have therefore retrenched the number of ingredients in them; and, as the medicine is always to be powdered for use, it is now ordered to kept in the form of powder.

It is thus prescribed there: take ceruss, five ounces; sarcocolla, an ounce; gum tragacanth, half an ounce; make the whole into a fine powder. *Pemberton's Lond. Disp.*

PULVIS *contrayervæ compositus*, the name given, in the late London Dispensatory, to the composition usually called lapis contrayervæ.

The preparation is also, there, made much less complex, by leaving out the less powerful absorbent powders, and using the compound powder of crab's claws in the place of all.

This is now ordered to be made only of the compound powder of crab's claws, a pound and an half; and contrayerva-root, five ounces. *Pemberton's Lond. Disp.*

PULVIS *e myrrha*, a form of medicine prescribed in the late London Dispensatory, to supply the place of the troches of myrrh.

The composition is the same, but for the omission of one or two of the ingredients, supposed not of the same virtues with the rest, or very disagreeable to the taste.

It is ordered to be made thus: take of dried leaves of rue, of dittany, of crete, of myrrh, each an ounce and a half; of assa fœtida, sagapenum, Russia castor, and opopanax, each an ounce; beat all together to a fine powder. *Pemberton's Lond. Pharm.*

PULVIS *e scammonio*, a name given, in the late London Dispensatory, to the purging powder commonly called the Earl of Warwick's powder.

It is, however, wholly altered here, the crystals of tartar and diaphoretic antimony being left out, and the medicine ordered to be made only of four ounces of scammony and three ounces of burnt hartshorn reduced together to a fine powder. *Pemberton's Lond. Disp.*

PULVIS *e succino, amber-powder*, a form of medicine prescribed, in the late London Pharmacopœia, to stand in the place of the troches of amber, or trochisci de carbone of former dispensatories.

The composition of the powder is this: take prepared amber and gum arabic, of each ten drachms; juice of hypocistis, balaustines, and Japan earth, of each five drachms; olibanum, half an ounce; strained opium, a drachm; mix all together into a fine powder. *Pemberton's Lond. Disp.*

PULVIS *fœcundans*, in natural history, a name given by late writers to that fine powder which is contained in capsules upon the stamina or threads in the flowers of plants, and is called by some English writers the male dust, and in general the farina of flowers.

Puteolanus PULVIS, in natural history, the name of a fossil substance, found in form of powder, and famous for its consolidating under water. The accounts of it seem, however, to be a little erroneous.

The substance itself is a pale greyish powder, composed of particles so extremely minute, as to escape the distinction even of the best glasses, and appear, when viewed by the microscope, only a loose, very fine, irregular powder. It has among it a few small spangles of talc, and, being shook up in a phial of water, leaves a whitish muddiness in it, which is very long in subsiding. If wetted with salt-water, it immediately dries into a firm solid mass, like stone. It does the same also in common water; but the mass is less firm.

The antients were all acquainted with this substance, and its properties. It is said, indeed, that, on running down into the water, it becomes a hard stone, while it remains under it; but this is probably a mistake, arising from this, that the powder was continually running down the hills into the sea, and lodging on their sides in large quantities in many places; when these masses came wet with the waves, in storms or high tides, and afterwards deserted by them, they naturally hardened into so many masses of a sort of stone; and these were probably what authors have seen and described, for they never,

never, probably, ſearched for theſe maſſes under water. The principal uſe of this powder, among the antients, was in mixing with their cements for buildings ſunk into the ſea. It is at preſent well known in France and Italy, as an ingredient in that ſort of plaiſter they call pozzolane.

The remarkable quality of its coaleſcing, on its being mixed with water, is probably owing to its having in its compoſition a quantity of a certain earth known in almoſt all ages and countries for coaleſcing into a kind of plaiſter without previous burning. The antients knew this earth by the name of gypſum tymphaicum; and we, by that of calx nativa. It is very common on the ſides of hills, in many parts of Italy. *Hill's Hiſt. of Foſſ.*

PU'NCTURE, (*Dict.*)—Among the number of the moſt ſimple wounds are reckoned thoſe which are made by Puncture, or ſtabbing on the external parts, and not penetrating to a very great depth. In theſe wounds, after the blood has been ſtopped at the firſt dreſſing, by the application of dry lint, the common digeſtive, or linimentum Arcæi, is to be ſpread upon a pledget and applied once every day; or, if the diſcharge is but ſmall, every other day, covering the dreſſings with a plaiſter and compreſs, and ſecuring the whole with a proper bandage. At each dreſſing, care muſt be taken to remove every thing that will give way readily; the pus or ſanies is to be gently wiped off with fine rags; and, unleſs a great diſcharge of matter make it neceſſary, too frequent dreſſings do rather harm than good. The firſt dreſſings that have been applied, eſpecially when there has been a flux of blood, ſhould by no means be removed forcibly, but be left till they will fall off of themſelves, which they will do after a ſuppuration is formed: and, by this caution, much pain, and, perhaps, a freſh hæmorrhage, are avoided.

When a Puncture, however, penetrates very deep, the cure is attended with many difficulties; eſpecially if it is made perpendicularly down, and has no depending orifice: for, in this caſe, the blood and matter are eaſily collected at the bottom, and protract the cure, and frequently form fiſtulæ. To prevent theſe conſequences, it will be proper to preſs the wound from the bottom upwards, to apply a compreſs towards the bottom of the wound externally, and to apply a bandage over all, which preſſes much tighter upon the lower than upon the upper parts. If all this precaution, however, prove of no effect, which, indeed, is too often the caſe, it is the moſt proper method to make a large opening at the bottom of the wound, before any fiſtulæ are formed there. In order to make this opening to the greater advantage, it will be proper to get a particular ſort of probe or needle, very blunt at top, and at the other end provided with a large eye, or hole, through which a linen rag may be paſſed. This probe is to be paſſed to the bottom of the wound, and the blunt end of it preſſed outwards toward the ſkin, till you can feel it with a finger: when you can feel it, cut down upon it, if you can ſafely, and make a large opening; ſpread the rag that you have run through the eye of the probe with ſome vulnerary balſam, and draw it through the wound after the manner of a ſeton, and leave it there, dreſſing up both the orifices with the ſame balſam, and covering the whole with compreſſes and the proper bandages. In every ſucceeding dreſſing, that part of the rag that is left out of the wound, is to be ſpread with freſh ointment, and the lower part drawn down till this takes place in the new wound. This method is to be continued till the wound is well cleanſed, the diſcharge greatly diminiſhed, and all in a readineſs to heal: the ſeton is then to be removed, and the wound healed as uſual. *Heiſter's Surg.*

PU'PIL (*Dict.*)—Pupil *contracted.* The diſtemper of the eye called by ſurgeons a contraction of the Pupil, is ſo total or cloſe a contraction of that part as will not let it tranſmit light enough to the bottom of the eye to enable the patient to ſee objects diſtinctly. Sometimes this diſorder is from infancy, and ſometimes it ariſes from an intenſe inflammation of the eye, or other cauſes.

The cure of this is extremely difficult; but Mr. Cheſelden has invented a method by which he has often proved very ſucceſsful in his attempts to relieve it. The method is this: the eye-lids being held open by a ſpeculum oculi, he takes a narrow ſingle-edged ſcalpel, or needle, almoſt like that uſed in couching for a cataract, and paſſing it through the ſclerotica, as in couching, he afterwards thruſts it forward through the uvea or iris, and in extracting it cuts through the iris.

If the diſorder is not accompanied with a cataract, it will be beſt to cut through the iris in the middle; otherwiſe, when there is a cataract, the inciſion ſhould be made a little higher in the uvea, that the cataract may not obſtruct the ingreſs of the rays of light. The cataracts that accompany this diſorder are uſually very ſmall, and ſometimes their adheſion to the iris is ſo firm, as to render it impracticable to couch or ſuppreſs them. *Heiſter's Surg.*

PU'PPETS, in natural hiſtory, the name given by Swammerdam to the nymphæ of animals, which he diſtinguiſhes from the chryſaliſes, by this ſimple name, calling theſe the gilt Puppets, from their golden colour.

PUR *autre vie*, in our law-books, is uſed where lands are held for the life of another.

PU'RCHASE-*book*, among traders, is the name given to a book which is a kind of journal, containing an account of all the purchaſes made, or things bought in the day.

PURCHASE, in the ſea-language, is the ſame as draw in: thus when they ſay, the capſtan Purchaſes apace, they only mean it draws in the cable apace; alſo, when they cannot draw or hale in any thing with the tackle, they ſay, the tackle will not Purchaſe.

PU'RGATIVE (*Dict.*)— Dr. Cheyne accounts for the action of Purgatives in the following manner: — A Purgative medicine being received into the ſtomach by the mouth, its particles do there vellicate or ſtimulate the fibres of the ſtomach, and thereby increaſe the digeſtive faculty, i. e. bring the muſcular fibres of the ſtomach and the muſcles of the abdomen and diaphragma into more frequent contractions than ordinary, till the medicine is admitted into the inteſtines; the fibres and glands whereof being more ſenſible than thoſe of the ſtomach, (whoſe parts, by the frequent rough contacts of one againſt another, and of the groſs bodies often thrown into it, are, as it were, deadened) it eaſily moves and brings them into frequent forcible contractions, whereby theſe glands are ſqueeſed, and ſo emit a fluid matter, which lubricates the paſſages, and which mixing with the feculent matter of the inteſtines, (which is rendered fluid by the ſame active and ſtimulating quality of the purgative medicine) renders it more fluid; by which, and by the uncommon contractions of the inteſtines, it paſſes more eaſily and plentifully into the inteſtinum rectum, and is thence ejected by ſtool.

Thus do gentle purges act, and only cleanſe the inteſtines, few of their particles entering in by the lacteal veins ſo as to affect the blood.—But in violent Purgatives the ſtimulating particles are mixed with the blood, and produce there, many times, very great effects, by occaſioning unnatural fermentations, by ſeparating the natural coheſions of the fluids of the body; and do alſo, by vellicating the ſpiral fibres of the veins and arteries, bringing thoſe into more forcible contractions, and thereby accelerate the motion of the blood:—all which may have ſometimes a good, ſometimes a bad effect.

As to the effects of Purgatives on animal bodies, Dr. Quincy adds, that every irritation of the inteſtines either quickens the periſtaltic motion in its natural direction, or occaſions ſome little inverſions of it.—Now, in both caſes, any matters that but ſlightly adhere to the coats, or inner membranes, will be looſened, and ſhook off, and carried forwards with the other contents; and they will alſo be more agitated, and thus rendered more fluid.

Hence is manifeſt how a purging medicine haſtens and increaſes the diſcharges by ſtool; but the ſame manner of operation alſo carries its effects much farther, in proportion to the force of the ſtimulus: for, where it is great, all the appendices of the bowels, and even all the viſcera in the abdomen, will, by a conſent of parts, be pulled or twitched ſo as to affect their reſpective juices in the ſame manner as the inteſtines themſelves do their contents.—The conſequence of which muſt be, that a great deal will be drained back into the inteſtines, and made a part of what they diſcharge.—And when we conſider the vaſt number of glands in the inteſtines, with the outlets of thoſe viſcera opening thereunto, and particularly of the liver and pancreas, it will be no wonder, that vaſt quantities, eſpecially in full conſtitutions, may be carried off by one purge.

As to thoſe Purgatives diſtinguiſhed by the names of cholagogues, hydragogues, phlegmagogues, on a ſuſpicion of an elective quality therein, they may be accounted for upon more intelligible principles:—for, when the diſcharges by ſtool diſcover an over-proportion of any particular humours, it is to be ſuppoſed there was a redundance of ſuch an humour, whoſe diſcharge any irritation would have occaſioned. Thus, in proportion to the proximity of ſome humours in the inteſtinal tube, and the diſpoſition of the paſſages to convey them that way, do they require greater or leſſer vibrations or ſhakes of the fibres to fetch them out.

For this reaſon, the briſker cathartics, which vellicate the membranes, moſt of all, pump out, as it were, from all the meſenteric glands, and neighbouring parts, their contents, which, becauſe they abound ſo much with lymphatics, and viſcid watery humours, make the diſcharges thin and watery. Thoſe which act in a ſomewhat lower degree, yet irritate enough to deterge and draw out a great deal of mucous and viſcid matter, which ſometimes, by lodgment and want of due motion, changing into various colours, occaſions the different names of phlegm or choler: as the former therefore paſs for hydragogues, ſo do the latter for purgers of phlegm and choler. But there is another principle beſides that of a ſtimulus, whereby a purging medicine is enabled to anſwer its intentions, viz. by fuſing the humours, and rendering them more fluid than before, whereby they are better fitted to paſs off by their proper emunctories.—Thoſe which conſiſt of very ſubtile and active parts are not ſo ſenſible in the larger paſſages, becauſe of the great quantities of matter, which lay too great a load upon them, and make them unheeded; but, when they are got into the blood in any conſiderable number, they divide and fuſe thoſe coheſions which obſtruct or move heavily

vily along the capillaries, and scour the glands; insomuch that every pulsation throws something through the intestinal glands, which goes away by stool, that the refluent blood had washed away and brought back from all parts of the body.

Of this kind are all those cathartics, which are said to purge the joints, and are prescribed in rheumatisms, and arthritic pains, as the radix turpethi, and all the aloetics.—And this is the reason why purging medicines of this sort are so easily changed into the most efficacious alteratives; for an alterative is a cathartic in a lower degree, or of a more remiss operation. Whatsoever brings such particles to a secretory orifice, which is fitted for its passage, oftener, either by accelerating the blood's motion, or breaking it into more particles of that particular size and disposition, will increase the secretion. According, therefore, to the difference of the parts where such secretions are inlarged, as the glands of the intestines, kidneys, or skin, are the medicines, which are the instruments therein, called cathartics, diuretics, or diaphoretics.

In order to explain more fully the operation of Purgatives, it may be convenient to attend to the common way of making a purge operate, more or less, than it otherwise would do.

Substances, then, which are gross and heavy, as those consisting chiefly of saline and earthy particles; such as tartar, manna, and the like; when reduced smaller by triture, or repeated solutions, operate more gently; but when acuated by acids, or any way made to expose their angles more plentifully to the membranes, they become rougher, and sooner take effect.

Resinous medicines, as scammony, gamboge, jalap, and most vegetable productions, are more violent, and operate sooner, when they are more tenacious and adhesive, as in their extracts; but gentler, when divided by hard brittle substances, such as salt of tartar, sugar, &c.

Medicines, which have in their composition sulphur and salt, are more or less rough and speedy in their operation, in proportion to their greater or lesser participation of the saline ingredient, and the asperity of its angles.—Of this kind are most minerals, and their preparations: it may be sufficient to instance in the management of antimony and mercury; the first of these is by chymical analysis known to be a composition of a subtile sulphur and salt; and the more the saline part is set loose by preparation, and opening the sulphur, as it is commonly termed, the speedier, and with the greater vehemence, will it operate; whereas, in its more imperfect preparations, when the salts are closely wrapped up in their native sulphur, it will hardly work at all, till it reaches the farthest stages of circulation.

Mercury per se is little known as a medicine; and its first preparation, which makes it into a sublimate, so loads it with saline spiculæ, that it amounts even to a poison; but the more those spiculæ are broken by triture, sublimation, &c. the milder doth it operate, and, if to the comminution of its points be added a sulphur subtile enough to join it, it may be reduced to so mild a medicine, as not to be felt but in the last stage of operation.

This short view may be sufficient to shew, 1. That it is the too great asperity and motion in a medicine, that will not suffer it to pass the stomach, without irritating it into such convulsions, as will throw it up again by vomit.

2. That a farther comminution, and smoothing its figure, will gain it admittance into the bowels, and cause it to operate, as a proper Purgative, by stool.

3. That a yet farther remission of these properties will convey it into the blood, and allow it there to promote evacuation by urine.

And, lastly, that a still farther comminution will pass it into the minutest canals, where, by the same properties, only in a lower degree, it will cause sweat, or increase perspiration.

Hence it appears, that the more subtle medicines operate in the capillaries, and smallest fibres, by the same mechanism that the more gross ones do in the common stream of the blood, when they go off by urine; or as the grossest of all do in the greater passages, when they promote evacuation by stool.

Hence it is evident, that the skill of preparing and administring of medicines consists in proportioning their manifest and known properties to the capacity and circumstances of the part they are to operate in; and to intend or remit their mechanical affections, as they are sooner or later to take place in the greater or smaller vessels.

Of the first class there are few can be reduced small enough to go beyond the larger passages, and none of them are worth the pains they require, to fit them farther than for diuretics: besides, their natural disposition to attract, and join with the serous part of the blood, whenever they get into that stage of motion, runs them off by the kidneys, before they can undergo comminution enough to get farther: but if by frequent repetitions of such medicines, and an uncommon laxity of the passages, any parts are passed into the habit, their grossness fouls the delicate strainers, which are destined for their expulsion; and they lodge upon the glands and capillaries in such manner, as to induce intermittents; which are observable in many persons, after a long use of cream of tartar, the common cathartic salts, and the purging waters, especially at the latter end of the summer, when the heat of the preceding season has debilitated the solids, and left them under too great a relaxation.

Among the resinous purges, there are many very powerful ones; but where their operation is desired in the viscera, blood, and remoter parts, they must be extremely divided; and this we find spirituous menstruums will do, by taking up the most subtile parts only, and carrying them into the very small passages, where they operate chiefly by fusion; because the softness of such substances cannot enable them, hardly in any degree, to act as stimuli, farther, at least, than ordinary detergents. And thus we find that aloe, the chief of this tribe, goes farthest into the habit, and continues longest before it operates, when managed with a spirituous menstruum, as in the tinctura sacra. The rad. turpethi, and colocynth likewise, with all of the vegetable kind, that will yield to a spirituous liquor, may, by that means, be carried into the farthest scenes of animal action; where they will prove efficacious medicines in cases, which, with other management, they would never be able to reach: and on this account it must undoubtedly have been, that we frequently meet, in practical writers, with many materials of this sort mentioned as alterants; the colocynth particularly by Helmont: for all medicines, which operate in the farthest passages, they commonly include under that general appellation.

But the most efficacious purges, and those which require the most skill, are procured from the mineral kingdom; these abound in solidity beyond any other materials, and therefore, where-ever they are brought into action, necessarily excel in the quantity of impulse; many of these therefore want not only the utmost comminution to carry them into the farther scenes of operation, but also some restraint of their asperities and motions, to fit them for many intentions.—Thus sublimate is not only to be much sweetened, that is, smoothed in its points, to make it a safe purge in the larger vessels; but if it be intended to go farther than the blood, and those glands, which in that circuit it is most apt to be lodged upon when it salivates, it must not only be rendered very fine, but also be covered with such substances as weaken its points, and make it pass into the last subdivisions of the constitution. To this purpose, the common practice wisely contrives in distempers, which, according to the course of circulation, lie most remote, to wrap up the basis of this medicine in sulphurs, and suchlike substances, as follow it into its last division, without giving it any asperities to make it act as a stimulus. Thus, for all cutaneous foulnesses, and habitual taints, the cinnabar, the æthiops, and all of that sortment, are in readiness; and that ordinary sulphurs will cover and deaden the efficacies of mercurial preparations, so that they shall not operate, but in such parts only, and in certain circumstances, is demonstrable in ordinary salivations, which are to be lowered by sulphureous medicines.

Medicines from such minerals where a salt and sulphur are united by nature, as they are in some mercurials by art, as antimony, the native cinnabar, steel, &c. are manageable only upon the same principles; and, the more they are designed to be carried into the habit, the more are they to be restrained by their natural or adventitious sulphurs: steel, when opened by, and joined with, the points of acid liquors, operates the sooner, and will sometimes prove even emetic; but, when it is covered with an additional sulphur, it will go farther, and answer intentions much more remote; as is manifest in the common preparations of steel with tartar or vinegar, and with sulphur.

This way of reasoning on these occasions seems the more just, from considering the texture of those substances, which by a natural preparation are fitted for operation in the minutest part of an animal body; such as those of the aromatic kind, all which, more or less, according to their greater or lesser degree of subtility and smoothness, promote a diaphoresis: for these consist of exquisitely fine salts, covered with a most subtile sulphur, as is demonstrable by chymical analysis; and the common sal volatile oleosum is an admirable contrivance upon the same foundation, where a very volatile animal salt is covered with a most exalted vegetable oil; whereby it is fitted to pass into the minutest fibres, and make, as it were, a part of the animal spirits themselves.

And here it may not be amiss to observe, that all animal salts are very volatile, or easily rendered so; but when bare and naked, just as the fire draws them out, with a mixture also of its own particles in their composition, they are too pungent to be felt without painful sensations; and when softened with a fine portion of somewhat of an opposite texture, which is smooth and yielding, they become most efficacious and safe sudorifics.

On these considerations it likewise ceases to be a wonder, why the subtile salts of cantharides are more sensibly injurious to the bladder than any other parts, and why camphire prevents those injuries; for the exquisite smallness of those spiculæ makes them imperceptible but in the most minute canals, into which the fibres composing the membranes of the bladder are known to be divided; and camphire blunts their irritations, because its extreme subtility enables it to follow them into those meanders, and sheathe their asperities.

To

To this purpoſe is very remarkable what many now commonly practiſe in guarding even mercurials againſt their ſtimulating properties, and ſending them into the fineſt paſſages to operate by fuſion, and the bare force of impulſe: for not only calomel and the mercurius dulcis may be reſtrained from manifeſt operation in the wider paſſages, and the glands about the mouth; but even the mineral turbith, which of itſelf, in a ſmall doſe, will operate powerfully by vomit and ſtool, will not, when mixed with camphor, be ſo much felt in thoſe reſpects, but go into the fartheſt circuit of motion, and promote the cutaneous diſcharge in a more efficacious manner, than any medicine of leſs ſpecific gravity.—In this management, the camphor is to be mixed but a very little while before taking, otherwiſe it has not the effect; which appears to proceed from its great volatility, which makes it in a great meaſure exhale while it ſtands mixed in a medicine.

PURIFICA'TION, in matters of religion, denotes an offering made the prieſts by women riſing out of child-bed, before they be re-admitted into the church.

By the law of Moſes, a woman, after bringing forth a male child, was unclean forty days; after a female, eight days; during which time ſhe was not to touch any thing holy, nor to go near the temple; but to continue within doors, ſeparate from all company and commerce of others.

This term expired, ſhe was to preſent herſelf at the temple, and at the door of the tabernacle to offer a lamb, as a holocauſt, and a pigeon or a turtle, which the prieſt taking, offered to God, and prayed for her, that ſhe might be purified.

This ceremony, which conſiſted of two things, a holocauſt, and a ſacriſice of expiation, was called טהר טהרה purificatio, purgatio.

The holy virgin, though, according to the fathers, exempt from the terms of the law, yet complied therewith; and at the time preſcribed went to the temple, and accompliſhed the law: in commemoration whereof, the church yearly ſolemniſes the feaſt of the Purification of the virgin, on the ſecond of February; called alſo the feaſt of Candlemas.

The feaſt of the PURIFICATION ſeems to be very ancient. It is ordinarily ſaid to have been inſtituted in the time of Juſtinian, in the year 542; and this, on occaſion of a mortality which that year diſpeopled almoſt the whole city of Conſtantinople. Yet there are ſome who imagine it to have been obſerved before, though in another manner, and on a different day, from that fixed by Juſtinian, viz. between the circumciſion and epiphany.—The ſame day is the preſentation of our Saviour in the temple.

PU'RPLE, *purpura* (*Dict.*)—In natural hiſtory, the name of a genus of ſhell-fiſh, the characters of which are theſe: it is a univalve ſhell, jagged and beſet from head to tail with ſpines, tubercles, umbo's, or ſtriæ. The mouth is ſmall and roundiſh: the tail is ſhort, and uſually the baſe runs out into a long beak.

It has been uſual with moſt authors to confound together the genera of the murex and Purpura, and to uſe the words as ſynonymous: but, though there is ſome external reſemblance between many of the ſhells of the two genera, yet they are eaſily diſtinguiſhed by this, and the mouth of the Purpura is leſs long, and is leſs dentated and alated than that of the murex. The body and the head of the ſhells of this genus are not ſo elevated as thoſe of the murex kind, and are not covered with points or buttons at the mouth. If a ſhell is therefore found to have a ſmall, ſmooth, and round mouth, and a body covered with undulated leaves, as it were, like thoſe of ſavory or endive, and ſometimes with long points, and its tail, whether long or ſhort, be hollowed and ſomewhat bent, this may be called a Purpura and not a murex.

The antients diſtinguiſhed three kinds of Purpura, one which had a long and crooked tail, made hollow like a tube or pipe; a ſecond which had either no tail at all, or at the moſt a very ſhort one; and a third which had no ſpiral head, or, as we ſhould expreſs it, no clavicle.

On examining the whole family of the Purpuræ, we may diſtinguiſh four remarkable ſpecific differences among them. The firſt of theſe comprehends thoſe Purpuræ which have the body of the ſhell garniſhed with a ſort of undulated foliage in clouded ridges, and have a ſhort and crooked tail. The ſecond comprehends thoſe which have the body of the ſhell covered with acute points, and have a long tail. The third comprehends thoſe which have as long a tail as the former, but have a ſmooth body, or at the utmoſt have only a few ſlight protuberances and wrinkles on it. And the fourth takes in thoſe which are ſmall, and have an elevated clavicle, a ſhort crooked tail, and the body of which is covered either with ſlender ſpines or hairs. See *Plate* XL. *fig.* 1.

This ſpecies of fiſh, as well as the murex, ſerved among the antients to dye the fine purple colour they were ſo fond of, and ſome of the buccina have been of late found to have the ſame juice. The Purpura and murex are both fiſhed up in great plenty in the gulph of Tarentum; but the ſmall quantity of the coloured juice which each fiſh contains, and the neceſſity of uſing it before the animal dies, makes it impoſſible to bring it to any regular article of traffic. The antients uſed this colour only on cotton and woollen ſtuffs, whereas our cochineal, which was unknown to the antients, ſtrikes equally well on ſilks and ſtuffs.

The Purpura lives on other fiſh. It uſually hides itſelf at a ſmall depth in the ſand, ſometimes even in freſh-water rivers, and as it lies hid, it thruſts up a pointed tongue, which wounds and kills any thing that comes over it. We frequently find ſea-ſhells with round holes bored through them, as regularly as if made with a boring inſtrument: theſe are generally allowed to be made by the tongue of the Purpura, in order to its feeling on the fiſh within.

The Purpura has two horns like that of a ſnail; and Fabius Columna ſays, that they have eyes in theſe, not placed at the ends, as in the ſnail, but in the middle of each horn.

The purple-fiſh is very well known, and has been known alſo in almoſt all times to afford a purple liquor; but, as there has been no method diſcovered of bringing this liquor into uſe in dying, the fiſh has been neglected, and its fluid never attempted to be brought into uſe.

The juice which gives this beautiful purple colour is, while it remains in the body of the animal, and while that is in health, wholly white; but no ſooner is it expoſed to the ſun, than it begins to change colour, and in leſs than five minutes goes through the ſeveral changes of pale green, yellowiſh, and a beautiful emerald green: after this, it becomes of a deeper and duſkier green, then bluiſh, reddiſh, and finally a deep and very beautiful purple. Sometimes the juice is found naturally green in the animal; this is probably from the creature's being in a diſeaſed ſtate: but, when it is naturally thus, it immediately becomes red, and afterwards purple, on being expoſed to the ſun, its ſeveral preceding changes ſeeming to have been made already in the body of the animal.

If a piece of linen be rubbed over with this juice, and part of it expoſed to the ſun, part not, that only will turn red which is ſo expoſed, the other remaining green without any alteration; and it is obſerved, that the ſtronger the ſun ſhines, the quicker the change appears, and probably the colour is in proportion alſo the more beautiful and lively. And it is very remarkable, that if a needle, or any other opake body, be laid upon the linen which is yet green, and is to become red on being expoſed to the ſun; after ſuch an expoſure the whole ſhall be changed red or purple, excepting only that ſmall ſpot which is covered by the needle, which will ſtill remain green.

A plate of glaſs, though it be three inches thick, will not prevent the colour from changing purple by being laid over it; but the thinneſt piece of metal will keep it wholly green. The one being opake, and the other pellucid, are evidently the only reaſons for this difference.

If the coloured linen be ſucceſſively covered by three pieces of paper, the one blacked with ink, the other in its natural ſtate, and the third rubbed over with oil, it will change colour on being expoſed to the ſun in different degrees; and that exactly in proportion to the degree of tranſparence in each of the papers: moſt of all in that which was covered with the oiled paper, ſomething leſs than that covered by the paper in its natural ſtate, and leaſt of all in that which was covered with the blacked paper, as that is leaſt tranſparent.

The common heat of a fire, or that of a red-hot iron, produce no change at all in the colour when green. The vapour of burning ſulphur produces a little; but the green which had not changed to purple by theſe experiments, immediately changed to it on being expoſed to the rays of the ſun.

Theſe experiments were all made in the months of January and February, by Mr. Du Hamel, in Provence; and, the ſun having power to change the colour ſo ſpeedily there in theſe cold months, probably in a warmer climate or ſeaſon the air would have been ſufficient for the purpoſe, without the open ſun; ſince it ſeems, from experiment, that both the ſolar rays, and the light alone in a cloudy day, can act upon this colour. The light and heat of the ſun both act on this colour: light is always ſufficient to produce the effect; but the heat may eaſily be too great, or too little, and, to do the whole in perfection, it muſt be at a certain middle degree.

This beautiful purple, if it can ever be brought into uſe in dying, will have one very great advantage from its viſcoſity. The pieces of cloth that had been ſtained by it retained their colour, in ſpite of ſeveral boilings in different liquors, which Mr. Du Hamel made them paſs through; and the colour, on examination, was found not to be ſuperficial, but penetrated the whole body of the ſtuff which was tinged by it. There are many inconveniencies which muſt naturally attend the uſe of this ſubſtance as a dye, but they may, perhaps, all be got over by care and application. It is very certain, that it is of too viſcid a nature eaſily to penetrate many ſubſtances; but it is alſo certain, that this might be obviated by diſſolving it in ſome proper liquor. It appears very plainly, that the ancients had a method of thus diſſolving their purple; but we neither know what was their purple, nor what was its diſſolvent; nor, which would be of much more conſequence to us at preſent, what is the proper diſſolvent for our own. *Mem. Acad. Scien. Par.* 1736.

PU'RPURA. See PURPLE.

PUS (*Dict.*) — A very ſmall portion of Pus, abſorbed into the blood-veſſels, raiſes a putrid fever as certainly as yeſt does a fermentation in wort. This fever is not owing to its ſtimulating the ſolids to quicker and greater vibrations, but to its increasing the inteſtine motion and accelerating the animal proceſs, haſtening the change of the juices to that ſubtile acrid ſtate which renders them unfit to be retained in the body, and diſpoſes them to run off in colliquative evacuations, ſuch as ſweating and purging, which conſtantly attend theſe putrid or hectic fevers, or riſing to internal ulcers. *Med. Eſſ. Edinb.*

When Pus is laudable and mild, it is one of the moſt powerful digeſters, ſuppurants, and incarners; when it ſtagnates too long, or when the liquors and veſſels are faulty, it may become an acrid, ſtimulating, eroding ſanies; when abſorbed into the blood, it affects all the liquors, ſtimulates the veſſels, and is capable of producing violent diſorders.

PU'SHERS, a name given by thoſe who breed ſinging birds to Canary birds when new flown.

PUSILLA'TUM, a word uſed by ſome medical writers to expreſs a coarſe powder, or any medicinal ſubſtance, beat into ſmall pieces for infuſion, or the like purpoſes.

PU'SU, in botany, the name of a famous plant, growing in China, and greatly eſteemed there. This and the ginſeng theſe people a long time kept to themſelves; but at length it was diſcovered, that the one was eſteemed a certain prolonger of life, and the other a preſervative againſt all diſeaſes.

They, in their manner of ſpeaking, ſay, that the Puſu gives immortality: we have not been ſo happy to obtain any of this famous plant for the trial, but the ginſeng having been brought over, and found not to poſſeſs thoſe great virtues they aſcribe to it, and the people in China, who are poſſeſſed of the Puſu, dying, as well as thoſe who have it not, we find, that the virtues of both are ſo greatly exaggerated by the eaſtern dialect that there is not much to be expected from them. *Reid's Experiments.*

PUTO'RIUS, in zoology, the name by which authors call the pole-cat; a creature of the weaſel kind, but larger than the common weaſel, and of a blackiſh colour; and remarkable for its ſtinking ſmell.

The whole circumference of the face is white; at the extremity of the angles of the mouth there begins a broad line of a yellowiſh hue, which ſurrounds the head, and is white in ſeveral parts. Its long hairs are black, its ſhort ones yellowiſh; and the throat, the feet, and the tail, are blacker than any other part of the body. The upper jaws ſtand out a little beyond the lower. The ears are broad and ſhort, and are fringed, as it were, with white. Its ſtink is occaſioned by an extremely fœtid matter, ſecreted by two glands, which it has in common with all the creatures of this kind, within the anus. It feeds on fleſh, conſequently ſtealing hens and other poultry, and ſometimes contenting itſelf with their eggs. *Ray's Syn. Quad.*

PUTREFA'CTION (*Dict.*)—In Putrefaction, there is a great inteſtine motion; when carried to a height, and, when the putrefying ſubſtance is much compreſſed, it is accompanied with heat and ſmoke, and ſometimes flame. Air is neceſſary to it, and the viſible texture of the putrefying maſs is changed. Putrefaction is the moſt ſubtle of diſſolvents. It effectually diſjoins and ſeparates all the component parts of putrifying bodies, except the ſea-ſalt. In this powerful ſolution, the inteſtine action of the minute particles of bodies creates, collects, or is by ſome way or other the cauſe and means of heat.

The fluids of the human body are much diſpoſed to Putrefaction, and out of the body become highly putrid, even in cool air, and without any ſtirring or agitation; and our blood and ſome of our juices, out of the circulation, but within the body, change to putrid matter.

The changes, wrought in bodies by Putrefaction, are no where more remarkable than in the Putrefaction of vegetable ſubſtances, which by means of this change are brought nearly into the condition and nature of animal ſubſtances.

To prove this by an eaſy experiment, take a large quantity of cabbage-leaves, and preſs them hard down with weights in an open tub, with holes bored in its ſide; ſet them in a warm place, and the leaves will ſoon conceive a heat in the middle, and at length the whole, or nearly the whole, will be converted into a ſoft pappy ſubſtance. This ſubſtance, diſtilled in a glaſs retort, yields the ſame kind of volatile ſalt and oil as animal ſubſtances do: neither is it particular to this plant, but all equally do this; the acid and the alcaline, the ſweet and the bitter, the aſtringent and emollient. Hence, we may learn, how it is that nature, in our bodies, converts vegetable into animal ſubſtances; and it is very remarkable, that not a grain of fixed ſalt can be procured from this putrefied maſs. *Shaw's Lect.*

It is an obſervation of lord Bacon, that an enquiry into the means of preventing or ſtaying Putrefaction is of excellent uſe in phyſic. Dr. Pringle has made a great many curious experiments and remarks on this ſubject, which are publiſhed by way of appendix to his Obſervations on the Diſeaſes of the Army.

Putrefaction is one of the inſtruments of nature, by which many great changes are brought about. With regard to medicine, we know that neither animal nor vegetable ſubſtances can become aliment, without undergoing ſome degree of Putrefaction. The criſis of fevers ſeems to depend upon it; and even animal heat, according to Dr. Stevenſon, does the ſame.

Now, that the concoction of the humours is nothing elſe but Putrefaction, ſeems probable from hence, that, whenever they are in that ſtate, they are always more fluid, and fitter to paſs through the ſmaller veſſels, where they ſtagnated before. Again, the offenſiveneſs of the ſweats, or other excretions conſequent on a criſis, is likewiſe a ſure ſign of a high degree of corruption. The time of reſolution or Putrefaction depends on the degree of the habit of the patient, and on the part obſtructed. Reſolution is the Putrefaction of the impacted humour only, but ſuppuration implies a corruption of the veſſels alſo. This manner of ſpeaking, indeed, has been diſuſed, from the prejudice that nothing was putrid but what was offenſively ſo; whereas, in fact, every fibre becoming more tender, and humour thinner, may be conſidered as putrid in ſome degree, whether the change tends to the better health, or to the deſtruction of the perſon, or whether it becomes grateful or offenſive to the ſenſes. *Pringle, Obſerv. on Diſeaſ. of the Army.*

Mr. Boyle has uſed the words fermentation and Putrefaction of the blood promiſcuouſly, in his treatiſe on the human blood. Stahl, and other celebrated chemiſts, likewiſe uſe the terms putrid ferment.

Putrefaction is always found to generate air. Hence, though fleſh, as well as blood, be ſpecially heavier than water, yet dead bodies are found to float, after lying ſome time at the bottom, from air generated in the bowels by Putrefaction. Now, as it has been found by experiments, that the blood and other animal ſubſtances begin to emit air, before they are ſo far corrupted, as the ſame frequently are in putrid diſeaſes, it is probable that ſeveral of the ſymptoms in deep ſurfeits may be owing to the action of the confined air.

As all the humours of the animal bodies become thinner by Putrefaction, ſo the ſolid or fibrous parts are thereby relaxed, or rendered more tender. And hence the extraordinary bulk of the heart, liver, and ſpleen, incident to perſons labouring under putrid diſeaſes, may be accounted for. It is remarkable, that in diſſections of people who die of the plague, the heart is always found of an uncommon bigneſs; and, as to the ſcurvy, the liver and ſpleen are ſometimes inlarged to ſuch a degree that the tumor may be ſeen outwardly. *Id. ibid.*

It being a received opinion, that bodies become highly alkaline by Putrefaction, the doctor made the following experiments, in order to diſcover how far this might be true.

The ſerum of human blood putrefied, made, with a ſolution of ſublimate, firſt, a turbid mixture, and afterwards a precipitation; which is indeed one of the teſts of an alkali, but not to be admitted here, ſince the ſame thing was done with the recent urine of a perſon in perfect health, which is never accounted alkaline. The ſame ſerum did not tinge the ſyrup of violets green, and made no efferveſcence when the ſpirit of vitriol was poured upon it. The experiment was twice made upon portions of different ſerums, both highly putrid; and once on water, in which corrupted fleſh had been ſome time infuſed; and the moſt that could be found was, that, a reddiſh caſt having been previouſly given to the ſyrup with an acid, this colour was rendered fainter, but not deſtroyed by the putrid humours. And, as to efferveſcence, the ſpirit of vitriol being dropped into thoſe liquors unmixed, and alſo diluted with water, the mixture was quiet, and only a few air-bubbles appeared on ſhaking the glaſſes.

Upon the whole, though there were ſome marks of a latent alkali in the putrid ſerum, they were ſo very faint, that a quantity of water, equal to that of the putrid liquors, mixed with only one drop of ſpirit of hartſhorn, being put to the ſame trial, ſhewed more of an alkaline nature, than any of the other.

It has alſo been a maxim, that all animal ſubſtances, after Putrefaction, being diſtilled, ſend forth a great quantity of volatile ſalt in the firſt water; but Mr. Boyle found, that this held good only in urine; and that, in the diſtillation of the ſerum of human blood putrefied, the liquor which came over firſt had little ſtrength, either as to its ſmell or taſte, and did not at firſt efferveſce with an acid. And here it may be obſerved, that the chemiſts have generally applied theſe particles, which they diſcovered in urine, to all the humours indifferently; whereas, in fact, there is a great diverſity: for ſome animal ſubſtances, ſuch as urine, the bile, and the craſſamentum of the blood, ſoon putrefy; the ſerum, the ſaliva, and the white of an egg, ſlowly. Yet, thoſe that ſooneſt corrupt, do not always arrive at the higheſt degree of Putrefaction: thus, the bile is ſooneſt corrupted, but the rankneſs of it is not to be compared to that of fleſh; and the white of an egg is not only much leſs diſpoſed to putrefy than the yolk, but, when corrupted, yields a different and leſs offenſive ſmell.

Doctor Pringle farther obſerves, that it ſeems peculiar to ſtale urine to contain an alkaline ſalt, which, without diſtillation, makes a ſtrong efferveſcence with acids. Whereas moſt other animal humours putrefied, though of a moſt intolerable fetor, yet contain leſs volatile ſalt, leſs extricable, and then not efferveſcing with acids. But what makes the difference between ſtale urine and other putrid ſubſtances ſtill more ſpecific, is its inoffenſiveneſs with regard to health; whilſt the ſteams of moſt other corrupted bodies are often the cauſe of putrid and malignant diſeaſes. So far then from dreading the volatile alcali as the deleterious part of corrupted bodies, it ſhould rather ſeem to be a corrector of Putrefaction. *Pringle's Obſerv. on the Diſ. of the Army.*

But

But ſtill there remains a prejudice, as if theſe ſalts, being the produce of corruption, ſhould therefore haſten Putrefaction; and not only in diſtempers where they are unwarily taken, but alſo in experiments out of the body. As to the effects ariſing from the internal uſe of them, little can be ſaid, unleſs the kind of diſeaſe were preciſely ſtated: for ſuppoſing theſe ſalts were by nature diſpoſed to promote Putrefaction; yet, if that is already begun, from a languor of circulation, and obſtruction, then may the volatiles, by their ſtimulating and aperient qualities, be the means of ſtopping its progreſs; and, on the other hand, though they were really antiſeptic, yet, if the humours are diſpoſed to corrupt, from exceſs of heat or motion, theſe very ſalts, by adding to the cauſe, may augment the diſeaſe. So that, upon the whole, it ſeems to be the faireſt criterion of the true nature of theſe volatiles, to enquire whether they accelerate or retard Putrefaction out of the body?

In order to decide this queſtion, repeated experiments were made, by joining both the ſpirit and the ſalt of hartſhorn to various animal ſubſtances; and it was conſtantly found, that, ſo far from promoting Putrefaction, they evidently hindered it, even more powerfully than common ſea-ſalt. Hence, the doctor thinks it probable, that the ſame, taken by way of medicine, will likewiſe prove antiſeptic; or, at leaſt, that we cannot juſtly ſuppoſe them corrupters of the humours, more than fermented ſpirits or ſea-ſalt.

With regard to the Putrefaction of dead bodies, it is found that ſome parts corrupt much ſooner than others. Thus, as the abdominal viſcera and muſcles corrupt the ſooneſt, it is a rule with anatomiſts, to begin their diſſections and demonſtrations with thoſe parts, the quick Putrefaction of which may be aſcribed to the putrid ſteams of the fæces. Next to the abdominal viſcera and adjacent parts, the lungs are commonly ſooneſt tainted, either from the air ſtagnating in the veſiculæ bronchiales, or from ſome remains of perſpirable matter, that, by acting as a ferment, may haſten the Putrefaction. *Pringle's Obſerv. on Diſeaſes of the Army.*

It is obſervable, that the Putrefaction of meat, and other ſubſtances, advances quicker in a confined than free air; for, as the moſt putrid parts are alſo the moſt fugitive, they inceſſantly iſſue from a corruptible ſubſtance, and diſperſe with the wind; but, in a ſtagnation of air, they remain about the body, and, in the nature of a ferment, excite its corruption.

Putrefaction is one cauſe of bilious and intermitting fevers, the dyſentery, malignant or peſtilential fevers, the ſcurvy, lepra Arabum, &c.

PUTREFACTION *of water*. It is ſaid to be the peculiar quality of the Thames water, that it will ſtink, and yet be wholeſome; and, after this, will recover itſelf again. Many ſailors have been obliged to drink it ſtinking, ſo that they held their noſes while they poured it down their throats, yet no ſickneſs enſued from it. It generates a ſort of ſpirit alſo in this ſtinking ſtate, which will take fire at the approach of a lighted candle, as if ſpirit of wine were touched by the ſame.

PU'TTOCKS, or PUTTOCK-*ſhrouds*, in a ſhip, are ſmall ſhrouds which go from the ſhrouds of the main-maſt, fore-maſt, and mizen-maſt, to the top-maſt ſhrouds; and, if there be any top-gallant maſts, there are Puttocks to go from the top-maſt ſhrouds into theſe. Theſe Puttocks are at the bottom ſeized to a ſtaff, or to ſome rope which is ſeized to a plate of iron, or to a dead-man's eye, to which the lanniards of the fore-maſt ſhrouds do come.

PY'CNI, [illegible], in the ancient muſic, was uſed for ſuch ſounds or chords of a tetrachord as might enter the ſpiſſum, or [illegible].

PYGA'RGUS, in natural hiſtory, a ſpecies of eagle, called alſo by ſome authors albicilla and iliannularia.

It is a large and fierce bird, of the ſize of a common turkey. Its beak is yellow, and covered with a yellow membrane at its baſe. It has large hazel-coloured eyes. Its feet are yellow, and its claws extremely ſtrong and ſharp. The head is white, and there are no feathers, but ſome fine hairs between the eyes and noſtrils. The upper part of the neck is of a reddiſh brown, and the rump black; all the body beſides this is of an obſcure ruſt colour, and its wings are partly black, partly grey. Its tail is long, and the upper part of it is white, and the reſt black. It is from this white part that it has its name albicilla.

Authors who have written on this ſubject, ſeem not all agreed to call the ſame bird by this name. The Pygargus of Aldrovand ſeems different from this, and the Pygargus prior of Bellonius ſeems no other than the male of that kind of hawk called in Engliſh the hen-harrier. *Willughby's Ornithol.*

PY'KER, or *Pycar*, in our law books, a ſmall ſhip or herring-boat.

PY'RAMID (*Dict.*)—Under this article we have obſerved that every Pyramid is a third part of a priſm, which hath the ſame baſe and height.

That is, the ſolid content of the Pyramid A B D (*plate* XLIV. *fig.* 21, in the Dictionary) is one third part of its circumſcribing priſm A B E F.

For every Pyramid which has a ſquare baſe (ſuch as A *a* B in the figure) is conſtituted of an infinite ſeries of ſquares, whoſe ſides or roots are continually increaſing in arithmetical progreſſion, beginning at the vertex or point D, its baſe A *a* B being the greateſt term, and its perpendicular height C D is the number of all the terms; but, the laſt term multiplied into the number of terms, the product will be triple the ſum of all the ſeries.

From hence it will be eaſy to conceive, that every Pyramid is a third of its circumſcribing Priſm, that is, of a priſm of equal baſe and altitude, of what form ſoever its baſe is of, viz. whether it be ſquare, triangular, pentangular, &c.

You may very eaſily prove a triangular Pyramid to be a third part of a priſm of equal baſe and altitude, by cutting a triangular priſm of cork, and then cut that priſm into three Pyramids, by cutting it diagonally.

PYRE'THRUM, in the materia medica, a root of which the druggiſts ſell us indiſcriminately two kinds; the one the root of a corymbiferous plant, called by authors Pyrethrum flore bellidis, or the daiſy-flowered pellitory of Spain; the other, the Pyrethrum cumbelliferum, or umbelliferous pellitory: and it is a diſpute among the learned, which of the two is the genuine and proper kind; the deſcription left us of it by Dioſcorides, as it is differently written, ſerving as well to prove the one ſo as the other.

The roots of the daiſy-flowered pellitory are what we moſt frequently meet with. They are of three or four inches long, of the thickneſs of one's little finger, greyiſh and wrinkled without, and whitiſh within, and of an acid and burning taſte. Thoſe of the umbelliferous pellitory are of the ſame length, but ſomewhat thinner, of a browniſh grey without, and white within, and are furniſhed with a ſort of beard at top, ſomewhat like the roots of the meum. It is of an acrid taſte, and much reſembles the other in its virtues. They are both uſed in the tooth-ach, and preſcribed by ſome in diſeaſes of the head and nerves, and are found to be diuretic and violently ſudorific; but they are very ſeldom given.

PY'RGUS, among the Romans, a dice-box of the ſhape of a modius, open above, and having a great many ſhelves or partitions within; ſo that, when the dice were thrown into it out of the fritillum, they were thereby overturned many times before they could reach the bottom, in which there was an opening for them to fall through upon the table. *Pitiſc. in voc.*

PYRICU'BIUM, in natural hiſtory, the name of a genus of foſſil bodies, uſually comprehended, with many others of a very different figure and ſtructure, under the general name pyrites. See *plate* XL. *fig.* 2.

The diſtinguiſhing characters of the Pyricubia are theſe: they are compound, inflammable, metallic bodies, of a cubic figure, or reſembling a die, being compoſed of ſix ſides.

Of this genus there are only two known ſpecies: Firſt, the great Pyricubium, of a foliaceous ſtructure; and, ſecondly, the ſmaller ſolid Pyricubium.

The firſt of theſe is a very elegant foſſil, and is ſo regularly ſhaped, and ſo highly poliſhed by nature, that it has been often ſuppoſed to be wrought by art. It is but moderately hard, but is very heavy, and is of a foliaceous ſtructure. It is exactly of the figure of a die, being compoſed of ſix regular ſides, placed at right angles; but, though ever thus regular in ſhape, it is not at all ſo in ſize: the moſt common ſpecimens of it are about a third of an inch in diameter; but it is found much larger, even to three inches, and ſo ſmall as to the tenth of an inch. It is perfectly poliſhed and ſmooth on all its ſurfaces, and is of a very beautiful whitiſh green, with a faint admixture of yellow. It is found in the German and Hungarian mines, and in the Eaſt-Indies.

The ſecond ſort, or the ſmall ſolid Pyricubium, is a foſſil of much leſs beauty, though equally regular in its ſhape and appearance. It is very heavy, and extremely firm and hard, and is not of a foliaceous or flaky ſtructure, but of one regular and uniform maſs, and, when broken, appears very bright and gloſſy. It is ever found in the regular form of a cube, or regular ſolid body, made up of ſix flat ſides placed at right angles. Its uſual ſize is about the eighth of an inch diameter, but it is found ſmaller than a pin's head, and ſometimes ſo large as to be near an inch. It is perfectly ſmooth on all its ſurfaces, and is naturally of a pale yellowiſh green, and as bright on the outſide as within; but very often it is found in a ferrugineous or duſky ſurface, owing to a ſort of ruſting, which is an accident to which the ſeveral ſpecies of naturally bright pyritæ are moſt of them alſo ſubject.

It is very common in Germany and Italy, and in ſome parts of America, as alſo in our own country. With us it is commonly found immerſed in ſlate, ſuch as we cover houſes with; but, in Germany and other places, it is uſually found looſe among the earth of mountains. With us it is uſually of a bright ſurface, in Germany it is more frequently duſky. *Hill's Hiſt. of Foſſ.*

PYRI'PLACIS, in natural hiſtory, the name of a genus of pyritæ, the characters of which are theſe: they are compound, inflammable, metallic bodies, found in looſe detached maſſes of a ſimple and uniform, not ſtriated, internal ſtructure, and are covered with an inveſtient coat or cruſt.

PYRIPOLYGO'NIUM, in natural hiſtory, the name of a genus of foſſils, the characters of which are, that they are compound metallic bodies, of a regular figure, conſiſting of twelve plants.

There is only one known ſpecies of this genus, though ſubject to great varieties in its appearance; and this has been by authors hitherto confounded, with many other bodies of a very different

different nature and figure, under the general name pyrites. The Pyripolygonium, when perfect, is an extremely elegant and beautiful fossil; but this is a state it is very rarely found in. It is moderately firm, of a compact texture, and very heavy; though its natural figure be a regular body, composed of twelve planes, yet it is subject to great imperfections and irregularities. It often seemsto want one or more of its sides, and not unfrequently, from the accident of breaking of some of its angles, to have more than its number; and very often has a great many other smaller and less perfect bodies of its own kind, growing to its larger and less perfect specimens. It is found, from the twentieth part of an inch, to four inches in diameter; but its most common size is about a third of an inch. It is naturally of a polished and shining surface, and of a pale whitish yellow; but sometimes it is brownish, or of an iron colour.

PYRITES (*Dict.*) — The principal contents of Pyritæ may be in general guessed at from their colour. The white Pyrites usually contains arsenic, the yellowish contains sulphur and iron, and the fully yellow sulphur and copper. The colours, therefore, make a very essential mark for the distinction of the several kinds of this fossil. The yellowish Pyrites, that is, such as contains iron and sulphur, is found in the strata of several kinds of stone, in clay, and in the earth lying over the mines of several metals. The white or arsenic Pyrites, and the fully yellow, are less common, but are usually met with about mines. *Agricola de Metall.*

It is a matter of great difficulty to ascertain the time of the formation of fossils. Many of them seem to have remained in their present state, unaltered, from the beginning of the world; but many have also been formed in later times, and continue to be formed to this day. Of the number of these last the stalactitæ, or stony icicles, hanging down from the roofs of grotto's, are known to be; and it is equally certain, that the pyritæ also are so formed, for many of the stalactitæ, in the caves dug by the German miners, are found to be coated over in several parts with Pyritæ; and, even in our own kingdom, pieces of wood buried in clay that contains Pyrites, such as is commonly dug to make tiles, if taken up again after a number of years, are always found impregnated with this substance, forming veins in it, and sometimes nodules on its surface. *Act. Erudit. Ann.* 1726.

The Pyritæ affixed to stalactitæ are finer than the other kinds, and it appears very evident to such as have thoroughly considered the process of nature in them, that they are not formed of particles brought together by water, in the manner of the Pyrites, in wood buried under clay, or in the manner of these stalactitæ themselves; but are composed of infinitely minute particles, brought together by their mutual attractions on a proper basis, and which had been before floating in the air.

The ancients in general supposed that copper was contained in the Pyrites; but they had no opinion that iron was a part of it, though it is certain that iron is the basis of almost all of them, and copper has a part only in a very few: but this was the effect of judging from appearances, instead of having recourse to experiments. Our own Lister has the honour of being the first author who has treated properly of them, and found out their true and general basis to be iron; but he carries it too far when he supposes them to be all properly iron ores: for this is not the case, many of them, which contain no other metal besides iron, yet, holding it in small quantities, and in such a combination of other principles, that it is scarce extricable from them, and some kinds contain no iron at all. *Lister de Font. Medic. Angliæ.*

Berger, who has written on the Caroline baths, has taken up the subject, and, improving upon Lister's plan, has given a much more just account of them. He allows that iron seems the basis of great numbers of the Pyritæ, and that this is evident from the observation, that the remaining matter of many of them, after burning away the sulphur, is found to be attracted by the magnet; but he observes also, that in many copper is mixed with the iron, and that, though iron is in general found in even those kinds which give the most obvious proofs of copper, yet there are some in which there can no iron be found.

This author observes also, that, besides the metalline particles, whether iron or copper, there is also contained in the pyritæ an unmetallic earth, which is in the composition of this stone most equally mixed and perfectly blended with the particles of these metals, and with those of the salts and sulphurs contained also in the mass. Sulphur also he acknowledges to make a great part of the Pyritæ, particularly of all the yellowish and full yellow kinds. The white or silvery Pyrites contains less sulphur than any of the others, and yet the yellow or venereal Pyrites, though it contains much arsenic, yet does not fail to contain sulphur also in considerable quantities. *Berger de Font. Carolin.*

The mention of gold and silver in the Pyrites is very common among authors, but the colour of these stones seems principally to have given ground for that opinion. In reality these metals are very seldom found naturally making parts of the Pyrites, and, when they are, it is only in a very inconsiderable quantity. But, in those specimens found about the mines of gold and silver, the particles of those metals assembled into visible masses are sometimes found unbedded in lumps of the Pyrites; and such pieces of this stone may well then be said to contain those precious metals. The occasion of this accident, however, is no more than this, that the Pyrites is formed in mines and other places at this day, which is plain from its being in some places found adhering to the sides of the stalactitæ, as has already been mentioned; and in like manner it might adhere to particles of gold and silver, and thereby give ground to the supposition of their being parts of it.

The common Pyritæ of our clay-pits and sea-coasts are used in the making of copperas and vitriol; but among these there is found a very great difference, some of them turning themselves very easily to vitriol, when only exposed to moist air; others doing it with more difficulty; and some not at all, though exposed many years. Some also yield all their vitriol at once, on pouring warm water on them; while others must lie exposed to the air at several different times, and roasted in the mean while, in order to obtain it. The settled observations on this subject, as collected from experiments, are these: No Pyrites which contains any copper, or any arsenic, will of itself turn into vitriol, but requires a previous roasting.

The sulphureous iron Pyrites, void of copper or arsenic, all turn to vitriol on being only exposed to the air; and that the sooner or later, as they are more or less of a compact substance. The fibrous or radiated Pyritæ are usually of this kind; but this is no general rule, for there are some radiated ones which remain whole years unaltered in the air.

Copper and arsenic always resist the shooting of the salts of the Pyrites, or its turning to vitriol; but these are not the only agents that resist this change, for in some merely ferreous and sulphureous Pyritæ the change is not made but with much time and difficulty. *Henkell, Pyritol.*

It is remarkable also, that vitriol is found in some Pyritæ, if water be poured upon them immediately after the roasting; while others will not yield any till they have been afterwards exposed to the air. It even seems, that we are to look into the air for the cause of the appearance of vitriol in the copperas stones. This it may greatly assist in effecting, as it carries a quantity of moist vapours in it: for it is well known, that the acid of sulphur has not the power to resolve iron into the form of a salt without the addition of water; nay, oil of vitriol, or of sulphur, being moderately concentrated, though it be then diluted with much more water than it is united with, while yet in sulphur, does not even dissolve filings of iron, unless there be four times or six times as much water poured to it. Water alone, however, though a great and necessary agent, cannot be supposed to effect the whole change; for, though there are some of the Pyritæ that yield their vitriol by means of it, yet there are others that do not; and some Pyritæ are presently turned into vitriol, when exposed to the air, which had before remained for many years under water unaltered. Of this kind there are many on the shores of the sea in most parts of Europe. In England particularly we have them in great plenty in Sheppey island in Kent. These Pyritæ will long resist the change into vitriol, when in the air, and yet they evidently contain no copper nor arsenic.

There is also a kind very common on the shores, which resembles wood in texture and appearance; and has probably once been wood, but has now its pores filled with the Pyrites: of these many lie buried a foot or more deep in the sand under the sea water; and in that state they never shoot into vitriol, but are of a firm texture and considerable hardness, and, when broken, look very bright within, and have no taste of vitriol, nor give any mark that they contain any: yet these, if they are taken up and exposed to the air for a fortnight, lose all their brightness and their hardness, and, mouldering to pieces, become so rich in vitriol, that it forms itself into regular crystals on their surfaces. Now, if moisture alone was sufficient to produce this effect, there is no reason why they should not have been resolved into vitriol under a very moist sand. The great cause we are able to assign, appears to be the vague acid, so common in the fossil world, and filling also the region of air; but an ingenious reasoner will still own, that, though this may do much, yet there must be some other cause, yet undiscovered, for the production of vitriol in these fossils; since this, as well as the moisture of the air, ought to act more equally than we find by experience it does on these stones, if all were owing to it. *Henkell, Pyritol.*

In the exposing these copperas stones to the air, if it be a moist season, no farther care need be taken of them than the piling them up in a heap; but moistening them now and then is a necessary circumstance in dry seasons, and in this case the water should be sprinkled on them in small quantities at a time, and the heaps now and then turned and new made. Much depends on this management, the same quantity of stones yielding twice as much copperas, with proper care, as they would without it.

When the matter of the Pyrites is mixed with the lead ores, the method of separating the metal by assaying is this: roast two centners of the ore, as in the usual method, and keep a stronger fire than when the ore is pure. The Pyrites, especially when it is merely iron, hinders an ore from easily growing clammy, or turning into large lumps, or entirely melting. When the ore is sufficiently washed, let it cool, beat it to powder,

der, and repeat the roasting to a third fire, till, when it is red-hot in the fire, there is no smell of sulphur: then mix the ore with six centners of black flux, and two of sandiver, and finish the work in the common way, only making the fire greater, and continuing it longer, towards the end of the operation. *Cramer's Art.*

PYRITRICHIPHY'LLUM, in natural history, the name of a genus of fossils of the class of the Pyritæ, the characters of which are these: they are compound, inflammable, metallic bodies, found in loose masses not of any regularly angular figure, and of a striated texture, with foliaceous ends to the striæ, appearing on the surface or within the mass. They are common in several parts of England.

PYRITRI'CHUM, in natural history, the name of a genus of pyritæ, the characters of which are these: they are compound, inflammable, metallic fossils, always found in detached masses of no regularly angular figure, and of a simply striated internal structure.

PY'RMONT-*waters.* — The country, all about where these springs are, abounds with materials which give virtue to the waters; and the quarries of stone, wherever they are dug, send up spirituous and martial exhalations as well as the springs that run from them, and the water among them has in general a vitriolic taste. Iron is found all about the place also, under the appearance of a yellowish earth or ochre, which contains so much of that metal, that it may be worked as an ore of it to great advantage. Ferruginous stones are also found in great abundance in the neighbourhood of the place; these may be also worked as iron ores, and the selenites is found in the strata of earth that make up the hills thereabouts, in great abundance, and in beautiful perfection.

The waters themselves, though they shew evident marks of an alcali, yet, have also an acid principle in them, of the nature of the common acid of sulphur, except in this, that in these waters the acid carries with it a subtile mineral oil or fattiness; and, mixing with the common alcali salt, which is found in all mineral waters, these together form a neutral salt: but, as in the composition of this salt there is much more alcali than acid, it is necessary that the water should shew alcaline rather than acid qualities. The analysis shews also, that the waters contain a stony matter embodied in them, which is pure, insipid, colourless, tasteless, and seems to be in nothing different from common crystal. The earth about the springs contains also a great number of lumps of a clayey matter, of the size of a walnut, and of a yellowish colour; in all of which, when broken, there is found pure crystal in small shoots, sometimes in its own regular figure, and sometimes irregular and mutilated.

A water, containing these principles thus combined, cannot but possess those virtues we find so eminent in this; these are the opening obstructions, correcting the sharpness of the humours, and restoring the solids to their due state. *Seipp. Nova Descrip. Font. Pyrm.*

The history of these waters is accurately given by Hoffman in his Observations on them, both in their natural state and in mixture with other bodies.

He first observes, that they contain a volatile and subtile principle, greatly more penetrating and strong, as well as in larger quantities, than any other mineral water, but that this is not to be expected in them any where but upon the spot, for those who transport them to other places are constrained to let a part of this fly off to preserve the rest. If either glass or earthen vessels be filled at the spring, and immediately corked and fastened down, the consequence is, that they will burst on the first motion or heat of the weather. They are, therefore, forced to fill them only in part at first, and let them stand a while for this subtile spirit to exhale, and then, a while after the filling them up, to cork and fit them for carriage.

Secondly, if they are drank upon the spot in a morning on an empty stomach, they affect the nose with a pungent tingling, and disturb the head for many hours afterwards.

Thirdly, if they are taken at the spring, they purge but very little, but, if taken in another place, after transportation, they purge considerably more, and render the stools black. It is observable also, that, if they are left in an open vessel a few days, their virtue exhales, and they no longer purge or render the stools black.

Fourthly, if tea leaves, balaustine flowers, or galls, are put into this water, they first change it to a blue, from that to a purple, and finally to a black. This is a ready proof, that black is only a deep purple, and purple only a deep blue: a little spirit of vitriol added to this liquor destroys all the colour, and renders it limpid as before.

Fifthly, if any acid be mixed with Pyrmont-water, there is raised an effervescence, and bubbles of air are carried up in great quantities; and this whether the stronger acids, such as spirit of vitriol, or aqua-fortis, be used; or the weaker, as vinegar, lemon juice, or Rhenish wine.

Sixthly, if an alcaline liquor be added, whether it be volatile, as the spirit of sal armoniac, or fixed, as the oil of tartar, there is no ebullition raised, but the liquor becomes turbid and milky. If spirit of vitriol be afterwards added to this, to saturate the additional alcali, the liquor becomes limpid again.

Seventhly, cow's milk mixed in equal quantity with Pyrmont-water does not coagulate, but, on the contrary, becomes thinner than before, and is preserved from turning sowre so soon as it otherwise would in hot weather. This is a proof that there is no predominating acid in these waters.

Eighthly, if syrup of violets be added to this water, it turns it to a beautiful green. This is a proof of the alcaline nature of these waters; and it is farther proved by adding spirit of vitriol, or any other acid, to this green liquor, which on that becomes limpid again.

Ninthly, four pints of this water, evaporated over a gentle fire, yield no more than two scruples of a dry residuum. Oil of vitriol being poured on this, an effervescence arises, and with it an acrid and pungent vapour, like that produced by mixing oil of vitriol and common salt. If spirit of vitriol be used instead of the oil, the effervescence is in a less degree, and the salt is in part changed to a bitter saline mass, the remainder separated from which proves to be a calcarious earth no longer fermenting with the spirit of vitriol.

Tenthly, if a quantity of Pyrmont-water be exposed twenty-four hours to the open air in a bason, it will at the end be found to have lost all its virtues, tasting wholly insipid, and being turbid instead of the fine clearness it had before, and a yellow ochreous earth is precipitated to the bottom; after this, the liquor will no longer shew any of those qualities which were before its distinguishing characters; it will no longer ferment with acids, nor turn black with galls, nor green with syrup of violets.

It appears from the whole, that the Pyrmont-waters possess a pure, extremely penetrating, and elastic mineral spirit, and that in a very large proportion, and to this their virtues are principally to be attributed. This mineral spirit, while it remains engaged in a calcarious earth, imitates the properties of an alcaline substance; and, when joined with a subtile martial earth, it emulates the properties of vitriol, giving the stools a black colour, and turning a tincture of galls into ink: and, while this remains in the water in those forms of an alcaline or vitriolic principle of so great subtility, it cannot but give them very great virtues in strengthening the tone of the viscera, opening obstructions, and stimulating in a proper manner the excretory ducts, so as to make them duly perform their office; but as soon as by the standing of the water open, or by any other accident, this subtile element is evaporated, all the virtues of the water must be gone with it.

The great quantity of this powerful spirit, contained in the waters, makes them more fit for the robust and strong constitutions, when depraved by illness, than for the weak and tender ones; but even the tenderest people may take them, only observing to take but a small dose, or to dilute them with an equal quantity of common water immediately before the taking them.

Hoffman also recommends the Pyrmont-water mixed with equal quantities of milk, on his own experience, in scorbutic and gouty cases. *Hoffm. Opera.*

Near the famous well at Pyrmont, is a stone quarry under ground, from some parts of which a sulphureous steam comes out, which commonly rises to a small height. Animals held in this steam are soon suffocated, but recover, if quickly taken out. When a man stands in this steam, but with his head over it, it proves an excellent sudorific. Dr. Seip proposes to perform cures in several diseases with it.

Imitation of PYRMONT-*water.* — This medicinal water may be imitated very nicely by art in the following manner: take a quart of the purest and lightest water, add to it thirty drops of a strong solution of iron made in spirit of salt, a drachm of oil of tartar per deliquium, and thirty drops of spirit of vitriol, or a little more or less, as is found necessary, not to let the alcali of the oil of tartar prevail too strongly, though it must prevail a little. Shake all briskly together, and on tasting it will be found extremely to resemble the true Pyrmont-water.

The basis on which this is founded, is the analysis and trial of the true Pyrmont-water, by which it is found to contain a subtile aqueous fluid, a volatile iron, and a predominant alcali, all joined together into one brisk pungent spirituous water. The artificial Pyrmont thus made, if the proportions are carefully minded, will extremely resemble the natural, and will have the same effects as a medicine. *Shaw's Lectures.*

PYRO'BOLUS, in natural history, the name given by many authors to the stone more generally called pyrites; others have called it siderites, pyrobalanus, pyropus, and othonua, and the Greeks mylias.

PYROCTOGO'NIUM, in natural history, the name given by Dr. Hill to a genus of fossils, usually comprehended by authors, with many other bodies of a different figure and structure, under the general name pyrites.

The characters of the Pyroctogonium are these: it is a compound, inflammable, metallic body, of a regular octohedral figure, or composed of eight planes.

There is only one known species of this genus, which is a very singular and elegant fossil, being composed of eight triangular planes; these being the sides of two quadrilateral pyramids, with broad bases, which, being joined base to base, constitute the Pyroctogonium.

This figure is very regular and determinate in the perfect specimens

cimens of the body, but there is ſcarce any foſſil which is more ſubject to imperfections and accidental variations. Its moſt perfect ſtate is when the two pyramids of which it is compoſed are placed evenly one over-againſt the other; but this is rarely the caſe, they are often placed unevenly, or ſlanting; their planes are frequently of very irregular lengths and breadths, and not unfrequently the ſpecimens are found mutilated and imperfect, and very often a number of them cohering in a cluſter one with another, and very much mutilating or injuring one another's figure. They are found of all the ſizes between that of a pin's head and an inch in diameter; but the large ones are ſcarce, and the moſt uſual ſtandard is a third of an inch. They are naturally of ſmooth and poliſhed ſurface, and of the colour of wrought iron; when broken, they are bright and ſparkling, and of a paler colour than without. When nicely examined as to their internal ſtructure, they are found to be compoſed, like the marcaſites, of a number irregularly arranged foliaceous flakes or plates.

It is found very frequently in Cornwall, Devonſhire, and moſt other of our countries where there are mines. It is ſometimes met with looſe in the earth, ſometimes lodged in the bodies of marcaſites, or in the ſolid foſſils, and varies ſometimes from its iron colour to a duſky yellow. It is ſometimes alſo found with many ſpecimens connected into a maſs; theſe are ſeldom uniform in ſize, and cohere in various directions, often injuring one another's figure. Sometimes alſo, as in the caſe of the cryſtals, they form a large maſs, of which the outer ſurface only is concreted into or covered with regular figures, the whole inner part being a confuſed ſubſtance.

Maſſes of this kind are not unfrequently found of a regularly orbicular figure, and beſet all over with regularly figured Pyroctogonia of various ſizes. *Hill's Hiſt. of Foſſ.*

PYRO'LA, *winter-green*, in botany, a genus of plants, whoſe characters are:

The leaves are alternate; the flower is roſaceous, pentapetalous, ſhaped like a hat, with a recurvated piſtil, and diſpoſed in a ſpike; the fruit is roundiſh, ſtriated, umbilicated, quinquecapſular, and full of ſmall ſeeds.

The leaves, which are the only part uſed, and that not often, are cooling and drying, and a good vulnerary, both for inward and outward wounds and hæmorrhages, ulcers in the kidnies or bladder, as, alſo, againſt making bloody water, and the exceſs of the catamenia. *Miller's Bot. Off.*

PYROLA'MPIS, *the glow-worm*, a ſmall inſect, remarkable for its ſhining in the night.

The male and female differ greatly in this ſpecies of inſect.

The male has wings, and is a ſmall fly; the female has no wings, but is a large crawling worm. The body of the male is oblong, and ſomewhat flatted; the wings are ſhorter than the body; the head is broad, dun, and flat; the eyes are large and black. This has no light iſſuing from it, and is not commonly ſuppoſed to be at all of kin to the glow-worm; but a very different inſect.

The female is what we expreſly call by this name. This is a very ſlow-paced animal, without wings, and ſomewhat reſembling a caterpillar; the head is ſmall, flat, hard, and black, and ſharp towards the mouth; it has ſhort antennæ, and ſix moderately long legs: the body is flat, and compoſed of twelve rings, whereas the body of the male conſiſts only of five; it is of a duſky colour, with a ſtreak of white down the back. It is often ſeen in the day-time, but is not known till in the dark; at which time it is eaſily diſtinguiſhed by the glowing light, or lambent flame, that is ſeen near the tail, iſſuing from the under part of the body.

PYRO'METER *, in mechanics, a machine for meaſuring the degree of expanſion of metals by heat.

* The word is derived from the Greek πῦρ, fire, and *μετρέω*, to meaſure.

The following Pyrometer is that of the ingenious Mr. John Ellicot.

A A (*plate* XXXV. *fig.* 12.) is a flat piece of braſs, which, for farther ſtrength, is ſcrewed down to a thick piece of mahogany: upon this plate are ſcrewed three pieces of braſs, two of which, marked B B, ſerve as ſupports for the flat iron bar C; and which, on account of its uſe, I ſhall call the ſtandard bar. The upper part of the third piece of braſs is a circle about three inches diameter, divided into 360 equal parts or degrees: within the circle is a moveable plate, divided likewiſe into 360 parts, and a ſmall ſteel index. The braſs circle in the fig. is marked D, and the moveable plate *d*. Upon the ſtandard bar the bar of metal is laid, on which the experiment is to be made, as E.

F is a lever two inches and a half in length, faſtened to an axis, which turns in two pieces of braſs ſcrewed to one of the ſupports marked B: to the end of this lever is faſtened a chain, or ſilk line, which after being wound round a ſmall cylinder; to which the index in the braſs circle D is faſtened, paſſes over a pulley, and has a weight hung to the end of it: upon the axis, to which the lever is fixed, is a pulley, $\frac{1}{4}$ of an inch in diameter, to which a piece of watch-chain is faſtened; the other end of this chain is hooked to a ſtrong ſpring, marked G, which ſpring bears againſt one end of the metal E.

H is a lever exactly of the ſame form and dimenſions with the former; but the chain faſtened to the pulley on its axis is hooked to the ſtandard bar. The line faſtened to the end of this lever, after being wound round a cylinder, to which the moveable plate is fixed, paſſes over a ſmall pulley, and has a weight hung to the end of it; or rather the ſame line paſſing under a pulley, to which the weight is hung, has its other end faſtened to the lever F: thus one weight ſerves for both levers, as in the figure.

From this deſcription it is plain, that, whenever the bar E is lengthened, it gives liberty to the weight to draw the lever F upwards by its action on the ſpring G; and the index will, at the ſame time, by means of the ſilk line, be carried forward in the circle; and as the bar ſhortens, it will return back again; the ſame motion will be communicated to the ſtandard bar.

The lengthening the bar the $\frac{1}{20}$ of an inch will carry the index once round the braſs circle, which is divided into 360 degrees; therefore, if the metal lengthens the 7200th part of an inch, the index will move one degree.

To make an experiment with this inſtrument, lay a bar of any kind of metal, as E, on the ſtandard bar; then heat the ſtandard bar to any degree of heat with a lamp, and mark the degree of its expanſion, as marked by the moveable plate: obſerve alſo the degree of expanſion of the metal E, by the heat communicated to it from the ſtandard bar, as marked on the braſs circle by the index: let the inſtrument ſtand, till the whole is thoroughly cold; then removing the bar E, lay a bar of any other metal in its place, and heat the ſtandard bar to the ſame degree of heat as before, which is ſeen by the moveable plates marking the ſame degree of expanſion. Then the index will ſhew the degree of expanſion of the ſecond metal, as it did of the firſt; and, by this means, the degrees of expanſion of different metals, by the ſame degree of heat, may be exactly eſtimated.

PYRO'PHORUS, the name uſually given to that ſubſtance called by ſome black phoſphorus.

It is made in this manner: take four or five parts of alum, and one part of wheat-flower, calcine this together to a brown or blackiſh maſs; powder this, and put it into a phial, ſtop it looſly with a paper, and ſet in a ſand heat, ſo as to make it continue glowing hot for ſome time; after this, remove the whole from the fire, ſuffer it to cool gradually, and finally ſtop the bottle very cloſe down.

A little of this powder being poured out of the bottle, and expoſed to the open air, immediately takes fire, and appears like a glowing coal; but the powder muſt be freſh made to have a good effect, for the ſun's rays, or the moiſture of the air being admitted to it, gradually take away its virtue.

Almoſt any animal or vegetable ſubſtance may be ſubſtituted inſtead of wheat-flower in this proceſs, and it will ſucceed equally well; but no other ſalt will do in the place of alum. *Shaw's Lectures.*

PY'RUS, *the pear-tree*, in botany, a genus of trees, whoſe characters are:

The flower conſiſts of ſeveral leaves, which are placed in a circular order, and expand in form of a roſe; whoſe flower cup afterwards becomes a fleſhy fruit, which is more produced towards the foot-ſtalks than the apple, but is hollowed like a navel at the extreme part: the cells in which the ſeeds are lodged, are ſeparated by ſoft membranes, and the ſeeds are oblong. See PEAR.

Q.

QUADRANGULA'RIS *piscis*, the *square-fish*, in zoology, the name of a fish, which, in its most usual size, is about fifteen inches long, four inches in the middle, and three inches and an half over. The forehead is square, a little hollow, and, by the eminency of the eyebrows, two inches and an half over. The nose blunt, and not very steep, with two holes in the place of nostrils, and the mouth very small. The back is a little convex toward the tail, and on the sides a little obtusely angled; as is also the belly, which is plain and flat, and a little rising towards the tail. It has five fins, two near the gills, two near the tail, and the tail-fin, which is considerably long. Part of the head and tail are covered with a soft skin, the rest of the body with a kind of crust, adorned all over with little round knots, reduced for the most part into hexagonal figures, and subdivided into equilateral triangles. *Grew. Muf. Reg. Soc.*

QUA'DRANS, a word used by some authors to express a fourth part of a pound, that is, three ounces troy weight, or four of the avoirdupois.

Hadley's QUA'DRANT (*Dict.*)— Though the late Mr. Hadley was undoubtedly the inventor of it, yet the principle upon which his invention turns, had not escaped the sagacity of Sir Isaac Newton, long before, as appears from a paper in his hand-writing found among the papers of the late Dr. Halley. But this was totally unknown to Mr. Hadley, and seemed to have been forgot by Dr. Halley himself. The account of Sir Isaac's invention is inserted in the *Philosophical Transf.* N°. 465, and is as follows.

P Q R S, *Plate* XXXV. *fig.* 8, denotes a plate of brass accurately divided, in the limb D Q, into ½ degrees, ½ minutes, and $\frac{1}{12}$ minutes, by a diagonal scale; and the ½ degrees, ½ minutes, and $\frac{1}{12}$ minutes, counted for degrees, minutes, and ½ minutes. A B is a telescope, three or four feet long, fixed on the edge of the brass plate. G is a speculum, fixed on the said brass plate perpendicularly, as near as may be to the object glass of the telescope, so as to be inclined 45 degrees to the axis of the telescope, and intercept half the light which would otherwise come through the telescope to the eye. C D is a moveable index, turning about the center C, and, with its fiducial edge, shewing the degrees, minutes, and ½ minutes, on the limb of the brass plate P Q; the center C must be over-against the middle of the speculum G. H is another speculum, parallel to the former, when the fiducial edge of the index falls on 00° 00′ 00″; so that the same star may then appear through the telescope, in one and the same place, both by the direct rays and by the reflected ones; but, if the index be turned, the star will appear in two places, whose distance is shewed, on the brass limb, by the index.

By this instrument the distance of the moon from any fixed star is thus observed: view the star through the perspicil by the direct light, and the moon by the reflected, or, on the contrary, and turn the index till the star touch the limb of the moon, and the index shall shew, upon the brass limb of the instrument, the distance of the star from the limb of the moon; and, though the instrument shake, by the motion of your ship at sea, yet the moon and star will move together, as if they did really touch one another in the heavens; so that an observation may be made as exactly at sea as at land. And by the same instrument may be observed, exactly, the altitudes of the moon and stars, by bringing them to the horizon; and thereby the latitude, and times of observations, may be determined more exactly than by ways formerly practised. In the time of observation, if the instrument move angularly about the axis of the telescope, the star will move in a tangent of the moon's limb, or of the horizon; but the observation may notwithstanding be made exactly, by noting when the line, described by the star, is a tangent to the moon's limb, or to the horizon. To make this instrument useful, the telescope ought to take in a large angle: and, to make the observation true, let the star touch the moon's limb, not on the outside of the limb, but on the inside.

Mural QUADRANT. Mr. Gersten has lately given us a description of a new astronomical mural Quadrant, which he says is free from many of the usual inconveniencies attending the use of such instruments. See *Phil. Transf.* N°. 483.

QUADRA'TO, or QUADRO, in the Italian music, is a name given to the note B, when it comes in the natural or diatonic order, and is thus marked ♮. It is a semitone minor higher than the B mol, or ♭, and in respect of that may be called sharp.

QUA'DRATURE *of the ellipsis.*—The ellipsis, is a curve whose precise Quadrature in definite terms is not yet effected. We have here therefore, as in the circle recourse, to a series.

Let A C (*Plate* XXXV. *fig.* 9.) $= a$, G C $= c$, P C $= x$. Then will

$$y^2 = c^2 = (a^2 - x^2) : a^2$$
$$y = c\sqrt{(a^2 - x^2)} : a$$

But $\sqrt{[a^2 - x^2]} = a - \frac{x^2}{2a} - \frac{x^4}{8a^3} - \frac{x^6}{16a^5} - \frac{5x^8}{128a^7} - \frac{7x^{10}}{256a^9}$, &c. in infinitum. Therefore, $ydx = cdx \frac{cx^2dx}{2a^2} - \frac{cx^4dx}{8a^4} - \frac{cx^6dx}{16a^6} - \frac{5cx^8dx}{128a^8} - \frac{7cx^{10}dx}{256a^{10}}$, &c. in infinitum.

if then for x be put a, the quadrant of the ellipsis will be $ac - \frac{1}{6}ac - \frac{1}{40}ac - \frac{1}{112}ac - \frac{5}{1152}ac - \frac{7}{2816}ac$, &c. in infinitum. Which same series exhibits the intire area of the ellipsis, if a denote the intire axis.

Hence, 1. If $\sqrt{ac} = 1$, the area of the ellipsis $= 1 - \frac{1}{6} - \frac{1}{40} - \frac{1}{112} - \frac{5}{1152} - \frac{7}{2816}$, &c. in infinitum: whence it is evident that an ellipsis is equal to a circle whose diameter is a mean proportional between the conjugate axis of the ellipsis. 2. Hence, also, an ellipsis is to a circle whose diameter is equal to the greater axis, as ac to a^2; that is, as c to a, or as the less axis to the greater. Hence, lastly, having the Quadrature of the circle, we shall likewise have that of the ellipsis, and on the contrary.

QUADRATURE *of the parabola.*—For the parabola we have a quadratrix or transcendent curve, which gives its squares. But it may be likewise had thus:

$$ax = y^2$$
$$a^{1:2}x^{1:2} = y$$
$$ydx = a^{1:2}x^{1:2}dx$$
$$\int ydx = a^{1:2}x^{3:2} = \tfrac{2}{3}\sqrt{ax^3} = \tfrac{2}{3}\sqrt{x^2y^2} = \tfrac{2}{3}xy.$$

Hence, the parabolic space is to the rectangle of the semiordinate into the abscisse, as $\frac{2}{3}xy$ to xy; that is, as 2 to 3.

Note, If a curve be not supposed described, but only an equation to it given, so as it does not appear, for instance, where the origin of x is to be fixed, we are to put $x = o$ in the integral, and, expunging what are multiplied by x, add to it the remainder, if there be any, under the contrary sign; to have the Quadrature sought.

QUADRATURE *of the hyperbola.*—For this, too, we have a quadratrix, invented by Mr. Perks.

The analytical Quadrature was first given by N. Mercator, of Holstein, the first inventor of infinite series's. But, Mercator finding his series by division, Sir Isaac Newton and Mr. Leibnitz improved upon his method; the one seeking them by the extraction of roots, the other by a series presupposed.

Mercator's QUADRATURE *of the hyperbola between its asymptotes.*—Since, in an hyperbola within the asymptotes, $a^2 = by + xy$; or if $a = b = 1$, which may be supposed, since the determination of b is arbitrary.)

Then will
$$1 = y + xy$$
$$1:(1 + x) = y$$

That is, the division being actually performed,

$$y = 1 - x + x^2 - x^3 + x^4 - x^5 + x^6, \text{ \&c.}$$
$$ydx = dx - xdx + x^2dx - x^3dx + x^4dx - x^5dx + x^6dx, \text{ \&c.}$$
$$\int ydx = x - \tfrac{1}{2}x^2 + \tfrac{1}{3}x^3 - \tfrac{1}{4}x^4 + \tfrac{1}{5}x^5 - \tfrac{1}{6}x^6 + \tfrac{1}{7}x^7, \text{ \&c.}$$

in infinitum.

QUADRATURE *of the cycloid.*—Since T P (*Plate* XXXV. *fig.* 10.) = P M; in the triangle P M T, the angles M and T will be equal; and consequently, T P Q = 2 M. But the measure of the angle A P Q is the half arch A P; which likewise measures the angle T P A. Therefore A P Q = T M P = M *m* S, by reason M Q and *m q* are parallel. Wherefore, since the angles at S and Q are right-angles, we have

$$AQ : QP :: MS : mS.$$

Let, then, A Q $= x$, A B $= 1$; then will P Q $= \sqrt{(x - xx)}$ and mS $= dx\sqrt{(x - xx)} : x$. But it is shewn, that $\sqrt{(x - xx)} = x^{1:2} - \frac{1}{2}x^{3:2} - \frac{1}{8}x^{5:2} - \frac{1}{16}x^{7:2}$, &c. in infinitum. Therefore, $dx\sqrt{(x - xx)} : x =$ (the numerators of of the exponents being diminifhed by two units in the divifion by x) $x^{-1:2}dx - \frac{1}{2}: x^{1:2}dx - \frac{1}{8}x^{3:2}dx - \frac{1}{16}x^{5:2}dx$, &c. in infinitum. Whofe fum $2x^{1:2} - \frac{1}{3}x^{3:2} - \frac{1}{20}x^{5:2} - \frac{1}{56}x^{7:2}$, &c. in infinitum, is the femiordinate of the cycloid Q M referred to the axis A P. Hence, Q M dx, or the element Q M S q of the cycloidal fpace A M Q $= 2x^{1:2}dx - \frac{1}{3}x^{3:2}dx - \frac{1}{20}x^{5:2}dx - \frac{1}{56}x^{7:2}dx$, &c. in infinitum. Whofe fum $= \frac{4}{3}x^{3:2} - \frac{2}{15}x^{5:2} - \frac{1}{70}x^{7:2} - \frac{1}{252}x^{9:2}$, &c. in infinitum, expreffes the fegment of the cycloid A M Q.

If, then, $mS = gG = dx\sqrt{(x - xx)} : x$ be multiplied into G M $=$ A Q $= x$; we fhall find the element G M H G of the area A M G $= dx\sqrt{(x - xx.)}$ Which being the fame with the element of the fegment of the circle A P Q, the fpace A M G will be equal to the fegment of the circle A P Q; and, confequently, the area A D C equal to the femicircle A P B.

Hence, fince C B is equal to the femiperiphery of the circle, if that $= p$ and A B $= a$; the rectangle B C D A $= ap$; and the femicircle A P B; and confequently, the external cycloidical fpace A D C $= \frac{3}{4}ap$. Therefore the area of the femicycloid A C B $= \frac{1}{4}ap$, and A M C B P A $= \frac{3}{4}ap$. Confequently, the area of the cycloid is triple of the generating circle.

Quadrature *of the logiftic, or logarithmic curve.*— Let the fubtangent P T, *Plate* XXXV. *fig.* 11, $= a$, P M $= x$— P $p = dx$; then will

$$y\,dx : dy = a$$
$$y\,dx = a\,dy$$
$$\int y\,dx = ay$$

Wherefore the indeterminate fpace H P M I is equal to the rectangle of P M into P T.

Hence, 1. Let Q S $= z$; then will the indeterminate fpace I S Q H $= az$; and, confequently, S M P Q $= ay - az = a(y - z)$; that is, the fpace intercepted between the two logiftic femiordinates is equal to the rectangle of the fubtangent into the difference of the femiordinates.

2. Therefore the fpace B A P M, is to the fpace P M S Q as the difference of the femiordinates A B and P M to the difference of the femiordinates P M and S Q.

Quadrature *of Des Cartes's curve*, which is defined by the equation, $b^2 : x^2 :: b - x : y$.

Since, $b^2 y = bx^2 - x^3$

$$y = (bx^2 - x^3) : b^2$$
$$y\,dx = (bx^2\,dx - x^3\,dx) : b^2$$
$$\int y\,dx = x^3 : 3b - x^4 : 4b^2$$

Quadrature *of all curves comprehended under the general equation*, $y = x\sqrt[m]{(x + a)}$

Since $y = (x + a)^{1:m}$

$$y\,dx = dx(x + a)^{1:m}$$

To render the element integrable, fuppofe,

$$(x + a)^{1:m} = v$$

Then will $x + a = v^m$

$$dx = mv^{m-1}\,dv$$
$$y\,dx = mv^m\,dv$$

$\int ydx = \frac{mv^m}{m+1} + 1 = \frac{m}{m+1}(x+a)\sqrt[m]{(x+a.)}$ Let $x = o$:

The remainder $\frac{m}{m+1}a\sqrt[m]{a}$. Whence, the area of the curve $\frac{m}{m+1}(x + a)\sqrt[m]{(x + a)} - ma\sqrt[m]{a}$.

Quadrature, in aftronomy (*Dict.*)— When the moon is in her Quadrature, fhe exhibits that phafis which we call the half-moon, i. e. fhe fhines with juft half her face; and is faid to be bifected, or dichotomifed. See PHASIS and DICHOTOMY, in the Dictionary.

In the moon's progrefs from the fyzygies to her Quadrature, her gravity towards the earth is continually increafing by the action of the fun; and her motion retarded for the fame reafon.— Her motion, then, in her orbit is floweft as her gravity to the earth is greateft when in the Quadratures.

In her recefs from the Quadratures to the fyzygies, the gravity continually decreafes, and the velocity increafes.

The ratio is thus: as radius is to the fum, or difference of one and an half the co-fine of double the diftance of the moon from the fyzygy, and half the radius; fo is the addition of gravity in the Quadratures to the diminution or increafe thereof in any other fituation.

Hence, the moon's orbit is more convex in the Quadratures, than in the fyzygies; and hence the circular figure of the moon's orbit is changed into an oval, whofe greater axis goes through the Quadratures; and hence, alfo, the moon is lefs diftant from the earth at the fyzygies, and more at the Quadratures.

It is no wonder, therefore, that the moon approaches nearer the earth when her gravity is diminifhed; that excefs not being the immediate effect of this diminution, but of the inflexion of the orbit towards the Quadratures.

QUADRI'GA, in furgery, otherwife called Cataphracta, is a ftrong bandage made ufe of in fractures of the fternum. It is compofed of a double-headed roller about fix Paris ells long and three or four fingers broad.

QUADRI'GÆ, among the Romans, chariots drawn by four horfes, which were harneffed all a-breaft, and not two and two.

QUADRI'LLE, a well known game at cards; and which has been, in feveral cafes, the object of mathematical computations. *De Moivre's Doctrine of Chances, 2d. edit.*

QUADRI'SETÆ, *the four-haired fly*, a term ufed by the writers, in natural hiftory, to exprefs thofe flies of the feticaude or hair-tailed kind, which have four hairs or briftles growing from the tail, as the others have three, two, or one.

QUA'DRULA, in natural hiftory, a word fometimes ufed in the fame fenfe as teffela, and fpoken of the cubic pyrites. Sometimes it is ufed alfo as the name of thofe light fpangles of fhining matter that are mixed among fand. Thefe are generally fragments of talc, and are of various colours, white, yellow, and blackifh.

Solinus has ufed the word Quadrula to exprefs the fragments of yellow talc that are found in that fand called ammochryfos, or golden fand. He miftakes thefe fhining particles for maffes of real gold, and makes the fand itfelf a kind of precious fubftance ranked among the gems, and brought from Perfia; but in this he does not agree with the reft of the ancients.

QUA'DRUPED (*Dict.*)— Quadrupeds are divided by Mr. Ray into thofe which are hoofed, ungulata, and clawed or digitate, unguiculata.

Hoofed Quadrupeds are either,

1. Whole-hoofed, folidipeda, μονώνυχα, μώνυχα, folidungula: as the horfe, afs, the onager or wild afs; the mule and the zebra of Africa, or the fine ftriped Indian or African afs, almoft like a mule in form and ftature.

Of the whole-hoofed kind, Ariftotle has obferved, that no one hath two horns—(he might have faid any horns) no one hath the talus or aftragalus, nor have the males any appearance of breafts.

2. Cloven-footed, and that either, 1, into two divifions only; as the δίχηλα, or bifulcate kind, which are again fubdivided into fuch as are, firft,

Ruminant, μηρυκάζοντα, that is, fuch as chew the cud; and thefe either have hollow and perpetual horns, as the bull, fheep, and goat-kind; or deciduous horns, as the hart and deer-kind, which ufually fhed their horns annually. See RUMIMANT, in the Dictionary.

Of the bull-kind are reckoned thefe: the common bos or bullock, of which the male is taurus, the female vacca: the German urus, urochs, or aurochs: the bifon, the bonafus, the bubalus, or bufalo: the bos Africanus of Bellonius, Obf. l. ii. c. 50, which he takes to be the bubalus of the ancients.

Of the fheep-kind, befides the common fort, are reckoned the Arabian ovis laticauda, whofe tail is fometimes of thirty pounds weight; the ovis ftrepficeros Cretica Bellonii; the ovis Africana, with fhort hair inftead of wool; the ovis Guineenfis, or Angolenfis of Marcgrave, *Hift. Brafil.*

Of the goat-kind, are, befides the common capra domeftica, the ibex, or German fteinbock, found in the tops of the Alps; the rupicapra, French chamois, or German goms; the gazella Africana or antelope; the gazella Indica; the capra fylveftris Africana Grimmii; the capra mambrina, or Syriaca of Gefner; the bufelaphus, or mofchelaphus Caii in Gefner; the tragelaphus Caii in Gefner, &c.

Of the hart or deer-kind, are reckoned, the cervus ἔλαφος, or red deer; the cervus platyceros or palmatus, the fallow deer; alce or the elk; rangifer, the rain-deer; the axis Plinii, according to Bellonius; the caprea Plinii, the cuguacu-etc, and cuguacu-zapara of Marcgrave; the caprea Groenlandica.

Secondly, of cloven-footed animals into two parts only, and which do not chew the cud, there is only the hog and fwinekind: under this head, befides the common fwine, are reckoned the wild boar, or fwine; the porcus Guineenfis Marcgravii; the porcus Indicus, called babyrouffa; the tajaca or aper Mexicanus mofchiferus of Dr. Tyfon, called by Marcgrave tajaca cunagoara, by others quauhtla coymalt, and quapizotl, and by Acofta, and fome others, zaino.

2. There are fome Quadrupeds, whofe hoof is cloven into four divifions; and thefe feem to be not ruminant: as the rhinoceros, the hippopotamus, the tapijerete of Brafil, the capy-bara of Brafil, and the animal mofchiferum.

Clawed or digitate Quadrupeds.— Of this kind, there are, firft, a fort whofe claws are not divided or feparated, but adhering to one another, covered with one common fkin, but with obtufe nails, fticking out round the margin of the foot; as the elephant, which is anomalous, and not clearly referable to this kind, or to that of cloven-footed Quadrupeds.

A fecond fpecies of this digitate-kind of Quadrupeds, which has only two claws, is that of camels; and, though thefe have no horns, they both ruminate, and have alfo the four ftomachs of horned ruminant animals.

Of the camel or dromedary there are two forts; one having but one bunch on the back, the other two.

To this kind alfo belong the Peruvian glama, which fome have reckoned among the fheep-kind; as alfo the pacos, the oris Indica, or Peruviana vulgo, much leſs than the glama.

A third ſpecies of this unguiculate kind includes ſuch animals as the Greeks called πλατυώνυχα, and ἀνθρωπόμορφα, which have the foot divided into many claws, with broad nails on them; as the ape and monkey kind.

Of theſe, ſome have no tails, and are called ſimiæ, or apes: others have tails, and are called monkeys, cercopitheci; and ſuch as have either long or ſhort tails, if they are of a larger ſize, are called papiones or baboons.— There are great numbers and varieties or this ſpecies of Quadrupeds; of which naturaliſts have deſcribed theſe: viz. the orang outang or homo ſylveſtris of Dr. Tyſon, deſcribed by him in a particular diſcourſe: the guarita of Braſil, Marcgravii; the cagui of Braſil, greater and leſſer; the cay of the ſame region, deſcribed by Lerius; the caitaia of the ſame country; the cercopithecus barbatus Guineenſis, two or three ſorts of it; the cercopithecus Angolenſis major; the cercopithecus non barbatus Cluſii; the cercopithecus Cluſ. called ſagouin: laſtly, if apes and monkeys have their ſnouts very prominent like dogs, they are called cynocephali.

A fourth ſpecies of this unguiculate kind, is when, though the claws are many, yet they are not covered at the end with broad flat nails, like the monkeys or apes; but are rather like the talons of hawks, &c. crooked and ſharp-pointed.

Theſe, in reſpect of their teeth, may be divided into ſuch as have many dentes primores, or inciſores, that is, cutting teeth, in each jaw, of which there are two ſorts; a greater, which either have a ſhort, round head, as the cat-kind; or a leſſer ſort, having a long ſlender body, with very ſhort legs, as the weaſel or vermin-kind.— There are alſo ſome of this ſpecies of Quadrupeds, which have only two large remarkable teeth in each jaw: theſe are the hare-kind, and live only upon herbs, graſs, &c.

Of the cat-kind of Quadrupeds are reckoned to be the lion, the tyger, the pardalis, which male is pardus, and female panthera, the leopard; the lupus cervarius, or lynx; the catus pardus, or cat-a-mountain; the common cat, and the bear.

Of the dog-kind are reckoned the wolf; the lupus aureus or jackall; beſides the common dog, of which kind they enumerate, the maſtiff; the canis Venaticus graius, Græcus, or Scoticus, the greyhound; graius Hibernicus, or the Iriſh greyhound; the canis Venaticus ſagax, indagator, ſpectator ferarum, &c. the hound; canis Venaticus Hiſpanicus or Aviarius, the ſpaniel for land or water; vertagus or tumbler; canis οἰκουρός, or domeſticus, the houſe-dog; canis melitæus, or the lap-dog; canis Getulus or Iſlandicus, the ſhock: and of all theſe ſorts there are many varieties of mongrels, and hybridous breeds.

Another ſort of the dog-kind is the fox; the animal zibethicum, or civet-cat, as it is corruptly called, but, by it's teeth and ſnout, is plainly of the dog-tribe; the American coati, rackoon, or rattoon; the yzquiepate; the carigueya, marituxaca, carigoy, ropoza, or poſſum; the taxus or meles; the badger, grey, or pate; the lutra or otter; the phoca, ſea-calf, or ſeale; the equus marinus, morſe, or ſea-horſe, miſtaken by ſome for the hippopotamus; the Dutch call him walras, the Danes and Iſlanders roſmarus; laſtly, the manati or vacca marina, the ſea-cow.

Of the vermin, or weaſel-kind of Quadrupeds, is firſt, the muſtela vulgaris, the common weaſel, in Yorkſhire called foumart or fitcher, γαλῆ; the viverra Indica, called quel and quirpele; and another ſort called mungo and mungathia, of a reddiſh grey: the muſtela, ermin, or ſtoat, if white: and muſtela ſylveſtris, the ferret; putorius, the pole-cat; martes or foyna, the martin or martlet; muſtela zibellina, the ſable; laſtly, the genetta, and the ichneumon Bellonii.

Of the hare kind of Quadrupeds, are firſt, lepus, or the common hare: cuniculus, the rabbet or coney: tapeti, or Braſil coney, and the aperea of Braſil; the hyſtrix, or porcupine, and the hyſtrix Americanus, or cuanda of Braſil; caſtor, fiber, or the beaver; ſciurus vulg. or ſquirrel: the Virginian, Zeylandic, Barbary, and American flying ſquirrel; mus domeſticus, major and minor, the common rat and mouſe: to theſe alſo may be referred mus major aquaticus, the water-rat; the muſk-rat, mus avellanarum, major and minor; the dormouſe or ſleeper, mus noricus, Cricetus, Alpinus ſeu Marmotta; the cavia cobaya, or cuniculus Americanus, the Guinea-pig; the agati and paca of Brazil; the mus Norwegicus, or leming; the glis Geſneri, or the rell; the mus Indicus, &c.

Anomalous QUADRUPEDS.— To theſe ſeveral kinds the following anomalous ones muſt alſo be added.

1. Such four-footed viviparous animals as have a longiſh ſnout, with their feet divided into many claws and toes, and having teeth; as the echinus terreſtris, or common urchin, or hedge-hog; erinaceus Indicus albus; tatu or armadillo prima of Marcgrave; tatuete of Braſil, or the ſecond ſpecies of the armadillo, according to Marcgrave; tatu apara, his third ſpecies of armadillo; tatu Muſtelinus, Soc. Reg. Muſ. the weaſel-headed armadillo; talpa, the mole, warp, or mold-warp; mus araneus, ſhrew, hardyſhrew, ſhrew-mouſe.

2. Quadrupedous and viviparous animals with a longiſh ſnout, having their feet divided into many claws or toes, but without teeth; as the tamandua-guacu of Braſil, Marcgravii; urſus formicarius Cardani, the great ant-bear; the tamanduais of Braſil, or Marcgrave's leſſer ant-bear.

3. Anomalous flying Quadrupeds, with a ſhorter ſnout, and their feet divided as above; being of the bat-kind, or flitter-mice; of which there are ſeveral ſizes and different forms.

4. There is one very anomalous animal which has but three claws on each foot; and that is the aſs, or ignavus of Marcgrave, the ſloth or ſluggard.

5. Viviparous and ſanguineous Quadrupeds, breathing with lungs, but having only one ventricle in the heart; as the rana aquatica, the frog or froſh; rana arborea, ſeu ranunculus viridis, the ſmall tree or green frog; bufo, ſive rubeta, the toad; teſtudo, the tortoiſe, in Greek, χελώνη; of theſe there are land and water ones, and many different ſpecies in foreign parts.

6. Oviparous Quadrupeds, with a long tail ſtretched out horizontally, are the lizard kind; as lacertus omnium maximus, the crocodile; cordylus, ſive caudiverbera, uramaſtix Græcis, larger than the green lizard; tapayaxin Novæ Hiſpaniæ; lacertus orbicularis of Hernandez; lacertus vulgaris, the common eſt, ſwiſt, or newt; lacertus viridis, the green lizard; lacertus fucetanus Adrovandi, at Rome and Naples called the tarantula: lacertus Indicus, called ſenembi and inguana; lacertus Braſilienſis, called tejuguacu, and temapara by Marcgrave; the taraguira, ameira, taraguico, Acuraba Americima, Carapopepa, Teiunham, &c. of Marcgrave; the lacertus Indicus; the ſcincus, or crocodilus terreſtris; the ſeps, or lacerta chocidica, a kind of footed ſerpent; ſtellio, the ſwiſt, or ſpotted lizard; ſalamandra terreſtris; ſalamandra aquatica, the water eſt; lacerta volans Indica; and the chamælion, or camelion.

Alated QUADRUPEDS. Among the many fabulous things with which natural hiſtory has been loaded, ſtories of flying Quadrupeds ſeem to claim a very high rank; the gryphon, the Quadruped dragon, and a great many other imaginary animals, having been introduced ſo ſeriouſly among the deſcriptions of real animals, that too many have been taught to believe them. Scheuchzer, in his Phyſica ſacra Jobi, has done much towards diſcountenancing ſuch relations, and Hyacinthus Gemma, who has written expreſly de fabuloſis animalibus, has added much on the ſame occaſion: yet all is not done. The world have late hiſtories of lemmas and baſiliſks, which never exiſted but in the imagination of the relator, or in the ſubtle contrivances of the fabricator; as is evidently the caſe in the baſiliſks, which we find in the muſæums of the curious, and which are all made out of the wray-fiſh. And the generality of readers are ſo fond of any thing that is marvellous, that theſe things are ſure to be remembered, while perhaps all the truths in the book are forgotten.

Though moſt of the ſtories of alated or flying Quadrupeds are falſe, yet, there are evidently ſome animals which ſhew, that this property is not denied to all Quadrupeds. We have bats in every part of this kingdom, and the Eaſt and Weſt-Indies are not without them; and whoever accurately examines this creature, will find that it has nothing of a bird but that one property of flying; and that what are called its wings, and ſerve it in the office of wings, are, in reality, only its fore-feet extended, and webbed with a peculiar kind of membrane.

There is a ſpecies of flying lizard very common in Java, and called by many the flying dragon. Bellonius had led the world into a great error in regard to this animal, having miſtaken it for a two-legged creature, and deſcribed and figured it as ſuch; but Bontius, and others ſince his time, have ſet us right about it from their own obſervation, and Piſo, as well as many others, have deſcribed it truly as a Quadruped.

Theſe creatures are properly enough called flying animals, as they can ſuſpend themſelves a long time in the air, and move about in it at pleaſure; but leſs accurate writers have added to the numbers of flying Quadrupeds the common ſquirrel, and ſeveral other creatures which live in woods, and being very light in their bodies, and very ſtrong in their legs, can leap or throw themſelves forward to a great diſtance, and by this means paſs from one tree to another. Of this kind the moſt eminent is that ſpecies called the flying ſquirrel, which has a ſort of membrane which it expands on each ſide to catch the air, and ſupport it from falling in its leaps; which by this means it makes very long, and ſeems to fly, eſpecially when it throws itſelf from the top of a very high tree to a low ſhrub.

Upon the whole, the ſtandard of the flying or alated Quadrupeds ſeems to be properly enough reducible to this: that the words flying and alated are not ſynonymous terms, and that there are three kinds of flying among the Quadruped claſs. The firſt abſolute and ſwift, flying as perfect as in birds; this peculiarly belongs to the bat, which is the only alated or winged Quadruped, properly ſpeaking. 2. An imperfect flying by means of certain membranes ſerving as wings, but imperfectly, and not turning quick, or enduring long flights; ſuch is the flying of the lizard, which is not properly an alated animal. And, laſtly, the imperfect flying of the ſquirrel kind, which even in that ſpecies called, by way of eminence, the flying ſquirrel, is not properly flying, but only long leaping; the

the creature being able to turn but very little out of a right-line, and only to suspend itself during a short time in a leap from a high place to a lower. *Phil. Transf.* Nº. 427.

QUADRUPLATO'RES, among the Romans, were informers, who had the fourth part of the confiscated goods for their pains. *Pitisc. in voc.*

QUÆ'RENS *non invenit plegium*, a return made by the sheriff upon a writ directed to him with this clause, viz. Si A. fecerit B. securum de clamore suo prosequendo, &c. F. N. B. 38. *Blount. Cowel.*

QUAIL, in ornithology, the name of a well known bird of passage, frequenting the corn fields, and sometimes the meadows. They begin to sing in the month of April, and make their nests in May, building on the ground.

Quails are to be taken by means of the call, during their whole wooing time, which lasts from April to August. The proper times for using the call are at sun-rising, at nine o'clock in the morning, at three in the afternoon, and at sun-set; for these are the natural times of the Quail's calling. The notes of the cock and hen Quail are very different, and the sportsman who expects to succeed in the taking them, must be expert in both; for, when the cock calls, the answer is to be made in the hen's note; and when the hen calls, the answer is to be made in the cock's. By this means, they will come up to the person, so that he may, with a great ease, throw the net over them and take them. If a cock Quail be single, on hearing the hen's note he will immediately come; but, if he have a hen already with him, he will not forsake her. Sometimes, though only one Quail answers to the call, there will three or four come up; and then it is best to have patience, and not run to take up the first, but stay till they are all entangled, as they will soon be.

The Quail is a neat cleanly bird, and will not run much into dirty or wet places: in dewy mornings they will often fly instead of running to the call; and in this case, it is best to let them go over the net, if it so happens that they fly higher than its top, and the sportsman then changing sides, and calling again, the bird will come back, and then will probably be taken in the net.

The calls are to be made of a small leather purse, about two fingers wide, and four fingers long, and made in the shape of a pear; this is to be stuffed half full of horse-hair, and at the end of it is to be placed a small whistle, made of the bone of a rabbit's leg, or some other such bone: this is to be about two inches long, and the end formed like a flageolet, with a little soft wax. This is to be the end fastened into the purse, the other is to be closed up with the same wax, only that a hole is to be opened with a pin, to make it give a distinct and clear sound. To make this sound, it is to be held full in the palm of the hand, with one of the fingers placed over the top of the wax; then the purse is to be pressed, and the finger is to shake over the middle of it, to modulate the sound it gives into a sort of shake. This is the most useful call, for it imitates the note of the hen Quail, and seldom fails to bring a cock to the net, if there be one near the place.

The call that imitates the note of the cock, and is used to bring the hen to him, is to be about four inches long, and above an inch thick; it is to be made of a piece of wire turned round and curled, and covered with leather; and one end of it must be closed up with a piece of flat wood, about the middle of which there must be a small thread or strap of leather, and at the other end is to be placed the same sort of pipe, made of bone, as is used in the other call. The noise is made by opening and closing the spiral, and gives the same sound that the cock does when he gives the hen a signal that he is near her.

QUA'KERS, a religious sect, who made their appearance in England, during the time of the interregnum.

They took their origin from George Fox, an illiterate person, born at Draiton in Leicestershire; and by profession a shoe-maker.

The accounts of those times tell us, that as he wrought at his trade, he used to meditate much on the scriptures; which, with his solitary course of life, improving his natural melancholy, he began at length to have visions; and, in consequence thereof, set up for a preacher.

The new prophet proposed but few articles of faith; dwelt mostly on morality; preached mutual charity, the love of God, and a deep attention to the inner motions and secret workings of the spirit.—He would have a simple worship, and religion without any ceremonies; making it a principal point to wait, in profound silence, the motion and direction of the holy spirit.

The genius of the times, the novelty of the doctrine, and the great appearance of devotion in the man, soon gained him disciples; and some unusual shakings and convulsions which they were seized withal, at their first meetings, procured them the appellation Quakers.

They profess a great austerity of behaviour; a singular probity and uprightness in their dealings; a demureness and gravity of countenance; a coldness and sparingness of discourse, to have time to weigh what they say; a great deal of frugality in their tables, and of plainness in their dress.

They declaim much against the interested views of the English ministers; blame all war, and set aside all use of oaths, as prohibited under the gospel.

According to the genius of rising sects, an eager zeal at first led them to some extravagancies: they would run about the streets naked, and were frequently in prison for interrupting the ministers in service time.

One of their company, Naylor, is said to have had the impiety to allow his followers to call him son of God, son of justice, and king of Israel; to strew garments before him, and hale him at his entry into Bristol, with Hosanna son of David. He had his trial for the same, was whipped for blasphemy, and excommunicated by the rest.

Besides other penalties inflicted on them, they were laughed at, and rallied in writing, and exposed on the theatre: but they despised alike both the press and the prison, and formed their sect, maugre all opposition of both; and under the direction of Fox, Dewsbury, and others, grew, from a loose, undisciplined multitude, into a regular body, with stated laws and polity; which they retain with great œconomy to this day.

The modern Quakers retain nothing of the extravagancies charged on their leaders; having approved themselves a sober, quiet people, of exemplary morals, and remarkably charitable and friendly to each other.

Their doctrines are not easily collected; at least, not easily represented out of their own terms, which appear somewhat ambiguous.

They hold Christ to be a light which hath lighted every man; and that whoever will soberly and seriously turn into himself with a sincere desire to know and practise his duty, will not fail to find there a sufficient director; a ray from the fountain of light illuminating the understanding, and assisting to distinguish good from evil.

They add, that such as follow the directions and convictions of this light, shall be holy and acceptable to God; and that this was the end of Christ's coming into the world.— That, so far as they follow this light, they shall be infallible; and that it is not opinions, speculations, or notions of what is true, or subscription of articles or formula's of faith, how soundly soever worded, that make a man a true believer or christian; but a conformity of mind and practice to the will of God, according to the manifestation and dictates of this divine principle of light within them.

Our Saviour's injunction about baptism they understand, in a figurative sense, of a conversion and change of the heart; and wholly neglect the outward sign.— Water-baptism, they hold, was only John's; that it was no more than a type or figure, fitted for the infant-state of the gospel; and therefore now useless, in a dispensation, which is spiritual and inward.

The same they hold of the supper; alledging, that both allude to old Jewish practices, and were used as types or significations of a near and accomplishing work.—They add, that the communion of saints consists only in a participation of the same divine principle, shewing itself in an unity of spirit.

As to ministry and ordinances, they deny that any are to be used of man's wit, or will, or carnal invention, or imitation; or other than what the inward principle directs them to.— Accordingly, they have no persons set apart for the ministry; but without distinction of quality or sex, every one who is of a sober life, and approved conversation, and believes him or herself called or moved thereto, is permitted to speak and prophesy in their assemblies.

They own the scriptures to be given by divine inspiration, and allow them the appellation of the form of sound words; but refuse to call them the word of God, as being a denomination properly attributed to Christ alone.— They add, that what makes them more scrupulous in this respect, is, that people are apt to be hereby led to think that, if they have the scriptures, they have all; and so look for no farther word or light.

They acknowledge the holy three that bear record in heaven, father, word, and spirit; but reject the school-terms, trinity, distinct, persons, hypostases, &c. as not scriptural, and as apt to convey too gross ideas.

They have been even charged with denying the incarnation, our Saviour's humanity, divinity, plenary satisfaction, and the resurrection of the dead: but this is injurious to them; and all that can be justly said, is, that they do not allow of them in the same sense, or speak of them in the same terms, as is commonly done among others.— They allow the incarnation, and that the Godhead dwelt bodily in Jesus; and yet many of them say, there is no Christ but what is within them: whence it should seem their notion of the incarnation only implied this, that the light, which they call the Christ within, dwelt in the man Jesus Christ fully.— Their reasoning, here, is, that, Christ, as God, not being divisible, the measure or manifestation of the spirit of Christ in us is a manifestation of the same Christ which dwelt bodily and fully in the man Jesus Christ.

They are silent as to the hypostatical union; and some of them are charged with allegorising away the whole history of the crucifixion, the resurrection, and ascension; though their best and most approved writers have been very explicit in their acknowledgment of the reality of the history.

They

They decline the uſe of modes or forms of civility; expreſſing their reſpect to their ſuperiors no other way but by obeying all juſt laws under their government.

The ſyſtem of quakeriſm is laid down in fifteen theſes, by Robert Barclay, in a well writ Apology addreſſed to king Charles II. Their hiſtory, writ in low Dutch by William Sewel, and ſince tranſlated into Engliſh, traces them from the beginning to the year 1717.—A hiſtory of this people was alſo publiſhed, anno 1695, by Gerard Croeſe; but that author is by them accuſed as having miſrepreſented facts, and in many reſpects done them injuſtice.

As to diſcipline and polity; the affairs of the communion are all managed under a democratical government, by rules eſtabliſhed by common conſent; and this principally at their meetings, whereof they have many kinds; viz. monthly, quarterly, yearly, ſecond day's meetings, meetings of ſufferings, &c.

Their monthly and quarterly meetings are held in their reſpective counties.— To theſe deputies are ſent from the ſeveral particular meetings.— Here inquiry is made into the ſtate of each meeting; who ſtand faſt to the rules and orders, and who backſlide; who pay tithes, and church rates, and who ſuffer for non-payment of either; who are married by prieſts, &c. and accordingly they proceed to cenſure, or incourage. —Here, too, they excommunicate, and here receive again into communion; of all which things exact regiſters are kept.

From theſe meetings appeals lie to their yearly ones, which are always held in London, and conſiſt of three orders or claſſes; viz. repreſentatives ſent from the quarterly meetings; correſpondents for the ſeveral counties and foreign countries; and miniſters, or preachers. —Hither are tranſmitted accounts of what has been tranſacted in all the monthly and quarterly meetings over all the world.— Here are meaſures concerted, and directions given as to behaviour about tithes and rates, providing for the poor, compoſing differences, &c.— Here public accounts are audited, and proper inſtructions given to the deputies to be obſerved at their return, and a yearly epiſtle of admonitions diſpatched to be read in all the monthly and quarterly meetings throughout the world.

The ſecond day's meeting, is a ſtanding committee conſiſting of the principal preachers in and about the city, who meet every Monday, to concert particular caſes and exigencies relating to the body, happening between the yearly meetings; particularly to examine, approve, licenſe, &c. all books printed in their behalf.

The meeting of ſufferings is held every week, and conſiſts of the correſpondents for each county.—Its buſineſs is to receive complaints from ſuch as have ſuffered for non-payment of tithes and rates, and to procure them relief, either by ſending them money, for which they have a ſettled fund, or by ſolliciting their cauſes above, or both.

QUALIFICA'TIONS *of members of parliament.* A knight, baronet, or any other under the degree of a baron, may be elected knight, citizen, or burgeſs.

An alien, though made a denizen, cannot ſit in parliament; even perſons naturaliſed by act of parliament are uſually reſtrained from ſitting as members. Perſons under the age of twenty-one years are not capable of being elected members of parliament. The election is void, and minors, though choſen, preſuming to ſit and vote, are under the ſame penalties as if they had ſat and voted without being choſen.

None of the judges of the King's-bench, Common-pleas, or barons of the Exchequer, that have judicial places, can be choſen knights, citizens, or burgeſſes of parliament. 4 Inſt. 47.

None of the clergy can be elected knight, citizen, or burgeſs of parliament; becauſe they are of another body, the convocation.

A perſon attainted of treaſon or felony is not eligible; for he ought, according to the writ, to be idoneus, diſcretus, & ſufficiens.

The king cannot grant a charter of exemption to any man, to be freed from election of knight, citizen, or burgeſs of the parliament.

For the incapacities of ſheriffs, mayors of towns, and the reaſons why they may or may not be elected knights, citizens, or burgeſſes, *vid.* 4 *Inſt.* 48. *Bro. Abr. Tit. Parliament. Cromp. Juriſd.* 3. 16. *Ruſhw. Collect. Townſh. Coll.*

QUA'LITY *of curvature,* in geometry, is uſed to ſignify its form, as it is more or leſs inequable, or as it is varied more or leſs in its progreſs through different parts of the curve.

QUA'NTITY (*Dict.*)— Mr. Machin, in the poſtſcript to the ſolution of Kepler's problem, inſerted in the *Phil Tranſ.* N°. 474, ſays, That he takes a mathematical Quantity, and that for which any ſymbol is put, to be nothing elſe but number with regard to ſome meaſure which is conſidered as one. For we cannot know preciſely and determinately, that is, mathematically, how much any thing is but by means of number. The notion of continued Quantity, without regard to any meaſure, is indiſtinct and confuſed; and although ſome ſpecies of ſuch Quantity, conſidered phyſically, may be deſcried by motion, as lines by points, and ſurfaces by lines, and ſo on; yet the magnitudes or mathematical Quantities are not made by that motion, but by numbering according to a meaſure.

Accordingly, all the ſeveral notations that are found neceſſary to expreſs the formations of Quantities, do refer to ſome office or property of number or meaſure; but none can be interpreted to ſignify continued Quantity as ſuch.

Thus ſome notations are found requiſite to expreſs number in its ordinal capacity, or the numerus numerans, as when one follows or precedes another, in the firſt, ſecond, or third place from that upon which it depends; as the Quantities x', x'', x, x', x'', referring to the principal one x.

So, in many caſes, a notation is found neceſſary to be given to a meaſure as a meaſure; as, for inſtance, Sir Iſaac Newton's ſymbol for a fluxion $\dot{x}$; for this ſtands for a meaſure of ſome kind, and accordingly he uſually puts an unit for it, if it be the principal one upon which the reſt depend.

So ſome notations are expreſly to ſhew a number in the form of its compoſition, as the index to the geometrical power x^n, denoting the number of equal factors which go to the compoſition of it, or what is analogous to ſuch.

But that there is no ſymbol or notation but what refers to diſcreet Quantity, is manifeſt from the operations, which are all arithmetical.

And hence it is, there are ſo many ſpecies of mathematical Quantity as there are forms of compoſite numbers, or ways in the compoſition of them; among which there are two more eminent for their ſimplicity and univerſality than the reſt; one is the geometrical power, formed from a conſtant root; and the other, though well known, yet wanting a name, as well as a notation, may be called the arithmetical power, or the power of a root uniformly increaſing or diminiſhing.

QUA'RRY, (*Dict.*)— For Quarries of free-ſtone, they firſt open a hole in manner of a well, twelve or fourteen feet in diameter; and the rubbiſh, drawn out with a windlaſs in large oſier baſkets, they heap up all around; placing their wheel, which is to draw up the ſtones, thereupon.

As the hole advances, and their common ladder becomes too ſhort, they apply a particular ladder for the purpoſe—When they have got through the earth, and are arrived at the firſt bank, or ſtratum; they begin to apply their wheel and baſkets to diſcharge the ſtones as faſt as they dig through them.

They uſually find ſeven of theſe different ſtrata, or beds of ſtones, of different heights, and ſerving for different purpoſes; though the number, as well as order wherein they follow, is various.

As to the drawing of the ſtone, i. e. the freeing it from the bed, they find that common ſtones, at leaſt the ſofter kinds, as they lie, have two grains; a cleaving grain running parallel with the horizon, and a breaking grain perpendicular thereto.—After uncoping, i. e. clearing the earth from off it, they obſerve by the grain where the ſtone will cleave, and there drive in a good number of wedges till they have thus cleft it from the reſt of the rock.

This done, they proceed to break it: in order to which, applying the ruler to it at both ends, (ten, e. gr. or twelve inches apart, according to the uſes the ſtone is intended for) they ſtrike a line, and by this cut a little channel with their ſtone-ax; and in the channel ſet five or ſix wedges (ſuppoſing the ſtone three or four feet) driving them in very carefully, with gentle blows, and ſtill keeping them equally forward.

Having thus broke the ſtone in length, (which they are able to do to half an inch of any ſize) applying a ſquare to the ſtraight ſide, they ſtrike a line, and proceed as before to break it in breadth.

This method of drawing is found vaſtly preferable to that where the ſtones are broken at random.—One load of the former is found to do the buſineſs of a load and an half of the latter.

But it may be obſerved, that, this cleaving grain being generally wanting in the harder ſtones, to break up theſe in the Quarries, they have great heavy ſtone-axes wherewith they work down a deep channel into the ſtone, and into this channel, a-top, lay two iron bars, driving their iron wedges between theſe bars.

Some in drawing of ſtone, eſpecially the very hard kind, make uſe of gun-powder, and with very good effect.—In order to which, making a ſmall perforation pretty deep into the body of the rock, ſo as to have that thickneſs of rock over it judged proper to be blown up at once; at the farther end of the perforation they diſpoſe a convenient quantity of gun-powpowder, filling up all the reſt with ſtones and rubbiſh ſtrongly rammed in, except a little ſpace for the train. — By this means is the rock blown in ſeveral pieces, moſt of them not too unweildy for a workman to manage.

In ſeveral parts of England we find ſea-ſhells buried in hard ſtone, and under great beds of earth.

Near Broughton, in Lincolnſhire, all the Quarries abound with them. At the eaſt end of the town there is a Quarry of a ſoft ſtone, which they dig through to get at a bed of clay, which is of peculiar glutinous quality, and hardens like mortar in drying; this is uſed for cementing other ſtones together, and in this are innumerable fragments of ſhells of cockles, ſcallops, ſea-echini, and corals; and among theſe fragments there are found ſome whole ſhells of their natural colours, and often wholly unhurt; though ſome of them are bruiſed and preſſed quite flat by the great weight of earth that lies upon them. On the ſouth ſide of the town there is a Quarry of a blue ſtone, which was doubtleſs in the times before the deluge a blue clay, of the ſame nature with that juſt mentioned. This contains in its body vaſt numbers of the ſame ſorts of ſhells, and of many other kinds; but they are all ſo firmly bedded in the ſtone, that it is not eaſy to get them out whole: but there is this very remarkable, that they only lie in the ſuperficial part of the ſtone, the ſtratum being very thick, but not one ſhell found in it beyond the depth of two feet from the ſurface.

The ſurface of this ſtratum of ſtone is not even and ſmooth, but is waved and ridged irregularly, like a bed of ſnow, or like the waves of the ſea in the time of a ſmall wind. This has juſt the appearance that the ſurface of a maſs of half hardened matter muſt have, if the wind blew fiercely upon it from one quarter; and, by the direction of theſe undulations, it is eaſy to ſee from what quarter the wind blew at that time. In that part of the ſtone which forms this undulated roughneſs, there are as many ſhells as any where elſe; and theſe lie partly buried and partly ſtanding out of the ſtone, juſt as we ſee the freſh-water ſhell-fiſh lie half in and half out of the mud of the bottom of a pond or river that is dried up in ſummer.

It is very obſervable, that, in this caſe, as much of the ſhell as is within the ſtone is perfectly well preſerved, and as hard as ſtone; whereas that part which ſtands out is either wholly decayed, or at the beſt of the nature of a rotten ſhell, which falls to pieces on being touched with the hands. The part of the ſhell within the ſtone is uſually converted into a maſs different from the ſhell in all things but figure; but that which ſtands out always preſerves the true texture of the natural ſhell, and is made up of many flakes and cruſts as the natural ſhells of the kind to which it belongs are.

Among the ſhells buried in the ſubſtance of the ſtone, ſome have their ſhell perfect on them, others have only a thin cruſt of a whitiſh ſtony matter in the place of it, and others are wholly naked, and have no ſhell nor any covering at all: theſe are properly only caſts of ſtone in the places where ſhells once were, all the matter of the ſhells themſelves having been diſſolved and waſhed away. In ſome of theſe there is a thick white ſubſtance in the place of the ſhell, between the caſt and the bed of ſtone: theſe come out the moſt eaſy and perfect of any, and the matter which ſupplied the place of the ſhell remains faſtened to the bed of the ſtone; others ſeparate themſelves very perfect after froſty nights.

Some of the cockles and other bivalves are found cloſed, others are found half open, as ſhell-fiſh naturally open their ſhells when deſerted by the water. In theſe the cavity is always filled with the matter of the ſtratum, and both petrified together. In ſome places they lie in heaps together in the ſtone, and there they uſually enter into and injure one another. Some are found ſhut ſo cloſely, that the matter of the ſtone-bed could not get into their cavity; and, of theſe, ſome are at this time wholly empty, others are filled, or partly filled, with cryſtals and ſpars: theſe bodies muſt have been in them only from the cryſtalline and ſparry matter riſing through the earth in vapour, and penetrating the very ſubſtance of the ſhells after their being lodged in the ſtone.

In this Quarry there is alſo found a very remarkable ſhell, reſembling a ram's horn, bent in the ſame manner, and with the ſame lineations. This is wholly different from the common cornu ammonis claſs, and has an operculum to cloſe its mouth with, in the manner of the wilks and other ſuch ſhells. This operculum is often found entire with the ſhell, or near it, in the ſame bed of ſtone.

This ſpecies of foſſil ſhell is found in prodigious numbers together, and uſually lies near the ſurface of the bed of ſtone, a part being buried in the ſtone, and a part ſtanding out of it; many of them ſtand more than half-way out, and the ſhell of theſe is ſo much more durable than that of the common kinds, that it is uſually very firm and ſtrong, even in ſuch places where the other kinds moulder all away. Theſe are uſually found entire, but in ſome places they are cruſhed flat, and otherwiſe bruiſed and injured.

From theſe and the like obſervations made on the whole ſurface of the earth, and to great depths in its bowels, wherever men have dug on any occaſion, ariſe plain proofs of the univerſality of the deluge; and from many of theſe obſervations it ſeems very plain, that in the time of the deluge the earth ſuffered great violence in many parts, that the bottoms of ſeas were in ſome places raiſed into mountains, and in others the tops of mountains ſunk into ſeas, and the beds of ſhells ſtill preſerved in the foſſil world were very often cruſhed and bruiſed by large maſſes of earth and pieces of rock thrown upon them.

Some think that it appears from the conſideration of the Quarries and ſtrata of earth, &c. in the preſent world, that the antediluvian earth had ſeas and ſhores, mountains and plains, rivers and vallies, as ours has; and that waters from within the earth were let out upon its ſurface, and the whole cruſt of the then world ſubſided under theſe; that the contents of the ſeas, ſuch as ſhells, corals, and the like, were after this toſſed variouſly about over the ſurface of this drowned world, and left in different parts of it; and that this preſent earth afterwards partly aroſe out of the common flood, as iſlands are now formed in ſome ſeas, and partly was deſerted by the waters, when called off again by the ſame almighty hand that brought it on: and, as the ſtrata of the earth were at that time ſoft, it is no wonder that matter then ſoft enough to let in the ſhells, &c. afterwards hardened, together with the ſhells it had received, into ſtone; and that in proceſs of time the ſtony particles, eternally floating in the air and waters that pervade all the ſtrata, depoſited their ſmall parts in the interſtices of theſe ſhells, and finally the whole became ſtone.

It is no wonder that all ſorts of marine productions, ſhells, parts of ſea-fiſhes, corals, and the like, are found at this time in beds and Quarries, in hills and mountains, and alſo in the bowels of the earth; for it is certain that they were produced in the antediluvian ſea, and were either elevated with the hills and mountains in the time of the deluge, or they fell into holes, clifts, and chaſms in the earth, which muſt be formed in vaſt numbers during the time of that terrible cataſtrophe, and in theſe they remain buried to this time; while others, lodged on what was then the ſurface, became afterwards covered with more ſtrata, depoſited from what was ſtill ſuſpended in the waters, and ſo were buried at great depths from the preſent ſurface; when others rolling about among the laſt ſediments of the ſame waters, while yet ſo unfixed as to be carried away with their violence, were finally left on or near the ſurface.

The Quarries about Broughton ſeem to have been but little diſturbed, and to have been originally the mud which formed the bottom of ſome large freſh-water lake; for the ſhells, found in greateſt plenty of all there, are freſh-water ſhells. Theſe ſeem to have remained in their original mud while turned to ſtone; and the other ſhells, natives of the ſea, which are buried there among them, ſeem to have been ſome of that immenſe number and variety that muſt have rolled along the bottom of that bed of waters; and the viſcid nature of the clay detained many of theſe among its own proper inhabitants, and preſerved them together in its ſtrong ſtate.

Beſides the parts of animals, theſe Quarries have vegetable matters alſo in them: the leaves and branches of whortles are not uncommon, and pieces of wood turned black and reſembling charcoal are alſo found there. Theſe have been preſerved in the ſame manner with the leaves of fern on the ſlate of our coal-pits, and the plants and fiſhes found in hard ſtone in many of the German mines. Many of theſe vegetable remains are alſo found in looſe nodules of ſtone reſembling pebbles: theſe are not leſs eaſily accounted for than the reſt; for it is not ſtrange to conceive, that leaves and pieces of plants might be, in that general confuſion, received into lumps of clay, which might afterwards be rolled into roundneſs by the motion of the water, and finally received into chaſms of the earth, and there petrified. *Phil. Tranſ.* N°. 266.

QUA'RTAN (*Dict.*)—*Continual* QUARTANS, in medicine, the name given to a ſpecies of compound fever, which has the paroxyſms of a common Quartan; but in which the heat never goes wholly off, but continues till the time of the ſucceeding fit. In all reſpects, except the regular returns of the paroxyſms, this diſeaſe greatly reſembles a hectic.

Signs of it. Every fourth day there is a regular paroxyſm, which begins with a coldneſs and ſhivering: this, however, does not return exactly to an hour, as the ſimple Quartan does in its fits; but uſually the ſucceeding fit anticipates the time of the former. When the cold fit is over, there comes on a violent day burning; the heat is much greater the firſt day than the ſucceeding ones, but continues in ſome degree till the fourth day, when the cold fit returns again, and the patient is ſeldom able to keep long together out of bed in the whole time. There is a continual thirſt, and dryneſs of the mouth, and the ſaliva is very little in quantity and very frothy; the appetite is bad, and the patient has uſually more inclination to ſalted and cold foods than any other; the head is diſordered rather than aking, and there is a continual deſire to ſleep, but what ſleep the patient has, is troubled and unſound, and gives very little refreſhment; the urine, during the whole courſe of the diſeaſe, reſembles, that of hectical patients, and is reddiſh and turbid, depoſiting, after a time, a roſe-coloured ſediment.

Perſons ſubject to it. This diſeaſe is frequently brought upon perſons who have had a common Quartan, by the injudicious treatment of that diſtemper, and particularly by the taking hot medicines in it before the approach of the fit; the too free uſe of aſtringents has alſo in many caſes changed that diſeaſe into this. People of a middle or more advanced age are more ſubject to it than youth; and, of theſe, ſuch are principally ſeen to be afflicted with it, as are of a melancholic habit and ſedentary life.

Prognoſtics in it. This diſeaſe, though in itſelf leſs dangerous than many others, yet very eaſily changes, under improper management, into a hectic, and ſometimes into a dropſy. This is the caſe not unfrequently, when it is treated with large repeated doſes of aſtringents; on the other hand, when it is treated with vomits and a hot regimen, it eaſily paſſes into an acute and dangerous inflammatory fever.

Method

Method of cure. Towards the time of the fit there should be given powders composed of the digestive salts, such as vitriolated tartar, with crabs-eyes, saturated with lemon juice. So long as the heat continues violent, the person is to be kept quiet, and to drink plentifully of warm and weak liquors; and in the following days, when the heat is observed to be decreased, gentle purges are to be given, with gentle aperitives and resolvents, such as the decoctions of dandelion and succory roots; and, towards evening, a gentle dose of some anodyne, as the storax pill and the like. The common violent methods by vomits, bleeding, stimulating purges, and hot alexipharmics, have no place in the cure of this disease; but, on the contrary, violently disturb nature, and add to the complaints. Absorbents in large quantities are also to be avoided, lest the viscid matter which is the cause of the disease should be increased by their effects: and, when the patient is happily cured, he is not immediately to abstain from medicines, since relapses are very frequent. Digestives and stomachics, taken for some weeks after, is the way to prevent them. *Junker's Consp. Med.*

QUARTA'RIUS, a measure among the antients, being the fourth part of a sextary, and nearly equal to a quarter of a pint of our wine-measure.

QUA'RTER-*chord*, in mining, is seven yards and a quarter, which the miner hath cross-ways of his vein on either side, for liberty to lay his earth, stones, and rubbish on, and to wash and dress up his ore. *Houghton's Compl. Miner in the Explan. of the Terms.*

QUARTER *of a ship*, is that part of the ship's hull which lies from the steerage room to the transom.

Close-QUARTERS, in a ship, those places where the seamen quarter themselves, in case of boarding, for their own defence and clearing the decks.

QUA'RTERING *the men*, in the sea language, the disposing of the ship's company at the time of an engagement in such a manner, that each may know where his station is, and what he is to do: as, some to the master, for the management of the sails; some to assist the gunners, to traverse the ordnance; some for plying the enemy with small shot; some to fill powder in the powder-room; others to carry it from thence to the gunners in cartridges, &c.

QUEEN-*bee*, a name given by late writers to what used to be called the king-bee, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every swarm, and which is always treated with the greatest respect by the rest.

This is, indeed, the parent of the swarm, and from the fecundity of this one female, a whole hive is easily and soon re-peopled.

It is to be observed, that the autumn and winter seasons destroy a great number of the bees; so that a hive, which was full in the summer, is often found so thinly peopled before the end of winter, that the bees seem only a few inhabitants in a very large city: by Midsummer again this same hive shall, however, be found so well filled with inhabitants, that there shall be a necessity of sending out a colony in the name of a new swarm, and yet the hive will remain as full as it can well hold. This increase might well appear very amazing, if all the remaining bees of the hive were supposed to be females, and to join in it; but how much more so when it must be acknowledged, that it is all owing to one female, and that this Queen-bee, or bee-mother, alone, has given origin to such an immense progeny?

The form of this bee, and there being only one such in a hive, naturally led all who saw it into an opinion of something singular in its nature, and the antients determined that it must be the king over the rest: they made it an absolute monarch, and have supposed that all the business of the hive was done by its immediate orders; and that the several parties of bees allotted to work in the making the combs, in the filling their cells, in the stopping the crevices of the hives, and in carrying away the filth, &c. had all their several stations allotted them by this wise and provident monarch. This was giving great talents to the monarch-bee; but this was mere fancy, and it is plain, that, if this creature rules, it is over a people who all perfectly well know their several business: but it rather appears, that there is no sovereignty at all, but that this creature is respected in a very high degree by the rest as the common parent of the whole nation.

There were not wanting among the antients, however, some who believed this large bee to be a female, and these pretend that she brought forth only females like herself, which succeeded her in her reign. They had a very different opinion as to the origin of the common bees, not supposing them generated of animal parents like themselves, but produced out of corruption, and born of the flesh of a bull or cow. Among the later writers this opinion, notwithstanding the sanction of the poet Virgil, has been laughed out of the world; yet it was long before the true origin of bees, even after this, was known. The author of the female monarchy, though well apprized of this great bee being of the female sex, yet supposed that she only produced young ones like herself; and pretended that the common bees copulated together for the production of other bees like themselves: this, however, has been since found to be wholly erroneous, the female, or Queen-bee, giving birth to all, and these common bees being of no sex at all. Many of the authors who have not given into the idle opinion of the bees being bred of putrid flesh, have yet given them an origin not less idle and ridiculous. They pretend that the bees are exempted from the pain of producing either eggs or young; and that their offspring are formed of the juices of flowers, the different kinds, as the drones, females, &c. owing their rise to juices of different kinds. These, and a number of other false notions, have been propagated in regard to bees; but their true origin could not well be found till we were in a condition to see what passes at certain times within the recesses of the hive, which is done by the use of that excellent invention the glass hive. By this, and by the help of dissections, we may easily inform ourselves perfectly of the true state of the case. The parts of generation are the subjects of our enquiry for this purpose, and, though the bodies of these animals are so small, these are usually sufficiently large to be distinguished, often taking up more room in the abdomen than all the other parts together. Thus, if the large long-bodied bee be opened, the abdomen will be found to contain vast numbers of oblong bodies, which any one acquainted with insects will easily distinguish to be eggs: vast numbers of these are large enough to be observable by the naked eye, but, when the assistance of glasses is called in, there are discerned a vast number of other smaller eggs, which exceed all computation. It is easy to determine from this, that this creature, so long esteemed a male, is in reality a female, and is in condition to give birth to a very numerous posterity.

In order to distinguish this, however, a proper time must be chosen for the dissection, and the most proper of all is when the creature is just ready to deposit her eggs. This is in the months of April and May, and the most certain time of all is when she is in a hive where a new swarm have been received about ten days before: if she be dissected at other times, the eggs are less visible; and, particularly in winter, there requires a good glass to shew the rudiments of them. This is a disagreeable experiment, indeed, because it is always the destruction of a future swarm; all the eggs we see in the dissected female being what would have produced bees to labour for our benefit.

When the body of one of the drones is opened, there is found, instead of these vast numbers of eggs, a part seeming proper for a male organ of generation; and in the abdomen a number of vessels running in several windings and contortions, and filled with a milky humour. These seem destined for the important use of impregnating the eggs in the belly of the female, and it is very natural to determine from this that these are the males.

The common bees, when dissected, at whatever time of the year, never shew the least marks of any sex at all. The intestines of these bees are found at times to be more or less distended with honey, and with rough wax; but there are never discovered any eggs, nor any of the winding seminal vessels, so that it is plain they have no share in propagating the species: and the observation of the swarms from time to time, with the assistance of glass hives, gives proof to what the dissections seem to make sufficiently certain without this evidence.

The female bee resides within the center of the hive, always living in one of the spaces between the combs; if she occasionally comes out to the surface, and is seen walking over the edge of a comb, she is to be well observed at those times; for her only business is the laying her eggs in some of the empty cells of that part of the comb, which done, she always retires again.

In order to see the female, or mother bee, employed in this operation, we are to observe in the morning hours, between seven and ten, what passes in a glass-hive into which a swarm have been received a few days before. The speed with which the common bees labour in making their combs on this occasion is almost incredible, and they seem not only to labour to have cells to deposit their honey in, but to know that the parent bee is at this time loaded with eggs for the production of a numerous progeny, and that she has an immediate necessity of cells for the depositing them in. This necessity is so urgent, that she is often forced to deposit them in cells not yet finished; though the bees labour so vigorously, that they often will erect a whole large comb in one day. If the hive be narrowly watched at these times in the morning hours, the female bee will be soon found employed in her work, and will be seen dropping her tail by turns into several cells every day. If the combs be examined a day or two after this, they will also be found to contain the eggs; one of these is placed in each cell, and appears in form of an oblong white body, fixed either to the solid angle of the base, or to one of the angles composed by the rhombs which form the triangular base of the cell, and is always attached in such a manner, that it lies nearly in an horizontal position.

The flat glass hives are the most favourable for the making these observations, since in those the combs are so narrow and so numerous, that the whole is taken in view at a time, from one side or the other; and there are always several combs to be made choice of for the operation; in the morning hours of April and May, the female mother-bee will be usually seen walking

walking very foberly over one or other of thefe combs, attended by a guard of about twenty of the common bees, all placing themfelves in fuch a manner, that their faces are turned towards her, and all paying her the greateft marks of homage and adoration. As fhe walks along in this ftate, fhe examines every cell as fhe paffes over, and fuch as fhe finds yet empty, and fit for her purpofe, fhe refts at: and, introducing the hinder part of her body at the top, plunges it fo deep in that her tail touches the bottom. Then fhe depofits one egg and no more, and this is at that time covered with a glutinous matter, which faftens it to the place where it is laid: from this cell the female paffes to feveral others, where fhe depofits her eggs in the fame manner.

Some authors who have written of the polity of bees, have reprefented the time of the female bee's laying her eggs as a feafon of feftivity and rejoicing in the hive; but this does not at all appear to be the cafe; the few bees which attend her on this occafion feem the only ones that know any thing of the matter, and their behaviour favours more of homage and refpect than of joy: they are continually ftroking and brufhing her clean with their legs and with their trunks, and offer her from their own mouths the fineft honey, when fhe has occafion for food. The reft are all employed in their proper offices, and the work of the hive goes on as ufual; and, indeed, it is well that it does fo, for this time of rejoicing would be of very bad confequence to the affairs of the hive, if carried on as fuppofed, fince the female bee is thus employed, more or lefs, during the whole fummer months.

When the female bee has laid fix or feven eggs, fhe always takes a time of refpite or repofe; and, during this time, the bees which form her levee are doubly bufy in their careffes, fome brufhing her head and breaft with their trunk, but feveral being always employed together to cleanfe the hinder rings of the body, which have been fouled by being thruft into the cells. When this is done, fhe begins again; but Mr. Reaumur obferves, that he never could fee a female lay more than ten or twelve eggs at one time: he fuppofes that his prefence difturbed the creature, and finally drove her into the inner parts of the hive, where fhe might continue her works in cells lefs expofed. It is not difficult to compute the number of eggs which the female lays every day, from the fwarm which is ready to leave the hive at the end of May: this fwarm ufually amounts to at leaft twelve thoufand, and, as the hive out of which thefe depart is not the lefs peopled by their lofs, it is evident that they were all the produce of the eggs depofited by the female in the preceding months of April, with a part of March, and a few of the firft days of May. On a moderate computation on thefe principles it will appear, that the female bee cannot lay lefs than two hundred eggs every day, for a long fpace of time together; and this, though feemingly a monftrous increafe, is yet much lefs than that of fome other of the winged infects, in one of which, a two-winged fly, that author counted no lefs than twenty thoufand living worms, all ready to be depofited by the parent, and to become flies of the fame kind.

It has been ftrongly objected againft this fyftem, that, though the female bee lays eggs, fhe is not the only one that lays; and many will not give up the opinion of the common bees alfo laying fome eggs, though but a few in number; obferving, that, if each of thefe lay only four or five eggs, it would be enough to give birth to a whole fwarm, without fuppofing that this prodigious fœcundity belonged to the female bee alone: but this is running into the old error of the female producing only females like herfelf; whereas, if we obferve the cells in which we fee the female depofit her eggs, we fhall in the fequel find the common bees produced from thefe eggs, and iffuing out of thefe cells: this is a fufficient proof to any fair reafoner, fince it appears very plain, that, if the female produces them, they do not produce one another. It is alfo evident, that not only thefe common or working bees, but alfo the drones, or male bees, are produced from the eggs of this fame female; and there is this remarkable forecaft in the female, that fhe always depofits the eggs which are to give origin to thefe, in peculiar cells, proper for the reception of the worms which are to be hatched from them. It is obferved, in examining a hive, that there are always fome combs, or fome parts at leaft of combs, the cells of which are much larger than thofe of the other parts or combs: thefe large cells are deftined for the refidence of the larger worms, which are to produce the drones or male bees. It has been obferved as a miraculous fingularity by fome, that the female bee always knows before-hand, whether the egg fhe is going to lay will produce a male or a common bee; and that, according to this knowledge, fhe never depofits the eggs for a male in a fmaller cell, nor that of a common bee in a large one; but there is, in reality, lefs wonder in this than is fuppofed, for the eggs of which the drones are to be hatched are much larger while in the body of the female than thofe of which the common bees are to be produced, and the whole occafion of this choice in regard to the placing of them is, that, when the creature finds a large egg coming forth, fhe feeks one of the large cells to depofit it in; and, when the common fmall eggs are coming, fhe contents herfelf with the common cells.

It is very natural to believe, that the female bee lays a third kind of eggs; and that, befides producing many thoufand common, or working bees, and many hundreds of the males or drones, fhe ought to lay one egg at leaft capable of producing a female like herfelf, which is to be the mother of a future progeny, and the Queen of the prefent race; fince, without fuch a one for their leader, the young brood would never leave the hive in the nature of a colony, and fettle themfelves elfewhere. What we thus perceive ought to be the cafe, is alfo found in reality to be fo, and the female, befides the other kinds of eggs, is found by a ftrict obfervation to lay alfo eggs of this kind. We might perhaps only expect one female bee to be produced for each fwarm, but, as nature has feemed everywhere prodigal in the manner of the increafe of her works, fo it is in this cafe alfo. What millions of feeds are produced on a common elm-tree, for one that ftrikes and fucceeds fo well as to grow up to be a tree? And, of the number of young produced from the fpawn of a carp, how few live to the fize of a parent? Thus it alfo is in regard to the female bees: nature, though it has allotted only one of this kind, as abfolutely neceffary to the new fwarm, yet has given abundance of chances for that one to fucceed, by the female's ufually laying at leaft ten eggs for the production of the female offspring, and often not lefs than twenty: there are, indeed, fome feafons when not one female is produced; but in thefe feafons there is no fwarm going out from the old hive, the creatures being informed by nature, that they have no bufinefs for combs and cells when they can have no offspring to rear in them.

The working bees are not only very obedient to, and very careful of their Queen, or female parent; but they are alfo very follicitous about her progeny. This is very evident in the ftructure of the cells, which they prepare for the reception of thofe eggs which are to be hatched into females. It has been before obferved, that they prepare larger cells for the eggs which are to become drones, or male bees, than for thofe which are to produce workers like themfelves. The large cells deftined for the drones are, however, of the fame fhape and figure with the others, differing only in fize; but this is not the cafe with thofe deftined for the female offspring: thefe are not only very large, but very clumfily contrived, for the fake of ftrength; their fides being much thicker than thofe of the reft, and their figure oval. The bees are extremely fparing of their wax on all other occafions, but for the conftruction of thefe royal cells, as they may not improperly be called, they are as remarkably profufe: one of the royal cells will weigh more than an hundred and fifty of the common kind. The bees are no more fparing of the room than of the materials in the conftruction of thefe royal habitations: they are often placed near the center of a comb, and a vaft number of other cells are deftroyed for their bafe; often alfo they hang down from the reft of the comb, in form of ftalactitæ from the roofs of fubterraneous caverns.

A cell of this kind, when firft formed, reprefents an acorn cup; but it is foon lengthened beyond the poffibility of retaining that figure, and it remains thus till the creature is hatched from the chryfalis or nymph ftate, and comes out of it; after which the bees, to lofe no room in the hive, form other common cells upon it, and the only remaining mark of the female cell, is the appearance of a knot in the place where it once ftood.

The number of cells deftined to receive the eggs which are to produce female bees are fo few, and they are commonly placed in fuch clofe parts of the hive, that there is no great probability of the feeing the female employed in laying her eggs in them: there is no reafon to doubt the fact, however, fince, when we know that fhe lays eggs for the production of the male and the working bees, there is no wonder that fhe fhould alfo lay fome for the production of females like herfelf.

It might feem much harder to conceive how fo vaft a number of bees fhould be produced from this one, as we know are produced from her; but, when one of the females is opened, the vaft number of eggs difcovered in each of her ovaries makes the prodigious increafe no way wonderful.

Swammerdam obferved, that the number of veficles in the ovary of the female bee was aftonifhingly great; he eafily counted an hundred and fifty in each ovary, and could count about feventeen eggs in each veficle large enough to be diftinctly vifible; each ovary contains, therefore, two thoufand five hundred and fifty eggs, and both ovaries five thoufand one hundred. When we find fo many eggs at once diftinguifhable by their fize, it will be eafy to conceive, according to the common courfe of nature in the propagation of infects, that there may be more than as many too fmall to be yet diftinguifhable; and, at that rate, the number of twelve thoufand bees, which is the quantity that compofes a moderate fwarm, is not wonderful for the product of the eggs of one female for one feafon. *Reaumur's Hift. Inf.*

QUE'RCUS, *the oak*; fee the article OAK.

QUERCUS *marina*, *the fea oak*, in botany, the name of one of the broad-leaved dichotomous fea-fucufes.

It is not agreed among the late botanifts what was the fea-oak of Theophraftus; and the moft ancient botanifts, Clufius and Cæfalpinus, fuppofe it to have been a fpecies of the fhrubby coralline; but that feems by no means to have been the cafe, fince Theophraftus fays his fea-oak had a long, thick, and flefhy fleshy leaf, when we may more naturally conclude it to have been of the fucus class. *Park. Herb.* 294. *Gen.* 1378, *&c. Dale, Pharmac.*

QUERQUE'DULA, in zoology, the name by which authors call the teal.

This is the smallest of all the duck kind. Its beak is black, and its head and the upper part of its neck of a reddish brown; but there runs on each side of the head a green streak from behind the eyes quite to the back park, and between these there is a black spot under the eyes; there is a white line which separates the reddish colour from the green. The lower part of the neck, the shoulders, and the sides are very beautifully variegated with black and white streaks. The breast and belly are of a dusky greyish white. The wings have some white in them, and the legs are of a pale brown. There is a black spot on the rump in the male, which is wanting in the female. The head also in that sex is less beautifully coloured. *Ray's Ornithol.*

QUERQUEDULA *cristata*, the crested teal, given by Bellonius and some others to a species of duck, remarkable for a tuft of feathers of an inch and a half long, hanging down from the back part of its head, and thence called the tufted duck, but more known among authors by the name capo negro. *Bellonius de Avib.*

QUICK.—By the word Quick are generally understood all live hedges, of whatever sort of plants they are composed, to distinguish them from dead hedges: but, in the more strict sense of this word, it is applied to the hawthorn, or mespilus sylvestris; under which name the young plants, or sets, are commonly sold by the nursery gardeners, who raise them for sale.

In the choice of these sets, those which are raised in the nursery, are to be preferred to such as are drawn out of the woods; because the latter have seldom good roots; though, as they are larger plants than are commonly to be had in the nursery, many people prefer them on that account: but from long experience I have found, that those hedges which have been planted with young plants from the nursery, have always made the best hedges. Indeed, if persons would have patience to wait for these from seed, and to sow the haws in the place where the hedge is designed, these unremoved plants will make a much stronger and more durable fence, than those which are transplanted: but I am aware that most people will be for condemning this practice, as being tedious in raising; but, if the haws are buried one year in the ground, to prepare them for vegetation; before they are sown, it will not be so long before this will become a good fence, as is generally imagined. Nay, from some trials of this kind, which I have made, I have found, that those plants which have remained where they came up from seed, have made such progress as to overtake, in six years, plants of two years growth, which were transplanted at the time when these seeds were sown.

And, if the hedges are raised from seed, it will not be amiss to mix holly berries with the haws, and, if so, these berries should also be buried one year, to prepare them, so that then both will come up together the following spring; and this mixture of holly with the Quick will not only have a beautiful appearance in the winter, but will also thicken the hedge at the bottom, and make it a better fence.

But, where the hedge is to be planted, the sets should not be more than three years old from the haws; for, when they are older, their roots will be hard and woody; and, as these are commonly trimmed off before the sets are planted, so they very often miscarry; and such of them as do live, will not make so good progress as younger plants, nor are they so durable; for these plants will not bear transplanting so well as many others, especially when they have stood long in the seed-bed unremoved. *Miller's Gard. Dict.*

QUI'ETISM, the sentiments of the Quietists, a religious sect which made a great noise towards the close of the last century.

Molinos, a Spanish priest, who died at Rome in the prison of the inquisition, passes for the author of Quietism; and yet the Illuminati in Spain had taught something like it before.

The name is taken from a sort of absolute rest, and inaction, which the soul is supposed to be in, when arrived at the state of perfection, which in their language is called the unitive life.—To arrive at this, a man is first to pass through the purgative way; that is, through a course of obedience, inspired by the fear of hell: hence, he is to proceed into the illuminative way, before he arrive at perfection; to go through cruel combats, and violent pains; i. e. not only the usual drinesses of the soul, and the common privations of grace, but infernal pains: he believes himself damned; and the persuasion that he is so, continues upon him very strongly several years: St. Francis des Sailes, says the Quietists, was so fully convinced thereof, that he would not allow any body to contradict him therein. — But the man is, at length, sufficiently paid for all this, by the embraces of God, and his own deification.

These sentiments of the Quietists, with regard to God, are wonderfully pure and disinterested.— They love him for himself, on account of his own perfections, independently of any rewards or punishments: the soul acquiesces in the will of God, even at the time when he precipitates it into hell; insomuch that, instead of stopping him on this occasion, B. Angelo de Foligny cried out, 'Haste, Lord, to cast me into hell: do not delay, if thou hast abandoned me, but finish my destruction, and plunge me into the abyss.'

At length, the soul, after long travail, enters into rest, into a perfect quietude.—Here it is wholly employed in contemplating its God; it acts no more, thinks no more, desires no more; but lies perfectly open, and at large, to receive the grace of God, who by means thereof drives it where it will, and as he will.

In this state, it no longer needs prayers or hymns, or vows; prayers where the spirit labours, and the mouth opens, are the lot of the weak and the imperfect: the soul of the saint is, as it were, laid in the bosom, and between the arms of its God, where, without making any motion, or exerting any action, it waits, and receives the divine graces. — It, then, becomes happy: quitting the existence it before had, it is now changed, it is transformed, and, as it were, sunk and swallowed up in the divine being, insomuch as not to know or perceive its being distinguished from God himself. *Fenel Max. des Saints.*

QUINQUEFO'LIUM, *cinquefoil*, in botany, a genus of plants, whose characters are:

The root is fibrous and perennial: the leaves grow by more than threes, at the top of the pedicle, round one center: the calyx is monophyllous, not caduceous, and, as it were octophyllous, or decaphyllous, expanded like a star, and furnished with very numerous stamina, proceeding from the compass of the base of the ovary: the flower is rosaceous, pentepetalous, and more rarely tetrapetalous, the petals standing round the base of the ovary: the ovary is a feminal head, involved in a calyx, hemispherical, and has several eggs, furnished with a long erected tube. The common cinquefoil, or five-leaved grass, has a large spreading, thick, woody root, covered with a dark-brown bark, and full of small fibres, sending forth many slender creeping stalks, which lie on the ground, emitting small fibrous roots from the joints, by which it easily propagates itself; at every joint grows the leaves, five set together upon one long foot-stalk, which are narrow, veiny, serrated about the edges, the two outermost being the shortest: amongst these come forth the flowers, consisting of five round yellow leaves, with several stamina in the middle, set, also, on long foot-stalks; and, after them, small, brown, naked seed: it grows everywhere by hedges and way-sides, flowering all summer. The leaves and root are used.

They are restringent and drying, and serviceable against all kinds of fluxes and hæmorrhages: the powder of the root, given to the quantity of a drachm, two or three times a day, is said to cure agues. The same is, also, accounted good against malignant distempers, and is an ingredient in Venice-treacle: it is frequently used in gargles for sore mouths and ulcerated gums, and to fasten loose teeth. *Miller's Bot. Off.*

QUINQUERTIO'NES, among the Romans, an appellation given to those who had gained the victory in the quinquertium or pentathlion.

QUINQUER'TIUM, among the Romans, was the same with the Grecian pentathlon, comprehending the five exercises of running, leaping, throwing, darting, and wrestling.

QUI'NTAIN, QUINTENA, in ancient customs, a post driven into the ground, with a buckler fixed to it, for the performance of military exercises on horseback, throwing of darts, breaking of lances, &c.

Math. Paris describes the Quintain as a kind of mark, formed like a man from the navel upwards, holding a shield in his left hand, and in his right a sword or stick; the whole so fitted as turn round on its foot, and so as that, a cavalier running a-tilt against it with a lance, if he hit it in the breast, it whisked round, and, unless he were very dexterous, struck him with the sword held in the other hand.

In other places, a-top of a post, was erected a slender beam fitted to turn round a spindle; at one of whose ends was a slope or flat board, and at the other a bag of sand, or dirt. — The sport was, with a long staff, or wooden lance, to ride a-tilt at the board, and to be either so skilful or lucky to escape the blow of the sand-bag.

This some take to be the same with the arietum levatio, frequently prohibited in our synods and episcopal constitutions.

The custom is still retained in Shropshire, and some other counties, among the nuptial solemnities.—He that breaks the most poles against the Quintain has the prize, which was anciently a peacock, now a garland.

Some derive the word from an ancient game called quintus; others from a man of the name Quintus.

The Vallus and Passus, mentioned in Cæsar, are taken, by Vigenere, for a kind of Quintain, or wooden man fixed up as an adversary, or man of straw, to prove one's dexterity against.

Mention is made of this exercise in the code, de aleatoribus, and in the paratitles of Cujas on the same — Juvenal speaks of women engaging therein:

Aut quis non vidit vulnera Pali?

QUINTAIN was also a right which the lord had to oblige all the millers, watermen, and other young people unmarried, to come

come before his caſtle every three years, and break ſeveral lances, or poles, againſt a poſt, or wooden man, for his diverſion.

QUINTE'SSENCE (*Dict.*)—QUINTESSENCE *of wine*, a term uſed by Glauber, to expreſs an eſſential oil of wine, which he directs to be made by a careful diſtillation, and which he is very fond of, as having a power to meliorate, improve, and even to ſpecificate the poorer wines into the nature of thoſe from which it was obtained.

This is one of the ſchemes of Glauber, generally eſteemed an impracticable one, though very plauſible in theory; but though, in general, there is a diſagreeable flavour in the Quinteſſence drawn after this method, which is different from the true flavour of the wine, and ſpoils the liquor it is added to; yet, by proper care, there is a poſſibility of ſucceeding ſo far as to render this extraneous flavour almoſt imperceptible, and produce an oil that will mend poor wines extremely, and give a truly vinous flavour to ſuch as are in themſelves taſteleſs; but whatever may be done by this method, may alſo be done with much more certainty, and much leſs trouble, by the concentration of wines by freezing. This may be eaſily practiſed in the wine countries; and by this means Burgundy, Champaign, and other the moſt valuable wines, may be reduced into thick extracts and robs, by the means of which wines may be made in England; a very ſmall quantity of theſe concentrated wines being ſufficient to convert the whole of any of the poor taſteleſs and inſipid wines, which are of themſelves of little or no value, into the very wine from which the rob was made, and that in ſuch perfection, that the niceſt judge cannot find out the difference.

Theſe robs of wine, made and preſerved upon the ſpot, would alſo be of infinite uſe, in the wine countries, as they might be kept to improve the wine of bad years. *Stahl, de Concentr. Vin.*

QUOD (*Dict.*)—QUOD *ei deforceat*, in law, a writ for tenant in tail, tenant in dower, by courteſy, or for term of life, having loſt their lands by default againſt him that recovers or his heir.

QUOD *permittat*, in law, a writ that lies where a man is diſſeized of his common of paſture, and the diſſeizor aliens, or dies ſeized, and his heir enters; then, if the diſſeizee die, his heir ſhall have this writ.

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RA'BBIT, *cuniculus*, in zoology, a well known animal of the hare kind.

The female or doe Rabbit goes with young thirty days, and then ſhe kindles; and, if ſhe take not buck preſently, ſhe loſes her month, or at leaſt a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in ſome places much ſooner; and they continue breeding very faſt from the time when they begin, four, five, ſix, or ſeven times a year being common with them. They have uſually from four to ſeven in a litter, and hence it is that a ſmall number at firſt will ſoon ſtock a whole warren, if left to breed a little while undiſturbed. The does cannot ſuckle their young till they have been at buck again; this therefore is to be done preſently, elſe there is a fortnight loſt of the time for the next brood, and the preſent brood alſo probably loſt. When the buck goes to the doe, he always firſt beats and ſtamps very hard with his feet, and, when he has copulated with her, he falls backwards, and lies as it were in a trance; in this ſtate it is eaſy to take him, but he ſoon recovers from it.

The buck Rabbits, like our boar cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their ſtocks, or neſts, with gravel or earth, which they cloſe ſo artificially up with the hinder part of their bodies, that it is hard to find them out. They never ſuckle the young ones at any other time than early in the morning, and late at night, and always, for eight or ten days, cloſe up the hole at the mouth of the neſt, in this careful manner, when they go out. After this, they begin to leave a ſmall opening, which they increaſe by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out: for they are at that time grown big enough to take care of themſelves, and to feed on graſs.

People who keep Rabbits tame for profit, breed them in hutches, but theſe muſt be kept very neat and clean, elſe they will be always ſubject to diſeaſes. Care muſt be taken alſo to keep the bucks and does apart till the latter have juſt kindled, then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

The general direction for the chuſing of tame Rabbits is, to pick the largeſt and faireſt; but the breeder ſhould remember that the ſkins of the ſilver-haired ones ſell better than any other.

The food of the tame Rabbits may be colewort and cabbage leaves, carrots, parſneps, apple rinds, green corn, and vetches, in the time of the year; alſo vine leaves, graſs, fruits, oats, and oatmeal, milk-thiſtles, ſow-thiſtles, and the like; but with theſe moiſt foods they muſt always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwiſe they will grow pot-bellied, and die. Bran and grains mixed together have been alſo found to be very good food. In winter they will eat hay, oats, and chaff, and theſe may be given them three times a day; but when they eat green things, it muſt be obſerved that they are not to drink at all, for it throws them into a dropſy. At all other times a very little drink ſerves their turn, but that muſt always be freſh. When any green herbs, or graſs, are cut for their food, care muſt be taken that there is no hemlock among it, for, though they will eat this greedily among other things, when offered to them, yet it is ſudden poiſon to them.

Rabbits are ſubject to two principal infirmities. Firſt, the rot, which is cauſed by the giving them too large a quantity of greens, or from the giving them freſh gathered with the dew or rain hanging in drops upon them. It is over moiſture that always cauſes this diſeaſe; the greens therefore are always to be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moiſture of their juices. On this account the very beſt food that can be given them, is the ſhorteſt and ſweeteſt hay that can be got, of which one load will ſerve two hundred couples a year; and out of this ſtock of two hundred, two hundred more may be eat in the family, two hundred ſold to the markets, and a ſufficient number kept in caſe of accidents.

The other general diſeaſe of theſe creatures is a ſort of madneſs: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called tare-thiſtle, to eat.

The general computation of males and females is that one buck Rabbit will ſerve for nine does; ſome allow ten to one buck, but thoſe who go beyond this always ſuffer for it in their breed.

The wild Rabbits are to be taken either by ſmall cur dogs, or by ſpaniels bred up to the ſport; and the place of hunting thoſe who ſtraggle from their burrows is under cloſe hedges, or buſhes, or among corn-fields and freſh paſtures. The owners uſe to courſe them with ſmall greyhounds, and, though they are ſeldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method is by nets, called purſe nets, and ferrets. The ferret is ſent into the hole to force them out, and the purſe net, being ſpread over the hole, takes them, as they come out. The ferrets mouths muſt be muffled, and then the Rabbit gets no harm. For the more certain taking of them, it may not be be improper to pitch up a hay net or two, at a ſmall diſtance from the burrows that are intended to be hunted: thus very few of the number that are attempted will eſcape.

Some who have not ferrets ſmoak the Rabbits out of their holes with burning brimſtone and orpiment. This certainly brings them out into the nets, but then it is a very troubleſome and offenſive method, and is very detrimental to the place, as no Rabbit will, of a long time, afterwards come near the burrows which have been fumed with theſe ſtinking ingredients.

RA'CA, or RACHA, a Syriac term, found in the goſpel of St. Matthew, ch. v. 22. and preſerved in moſt tranſlations.

Father Simon obſerves that the Greek tranſlator of St. Matthew's goſpel retained the Syriac Raca which he found in the original, by reaſon it was very common among the Jews. And St. Jerom, Luther, the Engliſh tranſlators, thoſe of Geneva, Louvain, Port-Royal, &c. ſtill preſerve it in their reſpective languages.

F. Bouhours chuſes rather to expreſs the ſenſe thereof in a ſort of paraphraſe, thus: he that ſays to his brother 'homme de peu de ſene, man of little underſtanding,' ſhall deſerve to be condemned by the tribunal of the council, &c.

Moſt tranſlators, except the Engliſh, and F. Simon, for Raca write Racha: but the former orthography ſeems the beſt founded; all the copies having Raca, and all the Greek ones ῥακά, or, with Heſychius, ῥακκά, which is the ſame: all we mean, but St. Irenæus, and Beza's copy, now at Cambridge, which have ῥαχά — In effect, the origin of the word ſhews it ſhould be Raca; as coming from the Syriac ריקא, Raca, of the Hebrew רק rek, empty, ſhallow.

RACHI'TIS, in medicine, a diſeaſe generally called the rickets. See RICKETS, Dictionary and Supplement.

RA'CING, the riding heats for a plate or other premium.

The firſt thing to be conſidered in this ſort of gaming is the chuſing a rider; for it is not only neceſſary that he ſhould be very expert and able, but he muſt be alſo very honeſt. He muſt have a very cloſe ſeat, his knees being turned cloſe to the ſaddle ſkirts, and held firmly there, and toes turned inwards, ſo that the ſpurs may be turned outwards to the horſe's belly; his left hand governing the horſe's mouth, and his right the whip. During the whole time of the race he muſt take care to ſit firm in the ſaddle, without waving or ſtanding up in the ſtirrups. Some jockies fancy this is a becoming ſeat; but it is certain, that all motions of this kind do really incommode the horſe. In ſpurring the horſe, it is not to be done by ſtriking the calves of the legs cloſe to the horſe's ſides, as if it were intended to preſs the wind out of his body; but, on the contrary, the toes are to be turned a little outwards, that, the heels being brought in, the ſpurs may juſt be brought to touch the ſides. A ſharp touch of this kind will be of more ſervice towards the quickening a horſe's pace, and will ſooner draw blood, than one of the common coarſe kicks. The expert jockey will never ſpur his horſe until there is great occaſion, and then he will avoid ſtriking him under the fore-bowels between the ſhoulders and girth; this is the tendereſt part of a horſe, and a touch there is to be reſerved for the greateſt extremity.

As to whipping the horſe, it ought always to be done over the ſhoulder on the near ſide, except in very hard running, and on the point of victory; then the horſe is to be ſtruck on the flank with a ſtrong jerk; for the ſkin is moſt tender of all there, and moſt ſenſible of the laſh.

When a horse is whipped and spurred, and is at the top of his speed; if he claps his ears in his pole, or whisks his tail, it is a proof that the jockey heats him hard, and then he ought to give him as much comfort as he can, by sawing the snaffle backwards and forwards in his mouth; and by that means forcing him to open his mouth, which will give him wind, and be of great service. If there be any high wind stirring in the time of riding, the artful jockey will let his adversary lead, holding hard behind him, till he sees an opportunity of giving a loose; yet, in this case, he must keep so close behind, that the other horse may keep the wind from him; and that he, sitting low, may at once shelter himself under him, and assist the strength of the horse. If the wind happen to be in their back, a just contrary method is to be taken with it; the expert jockey is to keep directly behind the adversary, that he may have have all the advantage of the wind to blow his horse along, as it were, and at the same time intercept it in regard to his adversary.

When running on level carpet ground, the jockey is to bear his horse as much as the adversary will give him leave, because the horse is naturally more inclined to spend himself on this ground: on the contrary, on deep earths, he may have more liberty, as he will there spare himself.

In riding up hill the horse is always to be favoured, by bearing him hard, for fear of running him out of wind; but, in running down hill, if the horse's feet and shoulders will bear it, and the rider dare venture his neck, he may have a full loose. If the horse have the heels of the rest, the jockey must always spare him a little, that he may have a reserve of strength, to make a push at the last post.

A great deal depends on the jockey's knowing the nature of the horse that is to run against him, for, by managing accordingly, great advantages are to be obtained; thus, if the opposite horse is of a hot and fiery disposition, the jockey is either to run just behind him, or cheek by joul with him, making a noise with his whip, and by that means forcing him on faster than his rider would have him, and consequently spending him so much the sooner; or else keep just before him, in such a slow gallop, that he may either over-reach, or by treading on the heels of the fore horse, endanger tumbling over.

Whatever be the ground that the adversary's horse runs worst on, the cunning jockey is to ride the most violently over; and, by this means, it will often happen that, in following, he either stumbles or claps on the back sinews.

The several corrections of the hand, the whip, and the spur, are also to be observed in the adversary, and in what manner he makes use of them; and when it is perceived by any of the symptoms, of holding down the ears, or whisking the tail, or stretching out the nose like a pig, that the horse is almost blown, the business is to keep him on to this speed, and he will be soon thrown out or distanced. If the horse of the opponent looks dull, it is a sign his strength fails him; and, if his flanks beat much, it is a sign that his wind begins to fail him, and his strength will soon do so too.

After every heat for a plate, there must be dry straw, and dry cloths, both linen and woollen, ready to rub him down all over, after taking off the sweat with what is called a sweat knife; that is, a piece of an old sword-blade, or some such thing. Some advise the steeping the cloths in urine and saltpetre the day before, and letting them be dried in the sun for this occasion. After the horse has been well rubbed with these, he should be chafed all over with cloths wetted in common water till the time of starting again. When it is certainly known that the horse is good at the bottom, and will stick at the mark, he should be rid every heat, to the best of his performance; and the jockey is, as much as possible, to avoid riding at any particular horse, or staying for any, but to ride out the whole heat with the best speed he can. If, on the contrary, he has a fiery horse to ride, and one that is hard to manage, hard-mouthed and difficult to be held, he is to be started behind the rest of the horses with all imaginable coolness and gentleness; and, when he begins to ride at some command, then the jockey is to put up to the other horses; and, if they ride at their ease, and are hard held, they are to be drawn on faster; and, if it be perceived, that their wind begins to rake hot, and they want a sob, the business is to keep them up to that speed: and, when they are come within three quarters of a mile of the post, then is the time to push for it, and use the utmost speed in the creature's power. When the race is over, the horse is immediately to be cloathed up, and rode home, and immediately on his coming into the stable the following drink is to be given him: beat up the yolks of three eggs, and put them into a pint and half of new milk made warm; let there be added to this three-penny worth of saffron, and three spoonfuls of sallad oil, and let the whole be given with a horn. After this, he is to be rubbed well down, and the saddle-place rubbed over with warm sack, and the places where the spurs touched, with a mixture of urine and salt, and afterwards with a mixture of powder of jet and Venice turpentine; after this, he should have a feed of rye bread, then a good mash, and, at some time after these, as much hay and oats as he will eat. His legs after this should be bathed sometimes with a mixture of urine and salt-petre.

RA'DISH, *raphanus*, in botany, a genus of plants, whose characters are:

The flower consists of four leaves, which are placed in form of a cross: out of the flower cup rises the pointal, which afterwards turns to a pod in form of an horn, that is thick, spongy, and furnished with a double row of roundish seeds, which are separated by a thin membrane.

There are several species of Radish, but we shall only mention that which is commonly cultivated in kitchen-gardens for its root; of which there are several varieties, as the small-topped, the deep-red, and the long-topped striped Radish; all which are varieties arising from culture. The small-topped sort is most commonly preferred by the gardeners near London, because they require much less room than those with large tops, and may be left much closer together; and, as the forward Radishes are what produce the greatest profit to the gardener, so these being commonly sown upon borders near hedges, walls, or pales, if they are of the large-topped sort, they will be apt to grow mostly at top, and not swell so much in the root as the other, especially if they are left pretty close.

The seasons for sowing this seed are various, according to the time when they are desired for use; but the earliest season is commonly towards the latter-end of October, that the gardeners near London sow them to supply the market; and these, if they do not miscarry, will be fit for use in March following, which is full as soon as most people care to eat them. These (as I said before) are commonly sown on warm borders, near walls, pales, or hedges, where they may be defended from the cold winds.

The second sowing is commonly about Christmas, provided the season be mild, and the ground in a fit condition to work: these are also sowed near shelter, but not so near pales and hedges as the first sowing. These, if they are not destroyed by frost, will be fit for use the beginning of April: but, in order to have a succession of these roots for the table through the season, you should repeat sowing of their seeds once a fortnight, from the middle of January till the beginning of April; always observing to sow the latter crops upon a moist soil and an open situation, otherwise they will run up, and grow sickly, before they are fit for use.

Many of the gardeners near London sow carrot-seed with their early Radishes; so that many times, when their Radishes are killed, the carrots will remain: for the seeds of carrots commonly lie in the ground five or six weeks before they come up, and the Radishes seldom lie above a fortnight under-ground: so that these are often up, and killed, when the carrot seed remains safe in the ground: but, when both crops succeed, the Radishes must be drawn off very young, otherwise the carrots will be drawn up so weak, as not to be able to support themselves, when the Radishes are gone.

It is also a constant practice, with the gardeners, to mix spinach-seed with their latter crop of Radishes; so that, when the Radishes are drawn off, and the ground cleaned between the spinach, it will grow prodigiously, and in a fortnight's time will as completely cover the ground, as though there had been no other crop. And this spinach, if it be of the broad-leaved kind, will be larger and fairer than it commonly is, when sown by itself; because, where people have no other crop mixed with it, they commonly sow it too thick, whereby it is drawn up weak; but here the roots stand pretty far apart, so that, after the Radishes are gone, they will have full room to spread; and, if the soil be good, it is a prodigious size this spinach will grow to, before it runs up for seed: but this husbandry is chiefly practised by such gardeners as pay very dear for their land, and are obliged to have as many crops in a year as possible, otherwise they could not afford to pay such large rents.

When the Radishes are come up, and have got five or six leaves, they must be pulled up where they are too close, otherwise they will draw up to top, but the roots will not increase their bulk. In doing of this, some only draw them out by hand: but the best method is to hoe them with a small hoe, which will stir the ground and destroy the young weeds, and also promote the growth of the plants. The distance which they should be left, if for drawing up small, may be three inches; but, if they are to stand until they are pretty large, six inches are full near enough, and a small spot of ground will afford as many Radishes at each sowing, as can be spent in a family, while they are good.

Horse RADISH, a well known plant, belonging to the genus cochlearia.

Horse Radish is propagated by cuttings or buds from the sides of the old roots. The best season for this work is in October or February; the former for dry lands, and the latter for moist. The manner of doing it is as follows: provide yourself with a good quantity of off-sets, which should have a bud upon their crowns; but it matters not how short they are: therefore, the upper part of the roots which are taken up for use, should be cut off about two inches long with the bud to it, which is esteemed the best for planting. Then make a trench ten inches deep, in which you should place the off-sets at about four or five inches distance each way, with the bud upward, covering them up with the mould that was taken out of the trench: then proceed to a second trench in like manner, and continue the same until the whole spot of ground is planted. After this, level the surface of the ground even, observing to keep it clear from weeds, until the plants are so far advanced, as to be ftrong enough to over-bear and keep them down. With this management, the roots of the horfe Radifh will be long and ftraight, and free from fmall lateral roots; and the fecond year after planting will be fit for ufe. It is true, they may be taken up the firft year, but then the roots will be but flender; therefore it is the better way to let them remain until the fecond year. The ground in which this is planted ought to be very rich, otherwife the roots will make but a fmall progrefs.

Radifhes have the virtues of the fcurvy grafs; the root is efculent, expels phlegm from the inteftines, and is a carminative. The flowers, leaves, feeds, and roots are antifcorbutic; for which reafon they are much in requeft, and are proper for phlegmatic conftitutions: the expreffed juice of the roots and feeds, taken in a morning with honey, is a very wholefome medicine, efpecially if a draught of whey be taken afterwards; for it cleanfes the ftomach, kidnies, and lungs, and is good againft an inveterate cough and hoarfenefs, proceeding from phlegm; but it is not proper in a cough proceeding from an inflammation, nor for thofe who fpit blood. The leaves are ufed among other greens. The root contains much of an aqueous and acrimonious fubftance; and, the drier it is, the more acrid it becomes; but its acrimony is loft in boiling. Its aquofity renders it flatulent, on which account it is faid not to be good in hypochondriacal diforders: the daily ufe of the root, however, is of fufficient efficacy to cure a great dropfy in the beginning; and it is of excellent fervice in the fcurvy. It is alfo aperitive, inciding, and good for the ftone, the nephritic cholic, a retention of urine, and the menfes, and in the jaundice. The feeds are opening; but, taken inwardly by themfelves, they excite a naufea. *Hift. Plant. afcript. Boerhaave*.

RAGS.—In fome counties of England, particularly in Oxfordfhire, it is a common thing to ufe old woollen Rags by way of manure upon land. Taylor's fhreads anfwer this purpofe, in fome degree; but the old Rags of cloaths which have been worn by men and women, are much better, which is owing to the falts they have imbibed from the perfpiration of the body they ufed to cover. *Plot's Oxfordfhire*.

RAG-*bolts*, in a fhip, are fuch as have jags or barbs on each fide, to keep them from flying out of the hole wherein they are driven.

RAG-*ftone*, a name given by our artificers to a kind of ftone, which they ufe for fetting an edge upon knives, chiffels, and other tools. It is a greyifh-coloured ftone, containing a large quantity of talcky particles, and fplits eafily into thin flakes. It is a foft ftone, and is ufed only to finifh the fetting an inftrument after the edge has been prepared by grinding or rubbing the tool upon fome other ftone of a coarfer texture. We have this from Newcaftle and many other parts of the north of England, where there are very large rocks of it in the hills.

RAG-*wort*. — There are two or three fpecies of this plant cultivated in the gardens of the curious; and one very common in moft places, which is the maritime kind, remarkable for its white leaves. This had been long ufed to be nurfed up, with great care, in our green-houfes: but of late, fome ftraggling feeds of it having propagated themfelves on a wall, and there ftood the winter's cold without hurt, we were taught that the plant did not require the care it had been ufed to be treated with. All the kinds may be propagated by fowing their feeds in March, on a bed of light earth, watering it frequently in dry weather. In May the plants may be taken up, and planted in pots, and fet in a warm fituation till October, when the tenderer kinds are to be taken into a green-houfe.

Thefe require much pruning in fummer to keep them in fhape, for they grow very faft, and in winter will die, if they are not often watered. *Miller's Gard. Dict.*

RAIN (*Dict.*) — As to the quantity of Rain that falls, its proportion in feveral places at the fame time, and in the fame place at feveral times, we have ftore of obfervations, journals, &c. in the Memoirs of the French academy, the Philofophical Tranfactions, &c. an idea whereof will not be unacceptable. Upon meafuring, then, the Rain falling yearly, its depth, at a medium, is found as in the following table:

Depth of RAIN *falling yearly, and its proportion in feveral places.*

	Inches.
At Townley in Lancafhire, obferved by Mr Townley	42$\frac{1}{2}$
Upminfter in Effex, by Mr. Derham, — ——	19$\frac{1}{8}$
Zurich in Switzerland, by Dr. Scheuchzer, ——	32$\frac{1}{4}$
Pifa in Italy, by Dr. Mich. Ang. Tilli, —— ——	43$\frac{1}{4}$
Paris in France, by M. de la Hire, —— ——	19
Lifle in Flanders, by M. de Vauban. —— ——	24

Proportions of the RAIN *of feveral years to one another.*

At Upminfter.			At Paris.	
1700	19 Inch.	03 Cent.	21 Inch.	38 Cent.
1701	18	69	27	78
1702	20	38	17	42
1703	23	99	18	51
1734	15	81	21	20
1705	16	93	14	82

Proportion of the RAIN *of feveral feafons to one another.*

1708	Depth at Pifa. Inch.	Depth at Upminft. Inch.	Depth at Zurich. Inch.	1708	Depth at Pifa. Inch.	Depth at Upminft. Inch.	Depth at Zurich. Inch.
Jan.	6 41	2 88	1 64	*July*	0 00	1 11	3 50
Feb.	3 28	0 46	1 65	*Aug.*	2 27	2 94	3 15
Mar.	2 65	2 03	1 51	*Sep.*	7 21	1 46	3 02
Apr.	1 25	0 96	4 69	*Oct.*	5 33	0 23	2 24
May.	3 33	0 02	1 91	*Nov.*	0 13	0 86	0 62
Jun.	4 90	2 32	5 91	*Dec.*	0 00	11 97	2 62
Half-year.	28 82	10 67	17 31	Half-year.	14 94	8 57	15 35

Preternatural RAINS (*Dict.*)— We have numerous accounts in in the hiftorians of our own, as well as other countries, of preternatural Rains, fuch as the raining of ftones, of duft, of blood, nay, and of living animals, as young frogs, and the like. We are not to doubt the truth of what thofe who are authors of veracity and credit relate to us of this kind, fo far as to fuppofe that the falling of ftones and duft never happened; the whole miftake is, the fuppofing them to have fallen from the clouds; but, as to the blood and frogs, it is very certain that they never fell at all, but the opinion has been a mere deception of the eyes. Men are extremely fond of the marvellous in their relations; but the judicious reader is to examine ftrictly whatever is reported of this kind, and is not to fuffer himfelf to be deceived.

There are two natural methods, by which quantities of ftones and duft may fall in certain places, without their having been generated in the clouds, or fallen as rain. The one is by means of hurricanes; the wind which we frequently fee tearing off the tiles of houfes, and carrying them to confiderable diftances, being equally able to take up a quantity of ftones, and drop them again at fome other place. But the other, which is much the more powerful, and probably the moft ufual way, is for the eruptions of volcano's, and burning mountains, to tofs up, as they frequently do, a vaft quantity of ftones, afhes, and cinders, to an immenfe height in the air; and thefe being hurried away by the hurricanes, and impetuous winds, which ufually accompany thofe eruptions, and being in themfelves much lighter than common ftones, as being half calcined, may eafily be thus carried to vaft diftances, and there falling in places where the inhabitants know nothing of the occafion, they cannot but be fuppofed by the vulgar to fall on them from the clouds. It is well known, that, in the great eruptions of Ætna and Vefuvius, fhowers of afhes, duft, and fmall cinders, have been feen to obfcure the air, and overfpread the furface of the fea for a great way, and cover the decks of fhips; and this at fuch a diftance, as it fhould appear fcarce conceivable that they fhould have been carried to; and probably, if the accounts of all the fhowers of thefe fubftances mentioned by authors be collected, they will all be found to have fallen within fuch diftances of volcano's; and, if compared as to the time of their falling, will be found to correfpond in that alfo with the eruptions of thofe mountains. We have known inftances of the afhes from Vefuvius having been carried thirty, nay, forty leagues, and peculiar accidents may have carried them yet farther. It is not to be fuppofed that thefe fhowers of ftones and duft fall, for a continuance, in manner of fhowers of Rain, or that the fragments are as frequent as drops of water; it is fufficient that a number of ftones, or a quantity of duft, fall at once on a place where the inhabitants can have no knowledge of the part from whence they come, and the vulgar will not doubt their dropping from the clouds. Nay, in the canton of Berne in Swifferland, the inhabitants counted it a miracle that it rained earth and fulphur upon them, at a time that a fmall volcano terrified them; and, even when the wind was fo boifterous, and hurricanes fo frequent, that they faw almoft every moment the duft, fand, and little ftones, torn up from the furface of the earth in whirlwinds, and carried to a confiderable height in the air, they never confidered, that both the fulphur thrown up by the volcano, and the duft, &c. carried from their feet, muft fall foon after fomewhere. It is very certain that in fome of the terrible ftorms of large hail, where the hail-ftones have been of many inches round, that, on breaking them, there have been found what people have called ftones in their middle; but thefe obfervers needed only to have waited the diffolving of one of thefe hail-ftones, to have feen the ftone in its center difunite alfo, it being only formed of particles of loofe earthy matter, which the water, exhaled by the fun's heat, had taken up in extremely fmall moleculæ with it; and this only having ferved to give an opake hue to the inner part of the congelation, to which the freezing of the water alone gave the apparent hardnefs of ftone.

The raining of blood has been ever accounted a more terrible fight, and a more fatal omen, than the other preternatural Rains, already mentioned. It is very certain, that nature forms blood no where but in the veffels of animals, and therefore fhowers of it from the clouds are by no means to be credited. Thofe who fuppofe that what has been taken for blood, has been actually feen falling through the air, have had recourfe to flying infects for its origin, and fuppofe it the eggs or dungs of certain butter-flies difcharged from them, as they were high up in the air. But this feems a very wild conjecture, as we know of no butter-fly whose excrements, or eggs, are of such a colour, or whose abode is so high, or their flocks so numerous as to be the occasion of this.

It is most probable that these bloody waters were never seen falling, but that people, seeing the standing waters blood-coloured, were assured, from their not knowing how it should else happen, that it had rained blood into them. A very memorable instance there was of this at the Hague, in the year 1670. Swammerdam, who relates it, tells us, that one morning the whole town was in an uproar on finding their lakes and ditches full of blood, as they thought, and having been certainly full of water the night before, they agreed it must have rained blood in the night; but a certain physician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microscope, and found that the water was water still, and had not at all changed its colour, but that it was full of prodigious swarms of small red animals, all alive, and very nimble in their motions, whose colour, and prodigious number, gave a red tinge to the whole body of the water they lived in, on a less accurate inspection. The certainty that this was the case did not however persuade the Hollanders to part with the miracle; they prudently concluded, that the sudden appearance of such a number of animals was as great a prodigy, as the raining of blood would have been; and are assured to this day, that this portent foretold the scene of war and destruction which Lewis the XIVth afterward brought into that country, which had before enjoyed forty years uninterrupted peace.

The animals which thus colour the water of lakes and ponds are the pulices arborescentes of Swammerdam, or the water-fleas with branched horns. These creatures are of a reddish yellow, or flame colour; they live about the sides of ditches, under weeds, and among the mud, and are therefore the less visible, except at a certain time, which is in the end of May or beginning of June; it is at this time that these little animals leave their recesses to float loose about the water, to meet for the propagation of their species, and by that means become visible in the colour they give the water. This is visible, more or less, in one part or other of almost all standing waters at this season; and it is always at this season that the bloody waters have alarmed the ignorant.

Artificial RAI'NBOW, a phænomenon produced by continually throwing water up into the air, as from a fountain, which breaking into small drops, exhibits the appearance of the Rainbow.

RAI'SIN-*brandy*, a name given by our distillers to a very clear and pure spirit, procured from Raisins fermented only with water. Thus treated, they yield a spirit scarce at all distinguishable from some of the wine spirits; for there are as many kinds of wine spirits as there are of grapes. The coarser the operation of distilling is performed in this case, the nearer will be the resemblance of the wine spirit; that is, there will be most of this flavour in the spirit, when as much as can be of the oil is thrown up with a galloping heat.

The distillers are very fond of the wine spirit, with which they hide and disguise the taste of their nauseous malt, and other spirits; and in defect of that spirit, this of Raisins, made in this coarse manner, will go almost as far. It is indeed surprising how extensive the use of these flavouring spirits is, ten gallons of Raisin spirit, or somewhat less of the wine spirit, being often sufficient for a whole piece of malt-spirit, to take off its native flavour, and give it an agreeable vinosity. It is no wonder, therefore, that the distillers, and ordinary rectifiers, are so fond of this, as it is a good cloak for their defects, and the imperfection of their processes. When Raisin brandy is intended for common use, the fire should be kept slower and more regular in the distillation, and the spirit, though it hath less of the high flavour of the grape, will be more pleasant and more pure. *Shaw's Essay on Distillery.*

RA'NA, *the frog*, in zoology, a very well known animal of the amphibious kind; the characters of it are, that the body of it, in one part of its life, is furnished with a tail.

The feet of the frog are webbed, for the better swimming, and it has very strong muscles in the hinder part of its body, to assist it in leaping. The lungs of the frog are different from those of all other animals; they are only a sort of membranaceous bladders, with several tubercles, by means of which they resemble the fruit of the firs or pines; these, when once inflated, do not immediately become flaccid, as in other animals, but remain in that state as long as the creature pleases. The creature can remain a long time under water, and has been kept so for several days by tying it down, and received no hurt from it. It is a very long-lived animal; and even if its belly be opened, and the intestines, and all the viscera, taken out, it will continue its leaping, and all its other motions, as if nothing had happened to it, for a considerable time; but, if the nerve of one of the hinder legs be cut, it loses all power of using that limb on the instant.

The frog differs from all creatures in the manner of its generation. It no way resembles any of the quadrupeds in this particular, and though, in some sort, it approaches to the nature of fishes, yet it differs from them also in many things. The egg of the frog is a small black spot, inveloped in a mucilaginous substance; in this egg is contained the embryo frog, which, on breaking of the egg in hatching, comes forth in form of a tadpole. This young animal is for some time nourished by the gelatinous matter which invelopes the egg, but it does not consume the whole of it; for the particles of water, making way by degrees into it, divide its parts, and it soon becomes expanded, frees itself from the living animal, and floats on the surface of the water, or at a small depth in it, in form of a thin cloud: this, though it now no longer serves for food to the young creature, is however of some service to it, serving it as an asylum, or place of rest and safety, when tired with swimming.

The egg of the frog therefore is, in some degree, analogous to that of an insect of the winged kind, which is to go through a metamorphosis before it arrives at its perfect state; for it hatches into the tadpole, as the egg of a butterfly into a caterpillar, and arrives at that its ultimate state, after a determinate time spent in the other. In this it differs from the generation of fishes, the eggs of whose spawn hatch into perfect fishes, which go through no change; and it differs from all in the gelatinous substance, which invelopes the egg, and serves as the first food to the fœtus.

The eggs are indeed, when nicely examined, found to be inclosed in a double liquor, a more pellucid and thin one within the gelatinous one, which serves as the general covering to the whole series of eggs; and it is this thin one which it principally feeds on, when first hatched, and which serves to the same purposes as the white of an egg in the fowl kind.

There is also an opinion that the male sperm of the frog is deposited on the spawn of the female after it is laid. *Ray's Syn. Quad.*

RANU'NCULUS, *crowfoot*, in botany, a genus of plants, whose characters are:

The flower consists of several leaves, which are placed in a circular order, and expanded in form of a rose; having, for the most part, a many-leaved empalement or flower cup: out of the middle of the flower rises the pointal, which afterwards becomes a fruit, either round, cylindrical, or spiked; to the axis of which, as a placenta, adhere many seeds, for the most part naked.

There are a great variety of species of Ranunculus; but that called the Persian Ranunculus, being universally admired, we shall only give the method of cultivating that beautiful flower.

The beds in which the Persian Ranunculus roots are planted, should be made with fresh light sandy earth, at least three feet deep: the best soil for them may be composed in this manner, viz. take a quantity of fresh earth from a rich up-land pasture, about six inches deep, together with the green sward: this should be laid in an heap to rot, for twelve months before it is mixed, observing to turn it over very often, to sweeten it, and break the clods: to this you should add a fourth part of very rotten neat's dung, and a proportionable quantity of sea or drift sand, according as the earth is lighter or stiffer; if it be light, and inclining to a sand, there should be no sand added; but, if it be an hazel loam, one load of sand will be sufficient for eight loads of earth: but if the earth is strong and heavy, the sand should be added in a greater proportion: this should be mixed six or eight months before it is used; and you should often turn it over, in order to unite their parts well together, before it is put into the beds.

The depth which this should be laid in the beds, must be about three feet; this should be below the surface, in proportion to the dryness or moisture of the place where they are situated; which, in dry ground, should be two feet eight inches below the surface, and the beds raised four inches above; but in a moist place they should be two feet four inches below, and eight above the ground; and, in this case, it will be very proper to lay some rubbish and stones at the bottom of each bed, to drain off the moisture; and, if, upon this, at the bottom of the beds, some very rotten neat's dung is laid two or three inches thick, the roots will reach this in the spring, and the flowers will be the fairer. This earth I would by no means advise to be screened very fine; only, in turning it over each time, you should be careful to break the clods, and throw out all large stones, which will be sufficient; for if it is made very fine, when the great rains in winter come on, it will cause the earth to bind into one solid lump, whereby the moisture will be detained, and the roots, not being able to extend their tender fibres, will rot.

The beds, being thus prepared, should lie a fortnight to settle, before the roots are planted, that there may be no danger of the earth settling unequally after they are planted; which would prejudice the roots, by having hollow places in some parts of the bed, to which the water would run and lodge, and so rot the roots in such places. Then having levelled the earth, laying the surface a little rounding, you should mark out the rows by a line, at about six inches distance each way, so that roots may be planted every way in straight lines; then you should open the earth with your fingers at each cross, where the roots are to be planted, about two inches deep; placing the roots exactly in the middle, with their crowns upright; then, with the head of a rake, you should draw the earth upon the surface of the bed level, whereby the top of the roots will be about an inch covered with earth, which will be be sufficient at first. This work should be done in dry weather, because the earth will then work better than if it were wet; but the sooner after planting there happens to be rain, the better it will be for the roots, for if it should prove dry weather long after, and the earth of the beds be very dry, the roots will be subject to mould and decay; therefore, in such a case, it will be proper to give a little water to the beds, if there should no rain happen in a fortnight's time, which is very rare at that season of the year; so that they will seldom be in danger of suffering that way.

When the roots are thus planted, there will no more be required until towards the end of November; by which time they will begin to heave the ground, and their buds appear; when you should lay a little of the same fresh earth, of which the beds were composed, about half an inch thick all over the beds, which will greatly defend the crown of the root from frost: and when you perceive the buds to break through this second covering, if it should prove very hard frost, it will be very proper to arch the beds over with hoops, and cover them with mats, especially in the spring, when the flower buds will begin to appear; for if they are exposed to too much frost, or blighting winds, at that season, their flowers seldom open fairly, and many times their roots are destroyed: but this happens more frequently to the Persian kinds, which are tenderer, than to those sorts which are pretty hardy; for which reason they are commonly planted in open borders, intermixed with other flowers, though in very hard winters these are apt to suffer, where care is not taken to guard off the frost.

In the beginning of March the flower stems will begin to rise; at which time you should carefully clear the beds from weeds, and stir the earth with your fingers between the roots, being very careful not to injure them; this will not only make the beds appear handsome, but also greatly strengthen their flowers. When the flowers are past, and the leaves are withered, you should take up the roots, and carefully clear them from the earth; then spread them upon a mat to dry, in a shady place; after which they may be put up in bags or boxes, in a dry room, until the October following, which is the season for planting them again.

RA'PA, *the turnep*; see TURNEP.

RAPU'NTIUM, *rampions or cardinal's flower*, in botany, a genus of plants, whose characters are:

The flower consists of one leaf, which is of an anomalous figure, hollowed like a pipe, and furrowed or channelled; divided, as it were, into many parts, in the shape of a tongue, defended by a vagina or covering, which infolds the pointal: when the flowers decay, the flower-cup turns to a fruit divided into three cells, full of small seeds, which adhere to a placenta, which is divided into three parts.

The crimson Rapuntium is greatly prized by the curious, for the beauty of its rich crimson flowers, which exceed all the flowers I have yet seen, in the deepness of its colour: and these commonly, when their roots are strong, produce large spikes of these flowers, which continue a long time in beauty, and make a most magnificent shew amongst other flowers. The time of their flowering is commonly in July and August; and if the autumn prove very favourable, they will sometimes produce good seeds in England. These plants are natives of Virginia and Carolina, where they grow by the sides of rivulets, and make a most beautiful appearance; from whence the seeds are often sent into England. These seeds commonly arrive here in the spring; at which time they should be sown in pots filled with light earth, and but just covered over; for, if the seeds are buried deep, they will not grow. These pots should be placed under a frame, to defend them from cold, until the season is a little advanced; but they should not be placed on an hot-bed, which will also destroy the seeds.

When the weather is warm, towards the middle of April, these pots should be placed in the open air, in a situation where they may have the morning sun till twelve o'clock, observing to water them constantly in dry weather; and, when the plants are come up, and are grown pretty strong, they should be transplanted each into a small pot filled with fresh light earth, and placed in the same situation, observing to water them in dry weather; and, in winter, they should be placed under an hot-bed-frame, where they may be sheltered from severe frosts; but, in mild weather, they should be as much exposed to the open air as possible.

The March following these plants should be put into larger pots filled with the same fresh earth, and placed, as before, to the morning sun; observing to water them in dry weather, which will cause them to flower strong the autumn following.

These plants are also propagated by parting of their roots: the best season for which is, either soon after they are past flower, or in March; observing to water and manage them, as hath been directed for the seedling plants, both in winter and summer. *Miller's Gard. Dict.*

RATAFI'A, a fine spirituous liquor, prepared from the kernels, &c. of several kinds of fruits, particularly cherries and apricocks.

Ratafia of cherries is prepared by bruising the cherries, and putting them into a vessel wherein brandy has been kept; then adding to them the kernels of cherries, with strawberries, sugar, cinnamon, white pepper, nutmegs, cloves; and to 20 pounds of cherries 10 quarts of brandy.—The vessel must be left open 10 or 12 days, then stopped close, for two months before it be tapped.

Ratafia of apricocks is prepared two ways; viz. either by boiling the apricocks in white wine, adding to the liquor an equal quantity of brandy, with sugar, cinnamon, mace, and the kernels of apricocks; infusing the whole for 8 or 10 days; then straining the liquor, and putting it up for use: or by infusing the apricocks, cut in pieces, in brandy, for a day or two; passing it through a straining bag, and putting in the usual ingredients.

RA'TTLE-*Snake*, in natural history, a very dreadful species of serpents, whose bite is fatal, if not timely remedied, and which is distinguished from all other serpents by the rattle in its tail. This is composed of several scaly substances, and is said to increase by the creature's age, every year adding one scale to it. It moves over the rocks and mountains with prodigious swiftness; but is less nimble on even ground, than many other snakes.

It grows to four or five feet long, and sometimes, though rarely, to more: one, of more than four feet long, having been dissected, and accurately described by Dr. Tyson, the account that gentleman gives of it may not be unacceptable to the reader: the body where largest, which was near the middle, measured six inches and an half round. Its neck only three inches. Its head was flat, as that of the viper; and, as the jaws are very broad and protuberant, and the nose sharp, it somewhat resembles the head of an arrow. At the end of the nose are placed the nostrils; and between these and the eyes there are two other holes, which may be mistaken for ears; but they only go into a hollow of the bones of the skull, without any perforation into the brain. The viper has nothing of these holes. The eyes are round, and wholly resemble those of the viper. The whole body of the creature greatly also resembles the viper, but for the singularity of the Rattle; and over the eyes there are two large scales looking like eyebrows.

The scales which cover the head are very small; thence they become gradually larger, as they reach towards the middle of the body, and from the middle to the tail they grow less and less again; and all, in shape, much resemble the broad and flat seeds of the common garden parsnip. There is some variety in the colours of this creature, whether according to the difference of age or sex, or from lesser accidents. The most usual colours are these: the scales are of a dusky greenish, like the feathers of the back of the green-finch, and are variegated with small black spots in great numbers; there are also four large ones of the same colour.

The back is of a mixed colour, of a dead yellowish brown, variegated with blotches of black and yellow, and with a number of small dots of the same colours; the larger blotches being laid in great regularity, and making a very beautiful tessellated figure. The scales become darker, as they approach the tail, where they are almost black; and those on the ridge of the back, all along, are raised into a sort of sharp prominence in their middle, like the scales of a crocodile; those on the sides are plain and flat. The belly is all along covered with oblong parallelogram scales laid transversely; these are very bright and glossy, and yellow, spotted with black.

The head is small, in proportion to the body, but the mouth is capable of opening to a prodigious width. The tongue is wholly like that of the viper, composed of two oblong portions, joined towards the bases, but separate as they approach the end. The teeth are of two kinds, the smaller ones designed for its eating with, the larger and longer for biting and poisoning what it seizes. These are only placed in the upper jaw; but all the teeth of the mouth are of the canine kind, as the creature, never chewing its prey, has no use for dentes molares, or grinders.

The poisonous teeth are situated on the outside of the jaw, in the anterior part of the mouth, not fixed in the sockets of the jaws, as the others, but fixed to two bones. These, in their natural state, are not visible, even when the creature's mouth is opened, unless it be with an intent to wound; for they lie back under a membranaceous covering, and the creature has a power of erecting and wounding with them at pleasure, as the lion and cat kind can retract or thrust out their claws. The teeth are crooked, and have a hollow at their bottom; and, at their point, a very plain and evident slit, looking like the nib of a writing-pen. The teeth are hollow all the way, from this slit to their bottom; and, on pressing the gums in a dead Rattle-snake, the poisonous juice may be seen to ascend, by degrees, up the teeth, and, at length, to be discharged out of the slit at the point. This makes it very plain in what manner the poison is conveyed into the flesh, when the creature bites.

The rattle is affixed to the last vertebra of the tail, and is composed of a series of small bones; that next the tail is usually of a bluish-grey colour, the rest of a pale brown. These bones are hollow, very thin, hard and dry, and of a brittle texture, and very sonorous. They are all of the same figure, representing, in some degree, the os sacrum in the human skeleton, and all are nearly of the same size. The last of these is is ſeen to have a rigid extremity, in manner of a tail; and all the others have the ſame, though it is not diſtinguiſhable in them, as, in the joining, it runs under two others; and, by means of this ſtructure, they are all moveable with the ſmalleſt force, and the ſound is the more vigorous, as each of theſe tails ſtrikes on two of the hollow joints, when put into motion. The age of the creature is known by the number of joints of this rattle, which are found to be from one to twenty, or more. The uſe of this ſeems not to be to the creature itſelf, but to other animals, that they may be alarmed at the approach of ſo terrible an enemy, and get out of its way in time. Piſo and ſome others affirm, that this rattle, put up a man's fundament, is as fatal a thing as the creature's bite. The power of doing miſchief, which nature has allotted to this animal, ſeems not only by its bite; but, according to the joint accounts of almoſt all authors, it appears to have a power of deſtroying, even by a look.

The charming or faſcination of the Rattle-ſnake, as this is uſually called, has exerciſed the wits of many naturaliſts in vain, and many have diſbelieved the fact. Sir Hans Sloane mitigates the matter, by ſuppoſing the creature firſt to ſeize or bite its prey, which it then ſuffers to eſcape, as far as the poiſon will let it, watching its death, that it may devour it without trouble: and that it is in this poiſoned ſtate that people have ſeen the ſquirrels, &c. dancing about before the Rattle-ſnake, and dying convulſed; all which they have attributed to the power of charming in the eye of the ſnake, not conceiving that it was the effect of the creature's having before bitten them. This, though a very plauſible account, yet, however, wants experience to confirm it, and the general teſtimony of people, who have ſeen the facts, makes againſt it.

The ſame author gives us, however, from Colonel Beverley, the whole proceſs of the charm. The Colonel acquaints us, that ſome company he was with once ſaw a hare, about half-grown, ſitting quietly in an orchard, and, ſtriking at her, ſhe only removed a few yards; when, wondering at the cauſe, they ſaw a Rattle-ſnake, at about ten feet diſtance, eyeing the hare as his deſtined prey. The poor creature was, by this time, in agonies and convulſions, often getting up on her legs, as if intending to run away, but always immediately falling down again; and, growing worſe and worſe, ſoon loſt the uſe of its hinder legs, and, panting vehemently, fell on its ſide. In about half an hour more, the hare ſeemed to have done with all ſtruggles, and to be dead; on which the ſnake uncoiled itſelf, and moved gently towards it, but, the poor hare ſtarting again, he ſtopped; but, when all was again quiet, he moved up to it, and, raiſing his head, looked all over his prey, his colours looking at that inſtant more beautiful than before, and his eyes ſparkling. The hinder part of the hare had been towards the ſnake all this time, and it had periſhed without much looking at its enemy. The ſnake wetted the body all over with his ſlaver; and then, with great difficulty, taking firſt the head into his mouth, ſwallowed that, and afterwards the whole body, ſucking it gently down, but not getting in the ſhoulders without much difficulty.

It is certain, upon the whole, that there is much in this account to favour Sir Hans Sloane's opinion of the hare's having been bitten, though that was not ſeen, ſince the convulſions, and loſs of the uſe of the hinder legs, ſeem a very natural effect of poiſon; but we are aſſured, by perſons who have been eye-witneſſes to the fact, that a bird, hopping about in all this agony and terror, has, on the frightening the Rattle-ſnake away, flown off without any difficulty: ſo that the whole ſeems not yet underſtood.

Rattle-*ſnake root.* See POLYGALA.

RAVELIN (*Dict.*)—*Plate* XXXI, *fig.* 14, exhibits a plan of a ſquare work, with four Ravelins before the curtins.

RAY (*Dict.*)—It is from the circumſtances of Rays, that the ſeveral kinds of bodies are diſtinguiſhed in optics. A body, for inſtance, that diffuſes its own lights, or emits Rays of its own, is called a lucid, or luminous body.

If it only reflect Rays which it receives from another, it is called an illuminated body.

If it only tranſmit Rays, it is called a tranſparent body.

If it intercept the rays, or refuſe them paſſage, it is called an opake body.

Hence no body radiates, i. e. emits rays, unleſs it be either luminous or illuminated.

It is by means of Rays reflected from the ſeveral points of illumined objects to the eye, that they become viſible, and that viſion is performed; whence ſuch rays are called viſual Rays.

In effect we find that any point of an object is ſeen in all places to which a right line may be drawn from that point: but it is allowed, nothing can be ſeen without light, therefore every point of an object diffuſes innumerable Rays every way. Again, from other experiments it appears that the images of all objects, whence right lines may be drawn to the eye, are painted in the eye, behind the cryſtalline, very ſmall, but very diſtinct.

And laſtly, from other experiments, that each Ray carries with it the ſpecies, or image of the radiating point: and that the ſeveral Rays emitted from the ſame point are again united in one point, by the cryſtalline, and thus thrown on the retina.

It is the ſpiſſitude, or cloſeneſs of the Rays emitted from a luminous body, that conſtitutes the intenſeneſs of the light. Yet the direction wherein the Rays ſtrike the eye, has a good ſway. In effect, a perpendicular Ray, ſtriking with more force than an oblique one, in the ratio of the whole ſine to the ſine of the angle of obliquity, as follows from the laws of percuſſion, a perpendicular Ray will affect the eye more vividly than an oblique one in that ratio.

If then the ſpiſſitude of the Rays be equal, the intenſity will be as the direction; if the direction be the ſame, the intenſeneſs will be as the ſpiſſitude. If both differ, the intenſeneſs will be in a ratio compounded of the direction and the ſpiſſitude.

Hence, firſt, If light be propagated in parallel Rays through an unreſiſting medium, its intenſity will not be varied by diſtance.

Secondly, If light be propagated in diverging rays through an unreſiſting medium, its intenſity will decreaſe in a duplicate ratio of the diſtances from the radiant point, reciprocally.

Thirdly, If light be propagated in converging Rays through an unreſiſting medium, its intenſity will increaſe in a duplicate ratio of the diſtances from the point of concourſe, reciprocally.

Fourthly, If the breadth of an illuminated plane be to the diſtance of the radiant point, as 1 to 2000000, it is the ſame thing as if the Rays ſtruck upon it parallel: and hence, ſince the diameter of the pupil of the eye, when largeſt, ſcarce exceeds half an inch; the Rays will fall upon it parallel, as to ſenſe, at the diſtance of 3860 Engliſh feet, which is nearly 6 furlongs.

The effect of concave lenſes, and convex mirrours, is to make parallel Rays diverge; converging Rays become parallel, and diverging Rays to become more divergent.

The effect of convex lenſes, and concave mirrours, is to make diverging Rays become parallel; parallel Rays become convergent, and converging Rays to converge the more.

The Rays of light are not homogeneous or ſimilar, but differ in all the properties we know of, viz. refrangibility, reflexibility, and colour.

It is probably from the different refrangibility, that the other differences have their riſe; at leaſt it appears, that thoſe Rays which agree or differ in this, do ſo in all the reſt.

Thus from the different ſenſations the differently diſpoſed Rays excite in us, we call them, red Rays, yellow Rays, &c.

RE, in grammar, &c. an inſeparable particle, or prepoſition, added at the beginning of words, to vary, double, or otherwiſe modify their meaning.

The modificative Re was firſt introduced by the Latins, from whom it is borrowed, into moſt of the modern tongues: Priſcian derives it from retro, backwards; others rather derive retro from Re; others derive Re from the Greek ῥᾳ, eaſy, or from ῥέω, I flow.

The effect of the Re is various: uſually it ſignifies again, rurſum, ἀνὰ; as in Re-join, Re-ſign, Re-ſume, Re-courſe, Re-bound, Re-cite, Re-hear, Re-cogniſe, Re-compare, Re-double, Re-linquiſh, &c.

Sometimes it ſtands for contra, ἀντὶ, againſt, as in Re-luctance, Re-cumbent, Re-cline, &c.

Sometimes for ὑπὲρ, ſuper, over, as in Re-dundant; ſometimes for πόῤῥω, longe, far, as in Re-moving, &c.

REA'LGAR (*Dict.*)—Realgar is of two kinds, native and factitious: the native Realgar is dug out of the ſame mines with orpiment, reſembling cinnabar in colour, and ſmelling like ſulphur and garlic when burnt, and made up in ſolid brittle glebes. The factitious kind is made of orpiment melted and boiled for ſome time in ſubliming veſſels, by which the yellow flowers are raiſed to the upper part of the veſſels, and the maſs remaining at the bottom, being condenſed by cold, becomes of a red colour, like cinnabar, and is called Realgar; which, if it be expoſed to the free air for a long time, becomes covered with a ſaline efloreſcence. This Realgar is not to be confounded with the factitious red arſenic.

Realgar is brought from China, in different figures; ſome of which reſemble the figures of little men called pagods; and I am of opinion that it is not cut into theſe figures, but caſt in moulds.

The correction of Realgar, firſt propoſed by Helmont, and afterwards publiſhed by Dallicot, firſt phyſician to the duke of Lorrain, which has been found ſucceſsful in many caſes, is this: put any quantity of Realgar, finely powdered, into a glaſs matraſs, and pour upon it as much of a ſtrong lixivium of tartar and nitre, as will ſwim four fingers breadth above the Realgar. Digeſt them in a ſand-heat for twenty-four hours, ſhaking the matraſs very often. Then pouring off, and preſerving the tincture, pour new lixivium upon the powder, and repeat the whole operation, till almoſt all the Realgar is diſſolved, ſome indiſſoluble metallic parts only remaining. Afterwards mix all the tinctures together, paſs them through cap-paper, and pour, at ſeveral times, as much vinegar of lead to the ſtrained liquor, as will precipitate all that can be ſeparated from it. Then pouring off the clear liquor from the precipitate by inclination, let the powder be waſhed with warm water till it becomes almoſt inſipid; and, when it is well dried, burn a sufficient quantity of rectified spirit of wine upon it; and they calcine it with the tincture of opium extracted with spirit of wine. The powder, so prepared, is a gentle escharotic, of great service in cancerous swellings. *Geoffroy.*

REA'LISTS, Realistæ, a sect of school philosophers, formed in opposition to the Nominalists.

Under the Realists are included the Scotists, Thomists, and all excepting the followers of Ocham.

Their distinguishing tenet is, that universals are realities, and have an actual existence, out of an idea and imagination; or, as they express it in the school language, a parte rei: whereas the Nominalists contend that they exist only in the mind; and are only ideas, or manners of conceiving things.

Doctor Odo, or Oudart, a native of Orleans, afterwards abbot of St. Martin de Tournay, was the chief of the sect of the Realists; he wrote three books of dialects; where, on the principles of Boethius and the ancients, he maintained that the object of that art is things, not words: whence the sect took its rise and name.

REA'SONING (*Dict.*)—The agreement or disagreement of two ideas does not appear from the bare consideration of the ideas themselves, unless some third be called in, and compared either separately or conjointly therewith: the act, then, whereby from ideas thus disposed and compared, we judge this or that to be so or not so, is called Reasoning.

Rohault defines Reasoning to be a judgment depending on some antecedent judgment: thus, having judged that no even number can be composed of five uneven numbers; and that ten is an even number; to conclude that ten cannot be divided into five uneven parts, is a ratiocination, or Reasoning.

This agrees with father Malebranche's doctrine, one of the great points whereof is, that Reasoning, on the part of the understanding, is only a mere perceiving.

That ingenious author endeavours to shew, that as to the understanding, there is no difference between a simple perception, a judgment, and a Reasoning, except in this, that the understanding perceives a simple thing without any relation to any thing else, by a simple perception.—That it perceives the relations between two or more things in a judgment.—And lastly, that it perceives the relations that are between the relations of things in a Reasoning. So that all the operations of the understanding are no more than mere perceptions.

Thus, for instance, when we conclude, that 4 being less than 6, twice 2, being equal to 4, are of consequence less than 6; we do no more than perceive the relation of the inequality between the relation of twice two and four, and the relation of 4 and 6.

The manner of proceeding justly in Reasoning, so as to arrive with the greater safety at the knowledge of truth, makes what we call method.

RECEI'VER (*Dict.*)—It is to be observed, that a very small crack in the Receiver, used in pneumatical experiments, does not render them useless; for, upon evacuating the internal air, the external, pressing the glass on all sides, brings the edges of the glass closer together. But, in case of considerable flaws, a plaster may be applied, made of quick-lime finely powdered and nimbly ground, with a proper quantity of the scrapings of cheese, and water enough to bring the mixture to a soft paste, which, when the ingredients are well incorporated, will have a strong and fetid scent; and then it must be immediately spread upon a linen cloth, and applied, lest it begin to harden. *Boyle's Works.*

RECLU'SE (*Dict.*)—The word is chiefly used for such as thus imprison themselves out of devotion, to do penance.—It is sometimes also applied to incontinent wives, whom their husbands procure to be thus kept in a perpetual prison in some convent.

Recluses were anciently very numerous: they were then a kind of solitaries who shut themselves up in some little cell, with a vow never to stir out of it.

None were admitted to this oath until they had given sufficient proofs of their abstinence, and had leave from the bishop, or the abbot of the monastery where they were shut up: for the cells of the Recluses were always to join to some monastery.

The prelate's permission being obtained, they were tried for a year in the monastery; out of which, during that time, they never stirred.

They were then admitted to their vow of stability in the church before the bishop; which being done, and the Recluse entered his little cell, the bishop set his seal on the door.

The cell was to be very small, and very exactly closed.—The Recluse was to have every thing within it necessary to life; and, even, if he were a priest, an oratory consecrated by the bishop, with a window which looked into the church, through which he might make his offerings at the mass, hear the singing, sing himself with the community, and answer those who talked to him. But this window was to have curtains before it, both within-side and without; so that the Recluse might neither see nor be seen.

Indeed he was allowed a little garden in his reclusion, to plant a few herbs and take fresh air: adjoining to his cell was that of his disciples, which he was very rarely without; with a window, through which they served him with necessaries, and received his instructions.

When it was judged proper to have two or three Recluses together, their cells were made contiguous to each other, with windows of communication: if any woman would consult them, or confess to them, it was to be in the church, and in the face of all the world.

Where there were two or three Recluses together, they were never to hold any conference, but on spiritual matters; and to confess to each other: where there was but one, he was to confess and examine himself.

If the Recluse fell sick, his door was opened for people to come in and assist him; but he was not allowed to stir out on any pretence whatever.

These articles are extracted from the rule, compiled for the Recluses, by Grimlaic, a priest in the IXth century.

There were also women Recluses, who led the same life, in proportion. St. Viborade lived a Recluse at St. Gall, and was there martyred by the Hungarians in 825.

RECH *interni minores*, in anatomy the name of a muscle which arises from the fore-part of the first vertebra of the neck, and is inserted into the anterior appendix of the os occipitis.

RECTIFICA'TION (*Dict.*)—That the Rectification of spirits may, in all cases, proceed with the greatest exactness, a due regard to it must be had even from the first fermenting the substances from which they are to be made, and continued through all the stages of distillation, the low wines, proof spirit, and alcohol. The management of the fermented liquor, to this purpose, is principally the letting it stand to subside after the fermentation is over, and the drawing it off clear and thin, not too rich for the still. The still is not to be over-filled with this. Great care must be taken to prevent its burning; and the faints that run last must be kept separate, not mixed with the rest of the liquor distilled, which is now called the low wines. In the rectifying these into proof spirit, great caution must be used that the fire be kept regular, not raised by sudden starts, which always throw up the oil in large quantities, which is to be left behind. In the succeeding Rectification of the proof spirit into alcohol, the same cautious management of the fire is necessary; and in both this, and the last, the faints are not to be suffered to run in among the spirit, but to be saved separate. They may be all mixed together at last, and reduced to a spirit fit for burning in lamps; but the keeping them out of the rectified liquor will keep away the coarsest and most stinking part of the oil of the ingredients. By these easy means, without any additional trouble or charge, we might be furnished with a spirit greatly exceeding what we commonly meet with. And, in general, the art and mystery of our sellers of the several sorts of English brandies seem to consist in this prudent management, and in the adding a little of the oleum vini, or oil of wine lees, to the spirits thus procured pure: this gives the flavour of foreign brandies, and is so extensive in its use, that half an ounce of it is sufficient for a hogshead of pure spirits.

Malt spirit is that which principally requires all this care in the Rectification, because its oil is more nauseous and offensive than that of any other spirit; but all others will be greatly the better for being treated in the same manner; and it is indeed necessary that they should for some particular uses. It is remarkable, that no one method of combinatory Rectification, that is, of the Rectification performed by the means of salts, and other additions, is suited to all the several kinds of spirits; scarce indeed will any one way serve for any two spirits; but this method, by simple and careful distillation, is equally suited to all. Melasses spirit, cyder spirit, wine spirit, or brandy, rum, and arrac, are all improved by it, and all of them are then known to be perfectly rectified. When in the state of alcohol, they not only prove totally inflammable in a little vessel floating upon cold water, but, when poured into the purest spring water, they have not the least power of making any change in it, nor leave any marks of oiliness, or that unctuosity, which, on the mixture of the less pure spirits, floats on the top, and in certain lights gives the rainbow colours. *Shaw's Essay on Distillery.*

RE'CTIFIER, in the distillery, the person whose employment it is to take the coarse malt-spirit of the malt-stiller, and re-distil it to a finer and better liquor. The art of the Rectifier might be intirely set aside, if the malt-stiller could make his spirit perfect at second operation; which seems very practicable, if the malt-stillers could be got to forsake their old track. The great things to be recommended for the improvement of their art, would be first the brewing in perfection, and secondly the keeping their wash after the manner of stale beer, till it has entirely lost its malt flavour, and required a pungent acid vinosity; and then thirdly leaving out the lees to distil with a well regulated fire. It is scarce to be thought how pure a spirit is to be obtained from malt this way; but the great art would be, the finding a way to make malt liquors artificially stale, bright, and of a fine flavour, though otherwise vinous. *Shaw's Lectures.*

RED, (*Dict.*)—To make a deep Red in glass, the following method is that most practised by the glass-men: take crystal frit twenty pounds, broken pieces of white glass one pound, calcined tin two pounds; mix these well together and put them into a pot to melt and purify; when these are melted, take steel calcined, scales of iron from the smith's anvil, both

both powdered very fine, of each an equal quantity; put leiſurely an ounce of this mixed powder to the beforementioned metal, mix all well together, and let them ſtand ſix or eight hours in fuſion, to incorporate; take out a proof after this, and, if there be too little of the powder, it will appear of a duſky yellow; then more of the powder muſt be added, and then add three quarters of an ounce of calcined braſs ground to a fine powder; mix them thoroughly together, and the maſs will be of a blood Red; continue ſtirring the whole together, and frequently taking out proofs of the colour; when it is right, work it immediately, otherwiſe it will loſe its colour and become black. The mouth of the pot muſt in this proceſs be left open, elſe the colour will be loſt. *Neri's Art of Glaſs.*

Blown Red, in the porcelain manufacture, a name given to a particularly coloured China ware of a ſpangled red, or to the colour alone that ſpangles it. It is an ornament eaſily introduced into uſe in our own manufactories of porcelain ware, and is done in the following manner: the colour is to be prepared of common copperas, calcined to a Red colour in a charcoal fire, in a crucible, with another luted on the top of it inverted, and with a hole in its bottom. The ſignal of the calcination being finiſhed, is, when the black clouds ceaſe to come up through the hole, and a fine white thin vapour ariſes in their place. The veſſels are to be then ſuffered to cool, and the Red matter in them is to be reduced to a fine powder. While the veſſels to be coloured with this are yet wet, the operator is to provide a glaſs pipe, and, covering one end of it with a piece of fine gawſe, he is to dip this into the powder, and taking it carefully out, with what little is ſticking to it, he is to blow againſt the veſſel at ſome diſtance from it: thus the fineſt part of the powder only will reach the veſſel, and will be laid on in form of glittering ſpangles, very ſmall, but all diſtinct. This is a ſort of colouring much eſteemed by the Chineſe themſelves, and they have a way of uſing the common blue in the ſame manner, but few of the veſſels, thus painted, come over to us. *Obſerv. de la Coutum. de l'Aſie.*

Red-*game*, an Engliſh name of a bird, common in the mountainous parts of Yorkſhire, and ſome other of our northern counties. It is of the ſhape of a partridge, but much larger, and of a mixed colour of red and black, and is feathered down to the ends of the toes.

Indian Red, a name uſed by the colourmen and painters, for a kind of purple ochre, brought from the iſland of Ormus, in the Perſian gulph, and uſed as a Red colour. It is called, among the authors on theſe ſubjects, terra Perſica. *Hill's Hiſt. of Foſſ.*

Red-*land*, in agriculture, a term much uſed by huſbandmen to expreſs a ſandy ſoil of a reddiſh hue, interſperſed for the moſt part with pieces of ſand ſtone of the ſame colour, or ſomewhat deeper.

There are ſeveral varieties of this ſoil, one of which is almoſt entirely made up of ſand; another with an admixture of clay with the ſand, the whole making a looſe loamy earth; and a third, full of fragments, of a poor ſandy iron ore, and often containing ſhining ſpecks of ſelenitæ. *Moreton's Northamp.*

Red-*ſhank*, in zoology, the name of a water bird, called by authors gallinula erythropus, and callidrys. It is about the ſize of the common plover. The back is of a greyiſh or browniſh green, uſually ſpotted with black; its neck grey, and its throat variegated with black and white; the breaſt is white, with a few looſe ſtreaks of black. The wing-feathers are variegated with black, brown, and white; the beak is two fingers breadth long, ſlender, and ſhaped like the beak of the woodcock; reddiſh at the baſe, and blackiſh lower down. Its legs are of a fine beautiful red, and the hinder toe is very ſhort and ſmall. *Ray's Ornithol.*

Red-*ſtart*, in zoology, the Engliſh name of the ruticilla, a very beautiful bird, with a white ſpot on his head and a very fine red tail.

Red-*weed*, in botany, a name given to a plant common in Bermudas, and ſome other places; and called by our firſt travellers to that part of the world the ſummer iſland Red-weed. Its berry is of a fine red colour, and affords a tincture little inferior to that of cochineal, and poſſeſſing all its virtues in medicine; the only misfortune of this, and ſome other very fine vegetable colours, is, that they fade ſoon. The juice of the fruit of the opuntia, or prickly pear, is as fine a dye as can be procured from the cochineal, but it will not ſtand; the inſect feeding on this, however, we find affords a colour of the ſame nature, that will ſtand. The fruit of the Red-weed is in the ſame manner liable to be eaten by inſects as that of the prickly pear, and it is worthy a trial, whether its colour, obtained at ſecond hand from thoſe inſects, will not ſtand as well as the cochineal does, and whether the inſects may not be propagated in a ſufficient abundance to ſerve the markets in the ſame manner. *Phil. Tranſ.* N°. 40.

Red-*wing*, in zoology, the name of a bird of the turdus, or thruſh kind, called alſo in ſome places the wind-thruſh, or ſwine pipe, and by authors the turdus iliacus, or tylas. It is a little ſmaller than the common thruſh, and is leſs ſpotted. Its back, neck, and head are of the ſame colour with thoſe of the common thruſh; but its ſides, under the wings, and the feathers which line the wings, are of an orange colour, or duſky red; its belly and breaſt are whitiſh, and its throat yellowiſh, with brown ſpots; the wings are of a ſort of cheſnut colour, a little variegated. It feeds on inſects, as worms, and the like; and is a bird of paſſage, coming to us at the ſame time with the fieldfare, and leaving us alſo, when that bird does. It is not well known where they breed, though ſome have gueſſed it to be in the mountains of Germany and Bohemia. They have a bitteriſh taſte, and are leſs valued than the fieldfare. *Ray's Ornithol.*

RE'DDLE, the common Engliſh name for the ſubſtance called, in Latin, rubrica, and uſed in painting and for marking ſheep, &c. *Hill's Hiſt. of Foſſ.*

REDUCTION *of a figure* (*Dict.*)—The great uſe of the proportional compaſſes is in the Reduction of figures, &c. whence they are alſo called compaſſes of Reduction.

There are various methods of reducing figures, &c. the moſt eaſy is by means of the pentagraph or parallelogram; but this has its defects. The beſt and moſt uſual methods of Reduction are as follow:

To Reduce *a figure:* As ABCDE, (*Plate* XLII. *fig.* 1.) into a leſs compaſs: about the middle of the figure, as *z*, pitch on a point: and from this point draw lines to its ſeveral angles, A, B, C, &c. then drawing the line *a b*, parallel to A B, *b c* parallel to B C, &c. you will have the figure *a b c d e* ſimilar to A B C D E.

If the figure *a b c d e* had been required to be enlarged, there needed nothing but to produce the lines from the point beyond the angles, as *z* D, *z* C, &c. and to draw lines, viz. D C, D B, &c. parallel to the ſides *d c*, *d b*, &c.

To Reduce *a figure by the angle of proportion.* — Suppoſe the figure A B C D E (*fig.* 2.) required to be diminiſhed in the proportion of the line A B to *a b* (*fig.* 3.) Draw the indefinite line G H (*fig.* 4.) and from G to H ſet off the line A B: on G deſcribe the arch H I. Set off the line *a b* as a chord on H I, and draw G I. Then with the angle I G H you have all the meaſures of the figure to be drawn. Thus, to lay down the point *c*, take the interval B C, and upon the point G deſcribe the arch K L; alſo, on the point G deſcribe M N; and upon A with the diſtance M N deſcribe an arch cutting the preceding one in *c*, which will determine the ſide *b c*. And after the ſame manner are all the other ſides and angles to be deſcribed.—The ſame proceſs will alſo ſerve to enlarge the figure.

To Reduce *a figure by a ſcale.* — Meaſure all the ſides of the figure, e. gr. A B C D E (*fig.* 2.) by a ſcale, and lay down the ſame meaſures, reſpectively, from a ſmaller ſcale in the proportion required.

To Reduce *a map, deſign, or figure, by ſquares.*—Divide the original into little ſquares, and divide a freſh paper of the dimenſions required, into the ſame number of ſquares; which will be larger or leſs than the former, as the map is to be inlarged or diminiſhed.

This done, in every ſquare of the ſecond figure, draw what you find in its correſpondent one in the firſt.

Reduction *to the ecliptic*, in aſtronomy, is the difference between the argument of latitude, as N P (*Plate* XLII. *fig.* 5.) and an arch of the ecliptic N R, intercepted between the plane of a planet, and the node N.

To find the Reduction: the angle of inclination P N R, and the argument of latitude N P being given; find, by the doctrine of ſpherics, the arch N R: ſubtract N R and N P from each other, the remainder is the Reduction.

Reduction, in metallurgy, is the bringing back metalline ſubſtances, which have been changed into ſcoriæ or aſhes, or otherwiſe diveſted of their metallic form, into their natural and original ſtate of metals again. *Cramer's Art of Aſſaying.*

All metals and ſemi-metals may be reduced by proper management, whatever have been their changes, except only zink, which, having been burnt to aſhes, admits of no Reduction. But the mixture of gold and ſilver was never yet radically diſſolved by any experiment, whatever ſome may have imagined. Even ſome earths will turn into metal by the admixture and intimate union of a phlogiſton, or inflammable principle; but theſe metals never need any ſuch principle to aſſiſt their Reduction.

REFI'NERS.—This is a very curious as well as uſeful trade, by which, they not only purify gold and ſilver themſelves, but ſeparate the filings made by the ſeveral operators thereon, from all manner of filth, without which art a great deal would be loſt.

The work is none of the eaſieſt nor cleanlieſt, but there is good pay to the journeymen, who can get three or four ſhillings a day, and no want of ſufficient profit to the maſters, who are not many in number, and will not take an apprentice under ten pounds, (I mean to the bare labouring part) whoſe hours for working muſt be from ſix to eight.

Some of the maſter Refiners deal alſo largely in gold and ſilver, which they ſell out in ſmall parcels for the worker's uſe, by which trade many good eſtates have been obtained; but thoſe in this way ſhould have five hundred or a thouſand pounds to turn about, and ſome extend it to eight thouſand pounds, yet a ſet of utenſils, fit for a bare working Refiner, will not coſt above fifty pounds.

REFI'NING (*Dict.*) — Refining of copper is only performed by giving the mineral matter ſeveral lotions before the melting it, and then giving it ſeveral repeated fuſions.

Refining of tin is performed much after the ſame manner as that of copper.

Though we may diſtinguiſh two kinds of fineneſs of this metal: the one ariſing from its fuſion; that tin, taken firſt out of the furnace wherein it is melted, being always purer than that towards the bottom.

The other kind of fineneſs is that given the tin by adding ſome other metal or mineral to it, to render it more ſonorous, as well as brighter: ſuch is tin of antimony, pewter, &c.

Refining of iron, begins likewiſe by the melting it.

The greater degree of fuſion the mineral has, the more the metal is purified: but this firſt fuſion is not ſufficient.—To render the iron malleable, and fit to endure the file, it muſt be melted a ſecond time; then forged or beaten a long time with huge heavy hammers, wrought by water; then heated in the fire, and at laſt reduced, on the anvil, into bars of ſeveral thickneſſes.

The more the iron is heated in the fire, and the more it is beaten, whether hot or cold, the finer it becomes.

Steel is only iron refined to a great degree by heating it, with ſome other ingredients which cloſe up the pores, and ſoften the grain thereof.

Refining of lead, is performed, like that of moſt other imperfect metals, by frequent meltings, ſtill ſcumming it before it be cold, and caſting in tallow, and other kinds of fat.

They alſo make eſſays of lead; not to refine it, but to ſee if it be pure, and without mixture of any other metal.

Subterranean RE'GION.—The earth is not only divided on its ſurface into Regions and countries, but philoſophers, who have had occaſion to diſcourſe of its inner parts, have alſo divided them into three diſtinct Regions, according to their different depths from the ſurface. The temperature of the ſubterranean parts of the globe is diſtinguiſhed according to the diviſion of theſe Regions, but is not ſo regular and preciſe as ſome have ſuppoſed. The firſt Region of earth is very variable both as to bounds and temperature. The ſecond Region ſeems for the moſt part cold in compariſon of the other two; but in ſeveral places, which, by reaſon of their diſtance from the ſurface of the earth, it would be natural to call the middle Region, the temperature of the air is very different at the ſame ſeaſons of the year, which ſhews that it depends on ſomething more than bare depth from the ſurface. The third Region of the earth is univerſally obſerved to be warm, but by no means regularly, or uniformly: the ſame depth in ſome places giving only a moderate warmth, while in others it gives a very conſiderable heat. Borrichius tells us of a certain abbé fond of chemiſtry, and particularly curious in the matter of long digeſtions by regular heat, who found a way of making a furnace pepetually warm, by piercing the earth to a certain depth, and uſing the heat of this third Region of it. His method, we are told, was to bore a hole with a pike twenty feet deep, and pour into it ten or twelve pounds of quickſilver; this made its way into the ſtrata, and through them in a body into the chambers of heat in this third Region, where the heat, having a vent upwards made by this opening, never failed to aſcend in a perpetual and regular ſtream, and gave that regular digeſting heat that no artificial fire could equal. But this is an alchemical ſtory. *Boyle of Coſmical Qualities. Borrich. de Ortu Chem.*

REGLETS, *or riglets*, in printing, are thin rulers, or ſlips of wood of different dimenſions, placed in the chaſe, between the pages, and at the extremes thereof, to keep them aſunder and hold them tight.

The Reglets make the chief part of what they call the furniture of the chaſe.

They are particularly denominated from the place they hold in reſpect of the pages, head-ſticks, foot-ſticks, gutter-ſticks, &c.

The term Reglet is alſo uſed abroad for a ruler of metal, three quarters of an inch long, but which may be lengthened out by joining ſeveral together; uſed to ſeparate the columns, in books that have ſeveral in the ſame page; as alſo for lines to place the notes on in printing of muſic.

Reglet, is alſo uſed for a little thin ſlip of wood uſed by ſome compoſitors to take off the lines from the compoſing-ſtick, and place them on the galley, as faſt as compoſed.

RE'GULUS (*Dict.*)—To procure the Regulus, that is, the mercurial parts of metals, &c. flux powders are commonly uſed; as nitre, tartar, &c. which purge the ſulphurous part adhering to the metal, by attracting and abſorbing it to themſelves.

Regulus is principally uſed for that of antimony, which is a ponderous metallic powder, that, upon fuſing ſome of the mineral in its crude ſtate, ſinks to the bottom, leaving the ſcoria or impurities a-top.

The alchymiſts will have this matter called Regulus, i. e. little king, as being the firſt born of the royal metallic blood; which is really a ſon, but not a perfect man, i. e. not yet a perfect metal for want of time and proper nouriſhment.

Antimony, purified by ſimple fuſion, is called Regulus of antimony, or Regulus antimonii philoſophorum.—But the more common way of reducing it into a Regulus, is with the addition of flux powders, as tartar and nitre.

The ſcoria found at the top of this Regulus is violently emetic, as well as the Regulus itſelf, whereof if cups or drinking veſſels be caſt, the wine put into them will become vomitive.

Of this Regulus caſt in moulds are made thoſe commonly called the antimonial pills, weighing about eight or ten grains each, one of which, being ſwallowed, will operate conſiderably by vomit and ſtool.

Theſe pills having thus performed their office, and been diſcharged the body, will ſerve the ſame purpoſe again and again; whence they have obtained the name of perpetual pills.—The virtue of this Regulus is not however inexhauſtible, as has been imagined; for by repeated infuſions in wine, though the liquor be made violently emetic at firſt, yet by degrees it loſes its force, and at length ceaſes to be vomitive.

The ſeparation of the ſilver out of the Regulus, made from the ſilver ore by means of lead, is to be performed in this manner: put two coppels of the ſame bigneſs, perfectly dry, and capable of containing at leaſt one third more than the Regulus, under a muffle in an aſſay furnace; make a ſtrong fire, and let them be red-hot for a quarter of an hour; then free the Regulus from its ſcoriæ, by ſtriking it gently with a hammer, and put it carefully into one of the hot coppels, and into the other put, at the ſame time, the ſame quantity of granulated lead alone, as was uſed in making the Regulus. When the Regulus boils and ſmoaks, diminiſh the fire a little, and let the coppels be kept moderately, but not violently redhot. When it has ſtood ſo long, that the ſkin of the litharge, continually produced from the lead, and covering the ſurface of the Regulus, diſappears, and the coppel ſhews the ſcoriæ only of the lead with the pure ſilver, either in fuſion, or hard and bright in the middle, let the coppel continue only a minute or two longer on the fire; then take it out with a pair of tongues, take away the metal in grains, and if any ſcoriæ, or fragment of the coppele adhere to it, wrap it together in a paper, and ſqueeſe it between the cheeks of a vice, or a pair of tongs, to break off that brittle matter without hurting the Regulus. If this Regulus be pure ſilver, it will now be very white; but, if it contain any gold, it will ſhew it by its yellowneſs.

To determine exactly how much ſilver the quantity of ore contained, weigh it nicely in a fine balance, and take out the ſmall reguline lumps from the other coppel, and, weighing that, deduct its weight from that of the other, becauſe ſo much ſilver that owes to the lead uſed in making it, and the remainder is the proportion of ſilver contained in the ore. *Cramer's Art of Aſſaying.*

Martial Regulus of antimony, is a mixture of little bits of iron, as the nails of horſe's ſhoes, melted with the Regulus.

In this operation the iron diſſolving and abſorbing the ſulphurous parts of the antimony, more ſtrongly than the fluxes in the former caſe, and turning it into a crocus; the antimony is hereby brought to a greater degree of purity, and rendered more efficacious than in the common Regulus.

The Regulus is ſometimes farther purified by repeated fuſions and detonations, with the addition of freſh antimony, and more nitre, alternately: in which caſe it becomes Regulus antimonii ſtellatus, or ſtarry Regulus of antimony.

Regulus *criſtatus*, the creſted or golden crown wren, the name of a very beautiful little bird, the ſmalleſt of the European birds. Its whole weight is not more than a drachm, and the crown of its head is adorned with a very beautiful ſaffron-coloured, or orange red ſpot, which is called its creſt, and by ſome its crown; and from this golden crown the bird has obtained the name of the Regulus, tyrannus, baſileus, and other appellations of royalty.

RE'LICS, *reliquiæ*, in the Romiſh church, certain remains of the bodies or cloaths of ſome ſaint or martyr, devoutly preſerved in honour to his memory, carried at proceſſions, kiſſed, revered, &c.

The abuſes in point of Relics are moſt flagrant: F. Mabillon, a Benedictin, complains of the great number of ſuſpected Relics expoſed on altars: he owns that, were there to be a ſtrict inquiſition into the Relics, vaſt numbers of ſpurious ones would be found offered every-where to the piety and devotion of the faithful; and adds, that bones are frequently conſecrated, ſo far from belonging to ſaints, that in all probability they do not belong to Chriſtians.

The catacombs are an inexhauſtible fund of Relics; yet it is ſtill diſputed who were the perſons interred therein.

In the eleventh century, a method was introduced of trying ſuppoſed Relics by fire.—Thoſe which did not conſume in the fire were reputed genuine; the reſt not.

It is an ancient cuſtom, which ſtill obtains, to preſerve the Relics in the altars whereon maſs is celebrated.—To this purpoſe, a ſquare hole is made in the middle of the altar, big enough to receive the hand; and herein is the Relic depoſited, wrapped in red ſilk, and incloſed in a leaden box.

The Romaniſts alledge a good deal of antiquity in behalf of their Relics.—The Manichees, it ſeems, out of hatred to the fleſh, which they held an evil principle, are recorded as refuſing to honour the Relics of ſaints; which is eſteemed a kind of proof that the catholics did it in the firſt ages.

Indeed folly and ſuperſtition got into religion but too early.—Even the touching of linen cloaths on Relics, from an opinion of ſome extraordinary virtue derived therefrom, appears to be as antient as the firſt ages; there being a hole made in the coffins of the forty martyrs at Conſtantinople, expreſly for this purpoſe.

RELI'GION (*Dict.*)— The following short account of all the Religions professed by the several nations, &c. of the known world, will, we presume, be acceptable to the reader.

1. Religions of Europe.

Sweden. The Swedes are Protestants, of the sect of the Lutherans. The gospel was first planted in this country, A. D. 829.

Denmark. The Danes are likewise Lutherans, having embraced the reformation much about the same time with their neighbours the Swedes.

Norway. The religion of this country is the same with that of Denmark, excepting that, in the northermost parts of the kingdom, the knowledge of Christianity is so greatly decayed, that the inhabitants, especially the Laplanders, differ but little from mere heathens.

Russia or Muscovy. The Russians are Christians, according to the doctrines and discipline of the Greek church; which they pretend to observe in the greatest purity; but, in truth, they have added thereto a great many superstitious practices and ridiculous ceremonies. They pay divine worship to the Virgin Mary, and the saints, and adore crucifixes. Christianity was first planted in this country, about the end of the Xth century, by the preaching of some Greeks, sent thither by the patriarch of Constantinople.

France. The only established religion in this country is that of the Romish church. But, though the French receive all the decisions of the council of Trent, in matters of faith; yet, in points of discipline and church-government, they claim certain privileges, called the rights of the Gallican church; which they never suffer to be infringed by any authority of the see of Rome.

Germany. The laws of the empire give free toleration to the exercise of three religions; namely, the Lutheran, Calvinist, and Popish.

Hungary. The prevailing religion of this country is that of the Romish church, especially since it is become subject to the emperor: however, the doctrines of Luther and Calvin are zealously maintained by multitudes of people.

Holland. No country in Europe can boast of more religions than Holland; where an universal toleration is granted to all sects and parties; and this for the sake of commerce. That publicly professed, and generally received, is the reformed Religion, according to the doctrines of Calvin.

Flanders. This country, being partly subject to the empire, and partly to France, possesses the Romish Religion, and that in its grossest errors.

Poland. The Polanders are, for the most part, Roman Catholics. Notwithstanding which, a general toleration is here granted to all Religions; insomuch that this country swarms with Greeks, Armenians, Lutherans, Socinians, Calvinists, Jews, Quakers, &c. The Lutherans are mostly found in Prussia. Christianity was established in various parts of Poland, at several times, and by several persons; being settled in Poland, properly so called, in 963; in Livonia, an. 1200; and in Lithuania, not till the year 1386.

Spain. The Spaniards are the closest adherents to the church of Rome, in her grossest errors and corruptions; and none are suffered to reside in this kingdom, who profess any other belief. For this reason the king of Spain is stiled the Catholic king. Christianity was first planted in Spain, according to an old Spanish tradition, by the apostle St. James, within four years after the death of Christ.

Portugal. The Portuguese are of the same Religion with their neighbours, the Spaniards; with this difference, that they tolerate Jews, and allow several foreigners, particularly the English factory at Lisbon, the public exercise of their Religion. This country received the gospel much about the same time.

Italy. The Italians, in general, are zealous professors of the Romish Religion: indeed, Italy is the very center of popery. The Christian faith was first preached in this country by St. Peter, who, it is said, went thither about the beginning of the reign of the emperor Claudius. The best summary of the Romish faith is the creed of Pope Pius IV.

Greece. The established Religion of this country, which is in subjection to the Turk, is Mohammedism; but the Christians, who are every-where tolerated in the Turkish dominions, are far more numerous in Greece, than the Mohammedans. The Religion of the Greek Christians is a schism or separation from the church of Rome, and consists, principally, in denying the procession of the Holy Ghost, purgatory, extreme unction, and confirmation; in administring the sacraments in both kinds, and to children of seven years of age; and in rejecting the use of images. Their clergy, as well as laity, are exceedingly illiterate and ignorant. Christianity was first preached in this country by St. Paul, the apostle of the Gentiles.

Little Tartary. The Crim-Tartars are, for the most part, zealous Mohammedans, excepting some few, who continue still Pagans.

The Danubian Provinces. The inhabitants of these different provinces are very different in point of Religion, but reducible to three classes, viz. Jews, Christians, and Mohammedans.

Scotland. The Religion of this northern part of Great-Britain is Presbyterianism.

England. The church of England pretends to profess the reformed Religion, in its choicest purity. In reforming their Religion, the English were not so hurried by popular fury and faction, as other nations were; but proceeded in a more prudent, regular, and Christian method, resolving to separate no farther from the church of Rome, than she had departed from the truth. So that the reformed church of England is the true mean between superstition and fanaticism. Her doctrine is entirely built upon the apostles and prophets: her government is truly apostolical: her liturgy an extract of the best primitive forms; and her ceremonies few, and such as tend only to decency and true devotion. All other sects and parties, except the Romish, are here allowed the free exercise of their Religion.

Ireland. The inhabitants of this island are partly Papists, and partly Protestants. The most civilised parts of the kingdom profess the reformed Religion, according to the platform of the church of England. But the far greater part of the native Irish still adhere to the Romish Religion.

2. Religions of Asia and Africa.

Tartary. The inhabitants of this vast country are partly Pagans, partly Mohammedans, and partly Christians. The Christian faith, it is thought, was planted in this country by the apostles, St. Philip and St. Andrew.

China. The prevailing Religion in China is gross idolatry; and, in some parts, the doctrines of Mohammed are professed.

Mogul's empire. The inhabitants of this country are mostly Pagans; and, next to Paganism, the Religion of Mohammed prevails.

The Peninsula of India, within the Ganges. The inhabitants of this tract of land are generally Mohammedans.

The Peninsula of India, beyond the Ganges. The inhabitants of this Peninsula are generally gross Idolaters.

Persia. The Persians are strict Mohammedans, but of the sect of Ali. Christianity was first planted in this kingdom by St. Thomas.

Natolia, or Asia Minor. The established Religion of this country is Mohammedism; but persons of all professions are tolerated here, and in other parts of the Turkish dominions.

Arabia. The Religion of Mohammed is professed in this country, where it took its first rise; that impostor being born in Arabia.

Syria. The inhabitants of this part of Asiatic Turkey are chiefly Mohammedans, with a mixture of Jews and Christians, particularly Greeks, Armenians, and Marionites. Christianity was planted here in the apostolic age.

Palestine. The inhabitants of this country are a mixture of Mohammedans, Jews, and Christians, who follow their respective Religions. Christianity was preached in this country by Christ himself, and his apostles.

The Euphratian provinces. The prevailing Religion in many parts of this country is that of the Armenians. Christianity was planted here by St. Bartholomew the apostle.

Egypt, Barbary, Bildulgerid, Zaarah, or the Desart; the Land of the Negroes: all Mohammedans or Pagans.

Guinea. Paganism is the Religion of this country, the profession whereof is attended with many ridiculous superstitions. In some places, on the Gold coast, the diabolical custom of human sacrifices is still in use.

Nubia. This spacious country was once Christian, having received the gospel in the earliest ages: but, for want of pastors, the inhabitants fell off from Christianity, and became either strict Mohammedans or gross Idolaters.

Ethiopia superior, or Abyssinia. This spacious empire contains a great mixture of people, as Pagans, Jews, and Mohammedans, of various nations; but the main body of the natives is Christian.

Ethiopia inferior. The numerous inhabitants of these countries are gross Idolaters.

From the foregoing view of the various Religions of the different countries of the world, it appears, that the Christian Religion, undoubtedly the true Religion, is of a very small extent, if compared with those many and vast countries, overspread with Idolatry or Mohammedism. This great and sad truth may be farther evinced by the following calculation, ingeniously made by some, who, dividing the inhabited world into thirty parts, find, that nineteen of them are possessed by gross Idolaters; six by Jews and Mohammedans; two by Christians of the Greek church; and three by those of the church of Rome and Protestant communion. If this calculation be true, Christianity, taken in its largest latitude, bears no greater proportion to the other false Religions, than that of five to twenty-five.

REMO'RA, *the sucking fish*, in natural history, a small oblong fish, whose body is of a cylindric figure, and tapers off to a thinness at the tail. Its mouth is triangular, and the upper part is shorter than its under. Its head is flat, and marked with streaks, so as to look like the palates of some fishes: these run transversely, and are carried on to the back, making a striated substance of two fingers breadth, by which it fastens itself to any other substance, as the body of a larger fish, the hulk of a ship, or the like. The eyes are small and yellow, with a black pupil. It has no teeth, but in their places a multitude of small prominences. It has two fins under the gills, and two more lower on the body. Besides these, it has two longitudinal fins, one on the back, the other on the belly, running the length of the body to the tail. The whole fish

fish is of a greyish colour, and it is caught in the East and West-Indies, and in many other seas.

RE'NTAL, a roll wherein the rents of a manor are written and set down, and by which the lord's bailiff collects the same: it distinguishes the lands and tenements, and the names of the tenants, the several rents arising, and from what time, usually a year. *Comp. Court-Keep.* 475.

RE'NTERING *, or FINE-DRAWING, in the manufactories, the sewing of two pieces of cloth, edge to edge, without doubling them; so as that the seam scarce appears at all: hence also called fine-drawing.

* The word is formed from the French, *rentraire*, which signifies the same thing; and which Menage after Salmasius derives from the Latin *retrahere* of *re*, in, and *trahere*, by reason the seam is drawn out of sight and covered.

Serges, &c. are to be sewed; cloths fine-drawn.—The author of one of the Lett. Edif. & Cur. speaking of the great dexterity of the fine-drawers in the East-Indies, assures us, that if you tear a piece of fine muslin, and give it one of them to mend, it shall be impossible for you to discover the place where it is rejoined, even though you had made a mark to know it by.

The dexterity of our own fine-drawers, though inferior to that above-mentioned, is nevertheless such, as puts them in a condition to defraud the king, by sewing a head or slip of English cloth on a piece of Dutch, Spanish, or other foreign cloth; or a slip of foreign cloth on a piece of English, so as to pass the whole as of a piece; and by that means avoid the duties, penalties, &c.—The trick was discovered in France, by M. Savary, author of the *Diction. de Commerce.*

To renter in tapistry, is to work new warp into a piece of tapistry damaged, eaten by the rats, &c. and on this warp to restore the ancient pattern or design.—The warp is to be of woollen, not linen.—Among the titles of the French tapistry-makers, is included that of Renterers.

Fine-drawing is particularly used for a rent, or hole, happening in the dressing or preparing of a piece of cloth, artfully sewed up or mended with silk.

All fine-drawings are reputed defects or blemishes, and ought to be allowed for in the price of the piece.—Hence, M. Savary establishes is as a rule, which is certainly founded on natural equity, that every manufacturer mark the fine-drawings of his cloths with a piece of packthread tied to the list, to direct the draper to the spot: and that the draper apprize the taylor or other person, to whom he sells it, of the same; that he may not come to damage in the cutting; there being instances of drapers condemned to take back their cloth, when cut to pieces, for omitting to mention the fine-drawings, and other flaws.

On this occasion M. Savary extols the procedure of an English merchant, who sending a piece of cloth damaged in one spot to his correspondent at Paris, put a piece of gold in the damaged place, to make up the damage.—But as this example is perhaps the only one of its kind, that author recommends it to the merchant or draper to unfold all the pieces entirely, as they come to him; to discover the fine-drawings and other flaws, in order to make the clothier accountable for them.

RE-ORDINA'TION, the conferring orders a second time. Re-ordination is practised in England when dissenting ministers conform to the church, the bishops contending that they alone have right to confer holy orders, and that every priest or minister who does not receive their hands, has no lawful, regular vocation. This proves a great obstacle to the re-union of those ministers to the church of England, many of whom are otherwise disposed to conform; inasmuch as Re-ordination implies their former vocation to be null; that they had administred the sacraments without any right thereto; and that all their ministerial acts were invalid.

REPE'LLENT *fluid*, a name given by Dr. Knight to a fluid which he supposes disseminated through the universe.

After proving that all the primary corpuscles of bodies are compounded of attracting and repelling matter, and that the smallest corpuscles in nature are such as mutually repel each other, the Dr. adds, 'A sufficient number of such Repellent corpuscles, collected together, will compose a fluid in all respects resembling pure elementary air, at least as far as we are able to judge from the known properties of that element. The common air, indeed, of our atmosphere is a fluid far less simple and homogene than what is here supposed: it is rather a chaos of all the substances in nature, and is on that account capable of producing a great variety of phænomena, that can in no wise be ascribed to so simple a cause. If therefore we would make a just comparison between the common air and our repellent corpuscles, we must suppose them also mixed with the same variety of other substances. Our Repellent fluid will be compressible and perfectly elastic, the distance of its particles will render it extremely rare and pellucid, and their distance and smallness together will make it exceed all other fluids in levity. If the air is really more elastic at different heights of the atmosphere, we need only conceive its particles of different sizes to account for it. The smallest, and consequently the lightest, will have most elasticity. Those, by the laws of hydrostatics, will rise highest, and vice versâ, the grossest and least elastic will occupy the lowest part of the atmosphere. *Knight's Attempt to demonstrate that all the Phænomena in Nature may be explained by two simple and active Principles, Attraction and Repulsion.*

REPETE'ND, in arithmetic, is used for that part of an intermediate decimal fraction, which is continually repeated ad infinitum.

Thus, in the intermediate decimal fraction, 317.45 316 316 316 316, &c. the figures 316 are called the Repetend. *Cunn. Treat. of Fractions.*

These Repetends often arise in the reduction of vulgar fractions to decimals; thus $\frac{1}{3} = 0.3333$, &c. $\frac{1}{7} = 0.142857$ 142857, &c. $\frac{1}{11} = 0.090909$, &c.

Single Repetend, is that where one figure only is repeated, as in 0.333, &c.

Compound Repetend, is that where two or more figures are repeated, as in 0. 09 09, &c. or in 0. 142857, 142857, &c.

Decimals with Repetends may always be reduced to vulgar fractions. For either the Repetend begins with the decimal or not:

If the Repetend begins with the first place of decimals, make it the numerator of a vulgar fraction, and make the denominator consist of as many nines as the Repetend has figures, then will this vulgar fraction be equal to the decimal.

Thus, if the Repetend be single, as in 0. 3333, the vulgar fraction equal to it will be $= \frac{3}{9} = \frac{1}{3}$. So, if the Repetend be compound, as in 0. 09, 09, &c. the equivalent vulgar fraction will be $\frac{09}{99} = \frac{9}{99} = \frac{1}{11}$.

And in like manner 0. 142857, 142857, &c. $= \frac{142857}{999999} = \frac{1}{7}$.

The reason is obvious from this consideration, that the decimal 0. 333, &c. is $= \frac{3}{10} + \frac{3}{100} + \frac{3}{1000}$, &c. the sum of which, by the rule mentioned under FRACTION in the Dictionary, will be equal to $\frac{3}{10}$ divided by $1 - \frac{1}{10} = \frac{3}{9} = \frac{1}{3}$, and so of the rest.

If the Repetend does not begin with the first place of decimals, but some place farther on towards the right as in the decimal 0. 83333, &c. where the Repetend does not begin till the second place of decimals, observe, that 0. 8333 +, &c. $= \frac{8}{10} + \frac{1}{10} \times \frac{3}{10} + \frac{3}{10^2} +$, &c. But $\frac{3}{10} + \frac{3}{10^2} +$, &c. $= \frac{3}{9} = \frac{1}{3}$, as before; therefore the proposed decimal is $= \frac{8}{10} + \frac{1}{10} \times \frac{1}{3} = \frac{8}{10} + \frac{1}{30} = \frac{250}{300} = \frac{25}{30} = \frac{5}{6}$.

Thus, also, if the decimal 0. 2, 27, 27, &c. were proposed, we shall find it $= \frac{2}{10} + \frac{1}{10} \times \frac{27}{100} + \frac{27}{100^2} +$, &c. And, $\frac{27}{100} + \frac{27}{100^2} +$, &c. being $= \frac{27}{99} = \frac{3}{11}$, the decimal will be $= \frac{2}{10} + \frac{1}{10} \times \frac{3}{11} = \frac{2}{10} + \frac{3}{110} = \frac{5}{22}$. The reason of which is obvious from what has been said. It may perhaps be worth while to observe, that, if the numerator of a vulgar fraction be unity, and the denominator any prime number, except 2 and 5, the decimal equal to the proposed fraction will always be a Repetend, beginning at the first place of decimals; and this Repetend must necessarily be a submultiple, or an aliquot part of a number expressed by as many nines as the Repetend has figures; that is, if the Repetend have six figures, it will be a submultiple of 999999; if four figures, it will be a submultiple of 9999, &c. From whence it follows, that, if any prime number be called p, the series 9999, &c. produced as far as is necessary, will always be divisible by p, and the quotient will be the Repetend of the decimal fraction $= \frac{1}{p}$.

REPRESE'NTATIVE *power*, in metaphysics, a term introduced by Leibnitz, to signify that power of the human soul, by which it represents to itself the universe, according to the situation of the body in the universe. See the article IDEA, in the Dictionary.

Wolfius calls this power vis representativa, to denote its being an active power, or rather a force actually exerting itself. For he expressly says, quod vis consistat in continuo agendi conatu. And he thinks, that, from this principle of a vis representativa, every phænomenon of the human mind may be accounted for. See his *Psycholog. Ration. Art.* 529.

But it may be presumed, that many will find this principle too obscure to be admitted.

When it is said, that our ideas are Representative of things without us, or of the universe; it may be asked in what sense this is to be understood? Do they represent it 1°. as a picture does its original? or 2°. as an effect of a cause? or 3°. as a sign represents the thing signified? The first opinion is exploded in part by Locke and the Cartesians, and totally by Dr. Berkeley, late bishop of Cloyne. The second is admitted by Hobbes, but denied by Leibnitz himself, and the idealists. The third should seem to be the opinion of Leibnitz, but he is not sufficiently explicit.

Dr. Berkeley admits ideas to be signs; but according to him they are arbitrary signs, depending on the immediate will of the Deity: hence the visual language; and ideas only signify or suggest each other, and spirits; but not bodies, the existence of which is totally unknown.

REPRODU'CTION (*Dict.*)—It is very well known, that trees and plants are to be raised from slips and cuttings, and some late observations have shewn, that there are some animals which have the same property.

The Polype was the first instance we had of this; but we had scarce time to wonder at the discovery Mr. Trembley had

made,

made, when Mr. Bonett discovered the same property in a species of water-worm.

Amongst the plants that may be raised from cuttings, there are some which seem to possess this quality in so eminent a degree, that the smallest portion of them will become a complete tree again.

It deserves enquiry, whether or not the great author of nature, when he ordained that certain insects, as these polypes and worms, should resemble those plants in that particular, allowed them this power of being reproduced in the same degree; or, which is the same thing, whether this Reproduction will or will not take place in whatever part the worm is cut: in order to try this Mr. Bonett entered on a course of many experiments on the water-worms which have this property. These are, at their common growth, from two to three inches long, and of a brownish colour, with a cast of reddish. From one of these worms he cut off the head and tail, taking from each extremity only a small piece of the twelfth of an inch in length, but neither of these pieces were able to reproduce what was wanting. They both perished in about twenty-four hours; the tail first, and afterwards the head. As to the body of the worm from which these pieces were separated, it lived as well as before, and seemed indeed to suffer nothing by the loss, the head-part being immediately used as if the head was thereon, boring the creature's way into the mud. There are, besides this, two other points in which the Reproduction will not take place; the one of these is about the fifth or sixth rim from the head, and the other the same distance from the tail; in all probability the condition of the great artery in these parts is the cause of this.

What is said of the want of the reproductive power of these parts, relates only to the head and tail ends; for as to the body, it feels very little inconvenience from the loss of what is taken off, and very speedily reproduces those parts. Where then does the principle of life reside in such worms, which, after having their heads cut off, will have, not only the same motions, but even the inclinations, that they had before; and yet this difficulty is very small, compared to several others, which at the same time offer themselves to our reason? Is this wonderful Reproduction of parts only a natural consequence of the laws of motion, are there lodged in the body of the creature a chain of minute buds or shoots, a sort of little embryos already formed and placed in such parts where the Reproductions are to begin? Are these worms only mere machines, or are they, like more perfect animals, a sort of compound, the springs of whose motions are actuated or regulated by a sort of soul? And, if they have themselves such a principle, how is it that this principle is multiplied and is found in every separate piece? Is it to be granted, that there are in these worms not a single soul (if it is to be so called) in each, but that each contains as many souls as there are pieces capable of reproducing perfect animals? Are we to believe with Malpighi, that these sorts of worms are all heart and brain from one end to the other? This may be, but yet, if we knew that it was so, we should know, in reality, but very little the more for knowing it; and it seems after all, that, in cases of this kind, we are only to admire the works of the great Creator, and sit down in silence.

The nice sense of feeling in spiders has been much talked of by naturalists; but it appears, that these worms have yet somewhat more surprising in them in regard to this particular. If a piece of stick, or any other substance, be brought near them, they do not stay for its touching them, but begin to leap and frisk about, as soon as it comes towards them. There want however some farther experiments to ascertain whether this be really owing to feeling or to sight; for, though we can discover no distinct organs of sight in these creatures, yet they seem affected by the light of the sun or a candle, and always frisk about it in the same manner, at the approach of either; nay, even the moon-light has some effect upon them.

A twig of willow, poplar, or many other trees, being planted in the earth, takes root, and becomes a tree, every piece of which will in the same manner produce other trees. The case is the same with these worms; they are cut to pieces, and their several pieces become perfect animals; and each of these may be again cut into a number of pieces, each of which will in the same manner produce an animal. It had been supposed by some, that these worms were oviparous; but Mr. Bonett, on cutting one of them to pieces, having observed a slender substance resembling a small filament to move at the end of one of the pieces, separated it, and, on examining it with glasses, found it to be a perfect worm of the same form with its parent, which lived and grew larger in a vessel of water into which he put it. These small worms are easily divided, and very readily complete themselves again, a day usually serving for the production of a head to the part that wants one, and in general, the smaller and the slenderer the worms are, the sooner they complete themselves after this operation. When the bodies of the large worms are examined by the microscope, it is very easy to see the appearance of the young worms alive and moving about within them; but it requires great precision and exactness to be certain of this; since the ramifications of the great artery have very much the appearance of young worms, and they are kept in a sort of continual motion by the systoles and diastoles of the several portions of the artery which serve as so many hearts. It is very certain, that what we force in regard to these animals by our operations, is done also naturally every day, in the brooks and ditches where they live. A curious observer will find in these places many of them without heads or tails, and some without either; as also other fragments of various kinds, all which are then in the act of completing themselves; but whether accidents have reduced them to this state, or they thus purposely throw off parts of their own body for the Reproduction of more animals, is not easy to determine. They are plainly liable to many accidents, by which they lose the several parts of their body, and must perish very early, if they had not a power of reproducing what was lost; they are often broken into two pieces, by the resistance of some hard piece of mud, which they enter; and they are subject to a disease, a kind of grangrene rotting off the several parts of their bodies, and must inevitably perish by it, had they not this surprising property.

This worm was a second instance, after the polype, of the surprising power in an animal of recovering its most essential parts, when lost; but nature does not seem to have limited her beneficence in this respect to these two creatures; Mr. Bonett tried the same experiments on another species of water-worms differing from the former in being much thicker: This worm, when divided in the summer season, very often shews the same property; for, if it be cut into three or four pieces, the pieces will lie like dead for a long time, but afterwards, will move about again, and will be found in this state of rest to have recovered a head, or a tail, or both. After recovering their parts, they move very little, and, according to this gentleman's experiments, seldom live more than a month. It should seem that the more difficult success of this last kind of worm, after cutting, and the long time it takes to recover the lost parts, if it do recover them at all, is owing to its thickness; since we always find, in that species of worms which succeeds best of all, that those which are thinnest always recover their parts much sooner than the others.

The water insects, also, are not the only creatures which have this power of recovering their lost parts. The earth affords us some already to grow in this manner from their cuttings, and these not less deserving our admiration than those of the water; the common earth-worms are of this kind. Some of these worms have been divided into two, others into three or four pieces, and some of these pieces, after having passed two or three months without any appearance of life or motion, have then begun to reproduce a head, or a tail, or both. The Reproduction of the anus, after such a state of rest, is no long work; a few days does it, but it is otherwise with the head, that does not seem to perform its functions in the divided pieces, till about seven months after the separation. It is to be observed that, in all these operations, both on earth and water-worms, the hinder part suffers greatly more than the fore-part in the cutting, for it always twists itself about a long time, as, if actuated by strong convulsions; whereas the head usually crawls away without the appearance of any great uneasiness.

REPU'LSION (*Dict.*) — The learned Dr. Knight observes that we have sufficient evidence of the existence of Repulsion from facts and experience. 'For, says he, all bodies are electrical, or capable of being made so: and electrical bodies both attract and repel. Secondly, both attraction and Repulsion are very conspicuous in all magnetical bodies. Thirdly, Sir Isaac has shewn from experiment, that the surfaces of two convex glasses repel each other. Fourthly, the same great philosopher has explained the elasticity of the air by supposing its particles mutually to repel. Fifthly, the particles of light are, in part at least, repelled from the surface of all bodies. Lastly, it seems highly probable that the particles of light mutually repel each other. The air is always rarified by heat; and that in a greater proportion, as the heat is more intense. What then must that rarefaction be in the focus of Villette's speculum? Perhaps a more perfect vacuum would not be produced by the best air-pumps. But suppose half the air still remaining, its expansive force will be equal to a column of mercury of fifteen inches in height; whose basis will be equal to an imaginary surface surrounding the whole focal space. But the atmosphere will press with a force equal to a column of the same base, and thirty inches in height. What is it that supports this extraordinary weight? A Cartesian will tell us perhaps, that there is no vacuum at all: but that the air is drove out of its place by the subtile matter; which being moved with great rapidity by the matter of the first element, i. e. light, and whirled round in a vortex, by its centrifugal force is determined every way to fly off, and so counter-acts the pressure of the air. But how can light, which moves, in this case, all of it in one direction, communicate a motion to the subtile matter so, that it shall act in all directions? Another difficulty arises from a defect in the momentum of light: which being supposed the primum mobile, ought to act with a force equal to several pounds of mercury. Now as all these difficulties vanish, if we only admit a Repulsion betwixt the particles of light themselves, and betwixt them and air, we can have no reason to doubt of the fact, especially since it is plain, from the arguments above, that there is such a cause as Repulfion in nature. 'For no caufe ought to be admitted, but what is really found in nature, and no more than are neceffary towards explaining the feveral phænomena'.

RESPIRATION (*Dict.*)—The alternate motion of the thorax and lungs in Refpiration is evident, but it is not eafy to determine the mechanifm by which thefe motions are performed. Dr. Martin thinks this has not been accounted for in a fatisfactory manner, either by Swammerdam, Borelli, Baglivi, Pitcairn, or Boerhaave, and has given us an effay on this fubject in the *Medic. Eff. Edinb.* Vol. I. *Art.* 12.

Dr. Hoadley endeavours to prove, that the external intercoftal mufcles ferve for infpiration, while the internal intercoftals are their antagonifts, depreffing their ribs in expiration. He thinks it proved by Dr. Hale's experiments, that there is air in the cavity of the thorax, between the lungs and the pleura, and endeavours to take off the force of Dr. Houfton's afferting that he faw the lungs and pleura contiguous. He grants, however, that fometimes there may be little or no air. He accounts for Refpiration much in the fame way with thofe who affume the contiguity of the lungs and pleura. He joins with thofe who think the impetus, which the internal furface of the lungs fuftains in common Refpiration, to be very little. The ufes of Refpiration are, to difcharge, from the venal blood and chyle, fuch parts as are unfit to render them arterial blood, and to admit air into the blood. From this doctrine he accounts for the phænomena of the difeafes of the lungs. He fubjoins the picture and defcription of an ingenious inftrument for illuftrating the manner in which Refpiration is performed.

Organs of RESPIRATION, *in fly-worms*. — Thefe afford us not only great matter of admiration in their general ftructure, but, by their almoft endlefs variety in the different fpecies of thefe creatures, give ample room for the forming claffes and genera from them.

The firft clafs of thefe creatures is of thofe with variable heads, whofe organs of Refpiration are principally behind, the large fenfible ftigmata, or breathing-holes, being placed there; and which have no fcaly legs, nor any regularly formed membranaceous ones; and which have, under their belly, certain flefhy protuberances, each feeming a portion of a ring, which is inflated at certain times.

Thefe are the characters common to a vaft clafs of thefe creatures, which are transformed into two-winged flies; but feem never to be the marks of thofe which are produced from the eggs of the four-winged clafs. *Reaumur's Hift. Infect.*

RESISTENCE (*Dict.*)— Refiftence of a globe, perfectly hard and in a medium, whofe particles are fo too; is to the force wherewith the whole motion may either be deftroyed or generated which it has at the time, when it has defcribed four thirds of its diameter, as the denfity of the medium to the denfity of the globe.— Hence alfo, infers Sir Ifaac Newton that the Refiftence of a globe is, cæteris paribus, in a duplicate ratio of its velocity. Or its Refiftence is cæteris paribus, in a duplicate ratio of its diameter. Or, cæteris paribus, as the denfity of the medium. Laftly, that the actual Refiftence of a globe is in a ratio compounded of the duplicate ratio of the velocity, and of the duplicate ratio of the diameter, and of the ratio of the denfity of the medium.

In thefe articles, the medium is fuppofed to be difcontinuous, as air probably is; if the medium be continuous, as water, mercury, &c. where the globe does not ftrike immediately on all the particles of the fluid generating the Refiftence, but only on thofe next it, and thofe again on others, &c. the Refiftence will be lefs by half. And a globe in fuch a medium undergoes a Refiftence which is to the force wherewith the whole motion it has, after defcribing eight thirds of its diameter, might be generated or taken away, as the denfity of the medium to the denfity of the globe.

RESISTENCE *of a cylinder* moving in the direction of its axis, is not altered by any augmentation or diminution of its length, and therefore is the fame with that of a circle of the fame diameter moving with the fame velocity in a right line perpendicular to its plane.

The Refiftence of a cylinder moving in an infinite unelaftic fluid, arifing from the magnitude of a tranfverfe fection, is to the force wherewith its whole motion, while it defcribes four times its length, may be taken away or generated, as the denfity of the medium to that of the cylinder, very nearly.

Hence, the Refiftences of cylinders moving length-wife, in infinitely continued mediums, are in a ratio compounded of the duplicate ratio of their diameters, the duplicate ratio of their velocities, and the ratio of the denfity of the mediums.

The Refiftence of a globe in an infinite unelaftic medium is to the force whereby its whole motion, while it defcribes eight thirds of its diameter, might be either generated or taken away, as the denfity of the fluids to the denfity of the globe, quam proximè.

Mr. James Bernoulli demonftrates the following theorems.

RESISTENCE *of a triangle*.— If an ifofceles triangle be moved in a fluid according to the direction of a line perpendicular to its bafe; firft, with the vertex foremoft, and then with its bafe; the Refiftence will be as the legs, and as the fquare of the bafe, and as the fum of the legs.

The RESISTENCE *of a fquare* moved according to the direction of its fide, and of its diagonal, is as the diagonal to the fide.

The RESISTENCE *of a circular fegment*, lefs than a femicircle carried in a direction perpendicular to its bafis, when it goes with the bafe foremoft, and when with its vertex foremoft (the fame direction and celerity continuing;) is as the fquare of the diameter, to the fame, lefs one third of the fquare of the bafe of the fegment. — Hence, the Refiftences of a femicircle, when its bafe and when its vertex go foremoft, are to one another in a fefquialterate ratio.

RESISTENCE *of a parabola*.—A parabola moving in the direction of its axis, firft with its bafis, and then its vertex foremoft, has its Refiftences as the tangent to an arch of a circle, whofe diameter is equal to the parameter, and the tangent equal to half the bafis of the parabola.

The Refiftence, if the vertex go foremoft, may be thus computed:—Say as the fum (or difference) of the tranfverfe axis, and latus rectum, is to the tranfverfe axis; fo is the fquare of the latus rectum to the fquare of the diameter of a certain circle, in which circle apply a tangent equal to half the bafis of the hyperbola or ellipfis. — Then fay again, as the fum (or difference) of the axis and parameter, is to the parameter; fo is the aforefaid tangent to another right line. And farther, as the fum (or difference) of the axis and parameter is to the axis; fo is the circular arch, correfponding to the aforefaid tangent, to another arch. This done, the Refiftences will be as the tangent to the fum (or difference) of the right line thus found, and the arch laft mentioned.

In the general, the Refiftences of any figure whatever, going now with its bafe foremoft, and then with its vertex, are as the figures of the bafe to the fum of all the cubes of the element of the bafe, divided by the fquares of the element of the curve line.

All which rules may be of ufe in the conftruction of fhips, and in perfecting the art of navigation univerfally: as alfo for determining the figures of the balls of pendulums for clocks, &c.

REST (*Dict.*)—Reft is either abfolute or relative as place is.

Some define Reft, the ftate of a thing without motion; and hence, again, Reft becomes either abfolute or relative, as motion is.

Sir Ifaac Newton defines true or abfolute Reft to be the continuance of a body in the fame part of abfolute and immoveable fpace: and relative Reft to be the continuance of a body in the fame part of relative fpace.

Thus, in a fhip under fail, relative Reft is the continuance of a body in the fame region of the fhip, or the fame part of its cavity.— True or abfolute Reft is its continuance in the fame part of univerfal fpace, wherein the fhip with its cavity and contents are all contained.

Hence, if the earth be really and abfolutely at Reft, the body, relatively at Reft in the fhip, will really and abfolutely move; and that with the velocity wherewith the veffel moves. — But, if the earth do likewife move, there will then arife a real and abfolute motion of the body at Reft, partly from the real motion of the earth in abfolute fpace, and partly from the relative motion of the fhip on the fea.—Laftly, if the body be likewife relatively moved in the fhip, its real motion will arife partly from the real motion of the earth in immoveable fpace, and partly from the relative motion of the fhip on the fea, and o the body in the fhip.

Thus, if that part of the earth where the fhip is, move eaftward with a velocity of 10010 parts; and the veffel be carried by the winds weftward ten parts; and at the fame time a feaman aboard walk with a velocity of one part: the feaman will be moved really and abfolutely in immoveable fpace eaftwards with 10001 parts of velocity; and relatively on the earth, with nine parts of velocity weftwards.

It is an axiom in philofophy, that matter is indifferent as to Reft, or motion.—Hence, Sir Ifaac Newton lays it down as a law of nature, that every body perfeveres in its ftate either of Reft, or uniform motion, except fo far as it is difturbed by external caufes.

The Cartefians will have firmnefs, hardnefs, or folidity of bodies to confift in this, that their parts are at Reft, with regard to each other: and this Reft they eftablifh as the great nexus, or principle of cohefion, whereby the parts are connected together.

Fluidity, they add, confifts in a perpetual motion of the parts, &c.—But the Newtonian philofophy furnifhes us with much better folutions.

REST *in mufic* (*Dict.*)—Refts are fometimes ufed in melody, that is, in mufic of a fingle part, to exprefs fome fimple paffion, or even for variety fake; but more frequently in harmony, or compofitions of feveral parts, for the fake of the pleafure of hearing one part move on while another refts; and this interchangeably.

Refts are either for a whole bar, or more than a bar, or but for a part of a bar. When the Reft is for a part, it is expreffed by certain figns correfponding to the quantity of certain notes of time; as minim, crotchet, &c. and is accordingly called minim Reft, crotchet Reft, &c.

The characters or figures, whereof, fee under CHARACTERS of mufic in the Dictionary; where the notes and correfponding Refts are found together.

When any one of thofe characters occurs either on a line or fpace, ſpace, that part is always ſilent for the time of a minim, or crotchet, &c. — Sometimes a Reſt is for a crotchet and quaver together; or for other quantities of time, for which there is no particular note: in which caſe the ſigns of ſilence are not many Reſts, but ſuch ſilence is expreſſed by placing together as if multiplied, as many as make up the deſigned Reſt. When the Reſt is for a whole bar, the ſemibreve Reſt is always uſed. —If the Reſt be for two meaſures, it is marked by a line drawn a-croſs a whole ſpace.—For three meaſures it is drawn a-croſs a ſpace and a half; and for four meaſures a-croſs two ſpaces. But, to prevent ambiguity, the number of bars is uſually writ over the ſign.

Some of the more ancient writers in muſic make theſe Reſts of different value in different ſpecies of time.— For inſtance, the character of a minim Reſt, in common time, ſay they, expreſſes the Reſt of three crotchets in triple time; in that of the triples $\frac{6}{4}$, $\frac{6}{8}$, $\frac{12}{4}$, $\frac{12}{8}$, it always marks an half meaſure, how different ſoever theſe may be among themſelves.

They add that the Reſt of a crotchet in common time is a Reſt of three quavers in the triple $\frac{6}{8}$; and that the quaver Reſt of common time is equal to three ſemi-quavers in the triple $\frac{6}{16}$. But this variety in the uſe of the ſame character is now laid aſide.

RETI'CULA, Reticule, in aſtronomy, a contrivance for the exact meaſuring the quantity of eclipſes, introduced about fifty years ago by the royal academy of Paris.

The Reticule is a little frame, conſiſting of thirteen fine ſilken threads, equidiſtant from each other, and parallel; placed in the focus of object-glaſſes of teleſcopes; that is, in the place where the image of the luminary is painted, in its full extent. —Of conſequence, therefore, the diameter of the ſun or moon is hereby ſeen divided into twelve equal parts or digits; ſo that, to find the quantity of the eclipſe, there is nothing to do but to number the luminous and the dark parts.

As a ſquare Reticule is only proper for the diameter, not for the circumference of the luminary; it is ſometimes made circular, by drawing ſix concentric equi-diſtant circles, which repreſents the phaſes of the eclipſe perfectly.

But it is evident that the Reticule, whether ſquare or circular, ought to be perfectly equal to the diameter or circumference of the ſtar, ſuch as it appears in the focus of the glaſs; otherwiſe the diviſion cannot be juſt.

Now this is no eaſy matter to effect, by reaſon the apparent diameters of the ſun and moon differ in each eclipſe; nay that of the moon differs from itſelf in the progreſs of the ſame eclipſe.

Another imperfection in the Reticule is, that its bigneſs is determined by that of the image in the focus, and of conſequence will only fit one certain magnitude.

But M. de la Hire has found a remedy for all theſe inconveniences, and contrived that the ſame Reticule ſhall ſerve for all teleſcopes, and all altitudes of the luminary in the ſame eclipſe. —The principle whereon his invention ſtands, is, that two object-glaſſes applied againſt each other, having a common focus, and there forming an image of a certain magnitude; this image will increaſe in proportion as the diſtance between the two glaſſes is increaſed, as far as a certain limit.

If then a Reticule be taken of ſuch a magnitude as juſt to comprehend the greateſt diameter the ſun or moon can ever have in the common focus of two object-glaſſes applied to each other; there needs nothing but to remove them from each other, as the ſtar comes to have a leſs diameter, to have the image ſtill exactly comprehended in the ſame Reticule.

Another improvement is, that whereas the ſilken threads are ſubject to ſwerve from the paralleliſm, &c. by the different temperature of the air; a Reticule may be made of a thin looking-glaſs, by drawing lines or circles thereon, with the fine point of a diamond; which ſhall be ſafe from any alteration of the air.

RE'TINA (*Dict.*)—The Retina is liable to two ſorts of diſeaſes; the firſt is a ſeparation of ſome parts of this membrane from the choroides. At the place where this ſeparation is made, there follows an elevation or fold, which ſtops the light, and hinders its paſſage to that part of the choroides which is covered by this fold; this occaſions a ſort of a ſhade, which the patients ſee in the air. The ſecond diſeaſe of the Retina is an atrophy or waſting of that membrane.

The cauſe of the firſt diſeaſe may, with a great ſhew of reaſon, be thus accounted for, that the blood-veſſels of the Retina become varicous; for it is eaſily conceived that the dilatation of theſe veſſels may ſeparate the Retina from the choroides, in that part which anſwers the dilated veſſels. I have always obſerved this diſeaſe to proceed from a cold in the head, after ſome violent exerciſe, or whatever elſe may have put the blood into a violent motion. Hence, I infer, that the external cold, by obſtructing the pores of the ſkin, has ſtopped the perſpiration of ſome part of the humours rarefied in the blood-veſſels, on the ſurface of the Retina; which, from the fineneſs of its texture, is damaged by this infraction, after the above-mentioned manner. I call this diſeaſe a ſeparation of the Retina from the choroides. As this membrane fills a conſiderable ſpace in the eye, this ſeparation is often made in ſeveral places; ſo that the ſigns of this diſeaſe anſwer to the number of the parts ſeparated.

Its ſigns are certain appearances in the air, more or leſs diſtant from the patient's eyes. They are a kind of ſhadows of different figures, modified according to the ſize and form of the parts of the Retina, which is ſeparated.

As to the prognoſtic, there is no danger of loſing the ſight in this diſeaſe; it is only troubleſome to the patient. As this diſeaſe begins with the ſame ſigns as a cataract, one diſorder may be taken for another; but to prevent the like miſtake, we ſhall propoſe the difference. In a cataract the ſight ſhortens and decays daily; whereas, in the preſent diſeaſe, the ſight continues the ſame both in quickneſs and extent.

Though remedies do not perfectly cure this diſeaſe, and that the perſons, once attacked with it, ſee ſome of theſe ſhades all their life, their number and compaſs in breadth may be ſtill leſſened. The following remedies are of ſervice; ſuch are broths made of crabs, repeated purges, eye-bright, tea drunk in the morning, powder of vipers, wood-lice, and eye-bright mixed together.

In an atrophy of the Retina, as the rays of light are not ſufficiently modified in that membrane, they make too vivid an impreſſion on the choroides, which is very detrimental to it. Hence, enſues a confuſed viſion; ſo that the patients, at the firſt look, can ſee very well; but, if they continue to read any time, or to look at any ſhining object, they feel a ſudden wearineſs in their head, and a dimneſs in their ſight, which obliges them to cloſe their eyes; then opening them a moment after they ſee, as at the firſt look, but for a ſhort time.

Embroiderers, ſtocking-weavers, and ſhoe-makers are ſubject to this diſeaſe; the firſt, becauſe the brightneſs of the gold, ſilver, and other colours damages the ſight by the lively impreſſion it makes on the eye; and the ſhoe-makers, in order to find the hole made by their awl to run the end through it, by this continual attention, fatigue and weaken their ſight ſo much that they are obliged to quit their trade. Theſe people can work but a few days in the week.

There are ſome people, though they do not work at theſe handicrafts, cannot, however, make uſe of their ſight a quarter of an hour, but their head is diſordered; of thoſe I chiefly treat.

No remedies cure this diſeaſe. Nothing avails but reſt and little exerciſe of the ſight. All thoſe perſons who are employed at fine or ſhining work, if they have a mind to continue, muſt make uſe of green ſpectacles.

RE'TORT, (*Dict.*)—The quantity of air riſing from ſome ſubſtances is apt to burſt glaſſes in diſtilling; Dr. Browne Langriſh has therefore given us a new contrivance of applying receivers to Retorts, by which ſuch accidents may be prevented.

To his firſt receiver he adapts a ſecond, inſerted into an opening at the top of the firſt, in order to give more room to the rarefied and new generated air. To an opening, at the bottom of each of theſe receivers, he fixes a bottle tied on cloſe by means of a bladder, ſo that they may be removed at any time, and another inſtantly placed in their room, by which means very little of the ſteam will eſcape. He alſo ties on a bladder to an opening, or upper neck of the ſecond recipient; and this bladder, being much thinner and weaker than any of the glaſſes, will always give way firſt, and prevent their burſting. And, even when there is the greateſt danger of this accident, the ſmalleſt pin-hole made through the top of the bladder, as ſoon as the fumes begin to riſe, will be ſufficient to let out the air as faſt as it is generated.

REY *graſs*, in huſbandry, a hardy ſort of graſs, much eſteemed among the farmers for that quality. It will grow on any land, and therefore produces crops where nothing elſe will. It thrives beſt of all on ſowre, clayey, and weeping grounds, and equally endures the ſevereſt droughts of ſummer, and froſts of winter, ſuffering no damage from either. It is the beſt of all winter foods for cattle, the ſhorter it is eaten the better, and it ſprings the earlieſt of any. There is no danger of over-ſtocking it, for, if it be left to grow too much, the ſtalk becomes hard and ſticky. It is beſt for horſes and for ſheep, and very much prevents the rotting of the latter. The beſt way of ſowing it is with clover. The common quantity of ſeed is two buſhels to an acre, but three buſhels is much better; though in ſome lands, where the clover is likely to ſucceed very well, they ſow eight pounds of clover ſeed and one buſhel of Rey ſeed to an acre, and this makes a crop that will laſt ſeven or eight years.

Some mow it as hay, and thraſh it for the ſeed, which, about London, ſells from half-a-crown a buſhel to three ſhillings. Four or five quarters of this ſeed will be ſometimes produced from an acre of the graſs. If at any time a field of this graſs is found to grow thin, it is only neceſſary to ſtrew on a buſhel of the ſeed, and roll it with a wooden roller, and the plants riſing from this addition will make the whole crop ſufficiently thick. Rey graſs has this great advantage, that it kills weeds without any other ſown plant; even thiſtles cannot grow among it. When the Rey graſs is cut for hay before perfectly ripe, the hay is the better; but the ſeed will not grow ſo well. When the ſeed is newly thraſhed, it muſt not be laid too thick, for it is very apt to heat and ferment, and the whole will be ſpoiled. *Mortimer's Huſbandry.*

RHE'UMATISM (*Dict.*)—The preceding cauſes of this diſorder

der are, a sanguineous habit, accompanied with an acrimony of the juices, a mature age, luxurious living, a sudden admission of the cold to the body, when over-heated; the influence of the weather in the autumn, an obstruction of perspiration, and a tough inflammatory state of the fluids, to be discovered by a pleuritic blood. It begins with a continual fever, and creates a violent dilacerating pain, which is greatly increased upon the smallest motion, is long fixed in one place, seizes the joints of any of the limbs, and is particularly incident to the knees, the loins, and the coxendix. It also sometimes affects the brain, lungs, and viscera, is accompanied with a tumor and redness of the part, and comes and goes periodically.

If it remains for a considerable time, and is increased, it often, after the most violent pains, deprives the limb of motion, and produces an anchylosis, which will hardly yield to any medicine.

The immediate cause of a Rheumatism seems to be so mild an inflammation, as not to degenerate into a suppuration in the lymphatic arteries of the membranes, contiguous to the ligaments of the joints. It is cured by venesection; repeated antiphlogistic purgatives, every evening after which a proper narcotic is to be exhibited; by mild tepid baths, and antiphlogistic fomentations applied to the parts affected; by drastic vesicatories and cauteries; by highly diluting and emollient medicines; by attenuating food; by rest, and the warmth of the bed; and towards the end of the cure by frictions with warm dry cloths, together with the use of antiscorbutic medicines.

A lumbago or Rheumatism seizing the loins, and sciatic pains, are cured in the same manner, though with somewhat greater difficulty.

Hence appear the reasons why this disorder is so frequent, and its appearances so various; why it is highly dangerous, when it seizes the brain or lungs; why in these parts it is not discovered without the greatest difficulty; and why the use of hot substances, or the too speedy exhibition of narcotics, must be dangerous in it. *Boerhaave's Aphor.*

This disease happens at any time, but especially in autumn, and principally affects such as are in the vigour of life. It is generally occasioned by exposing the body to the cold air, immediately after having heated it by violent exercise, or some other way. It begins with a chilness and shivering, which are soon succeeded by heat, restlessness, thirst, and the other concomitants of a fever. In a day or two, and sometimes sooner, there arises an acute pain in some one or other of the limbs, especially in the wrists, shoulders, and knees, which, shifting between whiles, affects these parts alternately, leaving a redness and swelling in the part last affected. In the beginning of the illness the fever, and the above-mentioned symptoms, sometimes come together; but the fever goes off gradually, whilst the pain continues, and sometimes increases, occasioned by the derivation of the febrile matter to the limbs; which the frequent return of the fever, from the repulsion of the morbific matter by external remedies, sufficiently shews.

This disease, when unattended with a fever, is frequently taken for the gout, though it differs essentially therefrom, as will easily appear to those who are thoroughly acquainted with both diseases; and hence it is, perhaps, that physical authors have not mentioned it; unless we should esteem it a new disease. But, however this be, it is at present very frequent, and though, when the fever is gone off, it seldom proves fatal, yet the violence of the pain, and its long continuance, render it no contemptible disease. For, in case of wrong management, it frequently remains not only several months, but some years, and even during life; though in this case it is not equally painful, but has its periodical returns, like the gout; and the pain may possibly go off spontaneously, after it has been of very long standing. But, in the mean time, the patient is deprived of the motion of his limbs during life, the joints of his fingers being contracted inwards, with stony concretions as in the gout, which rather appear in the internal parts of the fingers than the external, while the appetite may be very good, and the general health not amiss.

There is another species of this disease, though it is not generally esteemed of this kind, which may properly be called a rheumatic lumbago. It is a violent fixed pain in the loins, reaching sometimes to the os sacrum, and resembling a nephritic paroxysm; only the patient does not vomit. For, besides the intolerable pain near the kidneys, the whole conduit of the ureters, even to the bladder, is sometimes affected with the same, though in a less degree. I have been formerly led into an error hereby, as imagining it to arise from some gravel lodged in these parts; whereas, in reality, it proceeds from the peccant and inflamed matter of the Rheumatism, which affects only those parts, leaving the rest of the body free. Unless this acute pain be removed in the same manner as the former species, it continues as long, and proves equally violent; so that the patient cannot lie in bed, but is forced either to leave it, or sit upright therein, and be perpetually moving his body backwards and forwards.

Since both the kinds of this disease seem to arise from inflammation, as appears from their concomitants just mentioned, and especially by the colour of the blood taken away, which exactly resembles that of persons in a pleurisy, which is universally allowed to be an inflammatory disease; so I judge that the cure ought to be attempted only by bleeding, the heat of the blood being in the mean time abated by cooling and incrassating medicines, along with a proper regimen.

Accordingly, as soon as I am called, I direct ten ounces of blood to be immediately taken away from the arm or the side affected, and prescribe a cooling and incrassating julap, nearly after the following manner:

Take of the distilled waters of lettice, purslain, and water lily, each four ounces; syrup of lemons, an ounce and half; syrup of violets, an ounce; mix them together for a julap, of which let the patient drink at pleasure; or of the following emulsion:

Take seven blanched sweet almonds; of the seeds of melons and pompions, each half an ounce; the seeds of white poppies, two drachms: beat them together in a marble mortar, then pour on, by degrees, a pint and half of barley-water; mix them well, and, when strained, add two drachms of rose-water, and half an ounce of white sugar.

To ease the pain, I order a cataplasm, prepared of the crumbs of white-bread and milk impregnated with saffron; or a cabbage-leaf to be applied to the part affected, and frequently renewed. With respect to diet, I enjoin a total abstinence from flesh, and even the thinnest flesh-broths, substituting in their place barley-broth, water-gruel, panada, and the like. I allow only small-beer for drink, or, which is more proper, a ptisan prepared of pearl-barley, liquorice, sorrel-roots, and the like, boiled in a sufficient quantity of water. I, also, advise the patient to sit up some hours every day, because the heat which proceeds from always lying in bed, promotes and augments the disease.

The next day I repeat the bleeding in the same quantity; and in a day or two after, as the strength will permit, I bleed again; then interposing three or four days, as the strength, age, constitution of the patient and other circumstances indicate, I bleed a fourth time, which is generally the last, unless too hot a regimen has preceded, or heating remedies have been exhibited without necessity. But the use of opiates requires more frequent bleeding; and therefore, though the pain be ever so violent, during the whole course of the disease, yet, when I intend to effect the cure solely by bleeding, I judge it highly necessary to refrain from opiates, because the disease is fixed thereby, and does not yield so readily to bleeding; so that, where such medicines are given too frequently, bleeding must in consequence be oftener repeated than is otherwise necessary. Besides, in the height of the disease they do not answer the expectations we have conceived of them.

While the abovementioned remedies and regimen are carefully continued, I inject clysters made of milk and sugar, between times, on the intermediate days of bleeding; earnestly recommending the exact observance of these directions, for at least eight days after the last bleeding; and then I prescribe a gentle purging potion to be taken in the morning, and in the evening a large dose of syrup of white poppies in cowslip-flower water; whereby a check is put to the tumultuary motion of the blood, which might otherwise endanger a relapse. This being done, I allow the patient to return by degrees to his customary way of living, with respect to diet, exercise, and air; but at the same time caution him to refrain, for a considerable time, from wine, and all spirituous liquors, salt or high-seasoned flesh, and in general from all food of difficult digestion.

After having repeated bleeding, as above specified, the pain is greatly abated, though it does not go quite off; but, as soon as the strength returns, which bleeding had greatly impaired, the symptoms will vanish, and the patient recover perfectly; especially upon the approach of the following season of the year, which will be more conducive to recruit the strength, than that wherein he was first attacked with the disease.

But though this, or a similar method, seasonably used in the beginning of the disease, generally proves successful; yet it frequently happens, when the cure is attempted by a contrary procedure, that the patient is severely afflicted, during life, with flying pains, which are sometimes violent, and at others more gentle; whereby the unskilful are easily deceived, and they are commonly reckoned symptoms of the scurvy.

But it is here to be observed, that, when the Rheumatism hath taken deep root by a continuance of some years, it is improper to repeat bleeding at such short intervals as in the beginning of the disease, and better to interpose some weeks between the operations. By these means the morbific matter will either be quite exhausted, or at least in so great a degree, that the remains of it may be carried off entirely, by an issue made in one of the legs, and exhibiting a proper quantity of some volatile spirit, every morning and evenings in canary.

But, though there is a remarkable difference between the true Rheumatism and the scurvy, it must nevertheless be owned, that there is another species of the Rheumatism, which is near a kin to the scurvy: for it resembles it in its capital symptoms, and requires nearly the same method of cure; and therefore I call it a scorbutic Rheumatism. The pain sometimes affects one, and sometimes another part; but it rarely occasions a

swelling,

ſwelling, as in the other ſpecies, neither is it attended with a fever. It is, alſo, a leſs fixed pain, and accompanied with irregular ſymptoms; ſometimes it affects one limb, and ſometimes another; ſometimes it only attacks the internal parts and cauſes ſickneſs, which goes off again upon the return of the pain in the external parts. In this manner the patient is alternately afflicted, and the diſeaſe proves of long duration, like thoſe diſtempers which are eſteemed moſt chronical. It principally attacks the female ſex, and men of weak conſtitutions; ſo that I ſhould have concluded it ought to be referred to the tribe of hyſteric diſorders, had not repeated experience taught me, that it would not yield at all to hyſteric remedies.

Such, likewiſe, as have gone through a long courſe of the Peruvian bark, are ſubject to this diſeaſe, which, by the way, is the only ill effect I have ever obſerved from the uſe of this medicine. But, however it be, this diſeaſe, whether it proceeds from this or any other cauſe, is eaſily conquered by the uſe of the following remedies, which I ſhould have concealed, had I not preferred the good of mankind to any private intereſt:

Take of the conſerve of garden ſcurvy-graſs, two ounces; conſerve of wood-ſorrel, an ounce; compound powder of arum, ſix drachms; ſyrup of oranges, enough to make the whole into an electuary; two drachms of which is to be taken three times a day, for a month, drinking after it three ounces of the following diſtilled water:

Take of garden ſcurvy-graſs, eight handfuls; of water-creſſes, brook-lime, ſage, and mint, each four handfuls; the peel of ſix oranges; nutmegs bruiſed, half an ounce; infuſe them in ſix quarts of mum, and draw off only three quarts for uſe, in a common ſtill.

RHINO'CEROS, in zoology, the name of a genus of quadrupeds; ſo called from an horn growing on their noſe.

Of this genus there are only two known ſpecies. 1. The Rhinoceros with only one horn on its noſe; and, 2. The Rhinoceros with two horns.

In the year 1739 we had a young Rhinoceros ſhewn in England, of which Dr. Parſons has given a very accurate account in the *Philoſophical Tranſactions*.

The creature fed on rice, ſugar, and hay; his keeper uſed to mix the rice and ſugar in the following manner: ſeven pounds of rice and three pounds of ſugar made the proviſion for one day; he eat this at three meals; and beſides this, he eat about a truſs of hay every week, and a large quantity of greens that were brought to him, at different times, and of which he ſeemed more fond than of dried food. He drank often, and always was obſerved to ſwallow a large quantity of water at a time.

He appeared very peaceable in his temper, and bore to be handled on any part of his body, with great patience, except when he was hungry; but he was then always outrageous, as alſo when he was ſtruck. His moſt violent paſſions, even on the laſt occaſion, were however always immediately appeaſed by giving him victuals.

Notwithſtanding the lumpiſh aſpect, and heavy make of this creature, he would jump about very nimbly in his fits of paſſion, and often leap to a great height; and one common mark of his fury was the ſtriking his head againſt the walls, or any thing elſe that was in the way, and this he would do with terrible violence. He was very apt to fall into theſe paſſions in a morning before his rice and ſugar were given him, and from the whole he appeared quite untractable, and ſeemed able, in his paſſions, to have run ſo faſt, as that a man on foot could not have eſcaped him.

This creature was two years old, and did not exceed a young heifer in height, but was remarkably broad and thick. His head was very large; and the hinder part of it, near the ears, remarkably elevated above the reſt of the face, which was flat and ſunk down, in a remarkable manner in the middle, riſing again towards the origin of the horn, but in a much ſmaller degree. The horn ſtands upon the noſe of the animal as upon a ſort of hill; and when the ſceleton of the head is ſeen, that part of the ſkull on which the horn is fixed, is found to riſe into a blunt cone, to anſwer to a cavity in the baſis of the horn, which is very hard and ſolid; in other reſpects having no manner of hollow or core, like thoſe of other quadrupeds. The horn in this young animal did not riſe above an inch high from its tough baſis, and was black and ſmooth at the top, but ragged downwards; and the determination of its growth is backwards, not ſtraight up; this is very evidently ſeen in the horns of old Rhinoceroſes, which are always curved in a conſiderable degree that way. If we conſider the proportion of this animal's ſize to the length of its horn, and thence carry the proportion to that between the large horns we ſee in the muſeums of the curious, we muſt ſuppoſe the animal of a very ſtupendous ſize, when at its full growth. *Phil. Tranſ.* N°. 470.

The ſides of the under jaw, in this creature, ſtand very wide aſunder, ſlanting outwards to the lower edge, and backwards to the neck; the edges turn outwards from this ſtructure of the bones, and the head neceſſarily looks very large. That part of the head which reaches from the fore-part of the horn to the upper lip may be called the noſe; this is very thick and bulky, and has a kind of circular ſweep down towards the noſtrils; on all this part there are a great number of rugæ or wrinkles.

The noſtrils are ſituated very low, in the ſame direction with the opening of the mouth, and not more than an inch from it; and when viewed in a fore-view, the whole noſe, from the top of the horn to the verge of the lower lip, is ſhaped like a bell. The under lip is like that of an ox, but the upper more like that of a horſe, and he uſes it as that creature does, to gather up hay from the rack, or graſs from the ground; but with this ſuperior advantage, that this creature has a power of extending this lip to ſix or ſeven inches in length from the noſe, and there drawing it to a point; with this lip, thus extended, the creature is able to graſp a ſtick, or any ſmall ſubſtance, and hold it extremely faſt; and this power of prolonging the lips ſerves, in many purpoſes, to the ſame end as the trunk of that other unweildy animal the elephant.

The tongue of the Rhinoceros is ſaid to be ſo rough as to be able to rub a man's fleſh off from the bones; but in this young ſubject it was ſo ſoft, that it reſembled that of a calf. It may poſſibly grow harder with age; but the ſtory of its effects ſeems of a piece with the many other falſe marvels reported of this animal. The eyes are dull and ſleepy, much like thoſe of a hog in ſhape; he ſeldom opens them entirely; and it is to be obſerved, that they are ſituated nearer the noſe than thoſe of any other known quadruped. The ears are broad and thin towards the top, much like thoſe of a hog; but they ariſe each from a narrow round baſe, with ſome wrinkles on it, which iſſues out of a ſinus as it were ſurrounded with a fleſhy fold. The neck is very ſhort, and has two folds or wrinkles, wholly ſurrounding it, only that the anterior one is broken underneath; and has a flap hanging from it ſo deep, that it would contain a man's hand; from the middle of the poſterior plica of the neck, there ariſes another, which paſſing backward, is loſt before it reaches the body. The ſhoulders are thick and heavy, and have each a fold paſſing downwards. The body is very large and thick, and ſtands out at the ſides like that of a cow with calf. The legs are very thick and ſtrong; they are round, and ſomewhat ſmaller downwards than in the upper part; and when the creature ſtands upright, they bend inwards at the knee, ſo that they are nothing like ſtraight. In ſome quadrupeds the fetlock bends to the weight of the animal, but in this creature there is no appearance of any ſuch bending, ſo that he ſeems to ſtand upon four ſtumps, eſpecially when viewed behind. He has three hoofs upon each foot forward, but the back part is a great maſs of fleſh, rough like the reſt of the ſkin; and the ſole of the foot is very plump and callous in the ſurface, but eaſily yielding to the preſſure from the ſoftneſs of the ſubjacent fleſh. Its ſhape is like that of a heart, with a blunt apex before, and a broad baſe behind. The tail is very ſmall in proportion to the ſize of the animal, not exceeding ſeventeen or eighteen inches in length, and but thin or ſlender; it is very rough, and has a kind of twiſt or ſtricture towards the extremities, ending in a flat maſs; this gave occaſion to ſome authors to compare the whole tail to a ſpatula; on the ſides of this flat part, there grew a few ſhort, but very thick and ſtrong black hairs, but theſe grow much longer in the more advanced ſtate of the creature; and are not round, like other hairs, but flat, like ſmall pieces of whalebone. The creature has no other hair about it, except a very ſmall quantity at the edge of the ears. See two views of this creature, *Plate* XL. *fig.* 5, 6.

The penis of the male Rhinoceros is of a very remarkable ſtructure, being incloſed in two caſes. The female differs in nothing from the male except in the pudenda which are ſhaped like thoſe of a cow.

The ſkin of the Rhinoceros is thick, and ſeems almoſt impenetrable; it feels like a piece of board of half an inch thick. It is covered in all parts, more or leſs, with a ſort of incruſtations reſembling ſcales. Theſe are ſmall on the neck, and largeſt of all in the ſhoulders and hips; between the folds of this thick ſkin, the cuticle, which is left bare, is ſoft, and eaſily penetrable. The ſcabby incruſtations of the ſkin have been called ſcales, by ſome writers; but this is a very wrong term, for they have nothing of the nature of ſcales, nor any thing of regularity in them.

The creature is of the retromingent, and therefore probably of the retrogenerative kind; the penis, when erect, is not more than nine, or at the utmoſt ten inches long, and is curved backwards at the end. This was the deſcription of the Rhinoceros ſhewn in England at this time, and of all the others that have been ſeen in this part of the world, as to the general characters; but though theſe creatures which we have ſeen, have but one horn, it is very certain that there is a ſpecies of Rhinoceros which has two. Martial has mentioned a Rhinoceros, as ſhewn in the amphitheatre at Rome, which had two horns; but his commentators, ſuppoſing the copies erroneous, have been at great pains to alter it, ſo as to make it expreſs what they had ſeen or heard of, that is, a Rhinoceros only with one horn; but it appears from almoſt indiſputable teſtimony, that there not only is in nature ſuch a Rhinoceros with two horns, but that ſuch were ſhewn in the public ſports at Rome, and therefore the text ſeems to have been very right, and the commentators in the wrong. The creatures we have ſeen

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seen have indeed only had one horn; and the accounts of travellers, and the great number of horns preserved in the cabinets of the curious, which are all single, seem to prove this; but, though the Rhinoceroses of Asia are all one-horned, yet it is certain, that there is a kind found in Africa which has two horns, and it is known, that the Romans had beasts from this last part of the world as well as the other. Peter Kolbe, in his Voyage to the Cape of Good-Hope, describes Rhinoceroses which he saw, and which had a horn on the nose, and another close behind it. Sir Hans Sloane's museum affords two horns of a Rhinoceros, standing just as this author has described them, which are still fixed to the same integument; and we are convinced of the Romans being acquainted with this species, from a brass medal of Domitian, which has on it a Rhinoceros, with two horns on the nose placed in this manner.

Redi who has been very sagacious in discovering the falsity of many of the pretended medicines taken from animals, yet gives us, on the testimony of his own experience, an account of some very remarkable virtues in the parts of the Rhinoceros. The blood he assures us is excellent in cholics and dysenteries. The decoction of the skin, he assures us, is a grand stomachic antidote, and the horns are very valuable and alexipharmic.

RHINOCEROS *avis, the Rhinoceros bird*, a name given by authors to a species of Indian raven, called by others corvus Indicus cornutus. The beak of which is frequently brought over into Europe.

It is a very ugly bird, and of a very rank smell. It much exceeds the European raven in bigness, and its head and neck are very thick. Its eyes are very large, and its beak of a very remarkable figure; having a large and thick horn-like protuberance on its upper part. The whole beak is bent like a bow, not hooked at the end like the beaks of the hawk, &c. It is of a yellowish white below, and on the upper part towards the head is of a fine gay red, and the rest of a yellowish white: the upper chap is serrated. The horn grows out from the head with this, and runs along it, and bends up at its extremity; its upper and under parts are red, its middle yellow. The bird feeds on carrion, and the guts of the dead animals. *Aldrovand de Avibus.*

RICKETS, *rachitis (Dict.)*—This disorder is a kind of partial tabes, and consists in an unequal nutrition, by which some parts are deprived of their due nourishment, and waste away, whilst others, receiving more than enough, are preternaturally increased with an incurvation of the bones and spine of the back.

The Cure.

When viscid, tough, and pituitous humours, deposited on the spinal marrow, are the cause of the Rickets, the first intention of cure is to resolve the viscidity of the juices, remove obstructions, and by that means promote a free circulation of the humours through all the body. For this purpose, in order to remove the fountain of the disorder lodged in the primæ viæ, we are, above all things, to use gentle laxatives; not neglecting, if it is necessary, and the constitution of the child admits, the use of mild emetics, consisting of a few grains of the root of ipecacuanha, exhibited with sugar and cinnamon-water, prepared without wine, or reduced to the form of an electuary, with some proper syrup; for by these means the viscid sordes, collected in the stomach and intestines, are not only excellently eliminated, but, also, by the stimulus of such medicines, a due resolution of the humours, and an opening of the obstructed vessels, are successfully obtained: only such stimulating medicines are not to be exhibited to patients whose strength is exhausted, who labour under any disorder of the mesentery, or a violent obstruction of the viscera; since, in such cases, it is more expedient to exhibit medicines of the deobstruent kind.

To the medicines already recommended we may also, now and then, add those of a gently resolvent kind, as diaphoretics generally are; such as the tincture of tartar, the acrid tincture of antimony, and preparations of cinnabar; which, in the Rickets, are preferable to mercurials, and highly beneficial in eliminating the serous impurities, partly by perspiration, and partly by urine; especially if they are exhibited in such infusions as dilute and purify the blood.

But, in particular, for removing the obstruction of the spinal marrow, and restoring the influx of the nervous fluid into it, various authors recommend frictions of the spine of the back, arms, and legs, with warm linen cloths; as also fumigations of frankincense, amber, mastich, and olibanum. But I can, from experience, recommend, as the most effectual remedy, baths of sweet water, boiled with nervous herbs, such as marjoram, lavender, mother of thyme, rosemary, chamomile, and baum. In such baths, the patient is to be frequently immersed, and have the spine of the back and joints rubbed and anointed with the following nervous ointment.

Take of human fat, and expressed oil of nutmegs, each half an ounce; of Peruvian balsam one drachm, and of the oils of rue, lavender, and cloves, each thirty drops.

By these means I have often seen many patients afflicted with the Rickets, not only surprisingly relieved, but also totally recovered.

When the Rickets are of a long standing, the patient's head is preternaturally large, and its sutures gaping; the thorax at the sides is compressed to the sternum, which rises in a kind of sharp arch; the extremities of the ribs are full of knots; the abdomen protuberant, and the teeth carious and black; which symptoms gradually increasing, frequently through the whole of the patient's life, produce the like terrible disorders, especially a spina ventosa, and a caries of the bones.

During the whole course of the Rickets, a slow fever preys upon the body, till the patient dies; and then in the carcase all the fibres, membranes, vessels, and viscera, are found soft and flaccid, while the humours are colliquated and mucous.

Hence, the immediate cause of the Rickets is, a languid, mucous cold, and vapid cacochymy, perhaps complicated with a latent venereal taint, and accompanied with a lax and flaccid state of the solid parts.

The cure of the Rickets is most effectually produced by light, easily-digested, dry, lean aliments, seasoned with mild aromatics, and frequently exhibited, though in a small quantity; by drinking a small quantity of generous liquors, especially of ale, though not old, but long boiled and thick; by a dry and somewhat hot air; by wearing very dry and warm cloaths, especially such as are made of wool; by lying upon couches prepared of aromatic, corroborating, and drying herbs, laid upon boards, in the upper rooms of the house; by gestation, concussion, oscillation, riding in a chariot in rough roads; by much dry and warm friction, especially of the abdomen and spine, performed with cloths, impregnated with the smoke of aromatic substances; sometimes by the repeated application of cantharides, by gentle emetics, frequently though prudently repeated; by purgatives, and then by corroborating medicines, exhibited for some days successively; and, lastly, by the long continued use of corroborating, drying, antiscorbutic medicines, and such as rouse the spirits. Hence we understand the uses of immersion in cold water, for the cure of this disorder, which, however, is not to be put into practice, till the viscera of the abdomen are, in some measure, eased of the load of humours which oppress them. Hence, also, the proper use of liniments may be understood, which ought to be of the nervous kind, and applied to the abdomen, and spine of the back; but not to the prominent parts of the affected bones.

The best aliments for children labouring under the Rickets are:

1. Well fermented bread and biscuit, mixed with a small quantity of saffron, nutmeg, cardamoms, cinnamon, seeds of celeri, and other grateful and corroborating aromatics.
2. Lean pigeons, fowls, rabbits, mutton, kid, and veal, gently roasted, cut small, and mixed with biscuit, salt, and a little parsley, thyme, and nutmeg.
3. Millet and barley, boiled with water and raisins, and then seasoned with a little wine and mild aromatics.

The most proper drinks for persons labouring under the Rickets are, ripe, red, and astringent French wines, an ounce of which is to be exhibited three or four times a day.

Half an ounce of Hippocratic wine, exhibited at the same time. Brunswick mum, British ale, and that species of Dutch ale which is sold at twelve florins.

With these malt liquors, in the summer-time, may be mixed an equal quantity of medicated chalybeate water, but rather of the spaw-waters.

Take of the following recent leaves dried in a shade, viz. of the male fern, three pounds; of marjoram, baum, and mint, each two handfuls: and of the following recent flowers, also, dried in a shade, viz. of melilot, sweet trefoil, elder, and roses, each two ounces. Reduce to a fine powder. Mix with double the quantity of barley-chaff, and put all into bags for couches, on which the patients are to lie; these are to be carefully preserved from moisture, and frequently dried.

Take of benzoin, mastich, olibanum, amber, and frankincense, each one ounce; reduce to a powder; of which throw a little upon live coals, and the steam arising from it is to be received in cloths, for rubbing the parts.

Take of the roots of ipecacuanha, one scruple; of white French wine, one ounce; and of sugar, two drachms; infuse for a whole night; and when depurated, exhibit in the morning. Let this be repeated every fourth day, for five times.

Take of the best rhubarb, half an ounce; of citrine myrobalans, without the kernels, three drachms; and of the troches of agaric, two scruples. Infuse in four points of cold strong beer, for twenty-four hours; and let the patient use this for common drink for a month: but, if it should prove too purgative, it may be diluted with an equal, or if necessary, a greater quantity of other ale.

The corroborative, drying, exciting, and antiscorbutic herbs, proper for curing the Rickets, are, agrimony, betony, the bark of caper roots, spleen-wort, succory, dorder, finicle, endive, male-fern, liver-wort, hart's tongue, baum, myrobalans, osmund royal, polypody of the oak, the leaves and acorns of the oak, rhubarb, the leaves and root of the bramble, white maiden-hair, scabious, the bark, flowers and leaves of the tamarisk, trichomanes, and male speedwell.

Of these medicated ales, wines and infusions may be prepared and exhibited with great success; as also conserves, and other things of a like nature, thus:

Take of agrimony, spleen-wort, fern-root, hart's tongue, the root of polypody, and white maiden hair, each two ounces. Having cut these small, mix them, and put them in a linen cloth, infuse them in twelve pints of cold ale, to be used for common drink.

Or, take of the leaves and flowers of betony, three ounces; of the bark of the roots of capers, tamarisks, and wild bramble, and of trichomanes, each two ounces; and of filings of steel, half an ounce. Infuse in eight pints of cold white wine, of which one ounce is to be exhibited thrice a day.

Take of Boyle's ens veneris, two grains; which are to be exhibited every evening in Canary wine, for three weeks.

Take of the filings of steel, one ounce; of the strongest distilled vinegar, ten ounces; and of sugar, three ounces. Boil all together gently, for twenty-six hours, in a tall phial; and let the liquor, when filtrated, be kept in a close vessel. Six drops of it are to be exhibited every morning and evening, in a little Spanish wine. *Boerhaav. Aph. & Mat. Med.*

RI'DGES.—The method of plowing land up into Ridges is a particular sort of tillage. The chief use of it consists in the alteration it makes in the degrees of heat and moisture; these being two of the grand requisites of vegetation, and very different degrees of them being requisite to the different sorts of plants. Those plants commonly sown in our fields require a moderate degree of both, not being able to live upon the sides of perpendicular walls in hot countries, nor under the water in cold ones, neither are they amphibious; but they must have a surface of earth, not covered, nor much soaked with water, which deprives them of a proper degree of heat, and causes them to languish. In this case they look weak, and their leaves yellowish. They cease growing, and, in fine, die in a very weak and bad state. The only way to cure the land of giving this disease to plants, is to lay it up in Ridges, that the water may fall off, and run into the furrows below, from whence it may be conveyed by drains and ditches into some river, or otherways carried wholly off from the land.

The more any soil is filled with water, the less heat it will have. The two sorts of land most liable to be overglutted with water are hills, the upper stratum of mould in which lies on clay; and, generally, all deep and strong lands. Hills are made wet and spewy by the wet that falls in rains, dews, and mists; and this wet, not being able to sink through the clay, in these soils, runs down between it and the mould; but extending itself through the mould all the way, and making it continually washy. The plowing this sort of land in Ridges, made from the higher to the lower part of the field, is of no benefit; for the water will press from below upwards in these Ridges, being forced by the addition of fresh supplies above.

There are two methods of draining a hill ground like this. The one is to dig several deep trenches cross-wise, or horizontally on the sides of the hill: let these be nearly filled up with stones, and the surface covered in the common method: the wet will be received into these in all parts, and discharged at the ends; and the plough will go over the stones, without striking through the depth of earth that covers them. Thus, the land will be dried for a time; but, as these channels fill up with earth, between the stones, they become of no use, and the expence of making new ones is very great.

The other way is to plow the land in Ridges almost horizontally, and then the furrows between them are so many drains, carrying off the water at their lower ends; if the plough is made to strike a few inches deep into the clay, and the ends of the furrows are no higher than the other parts: every furrow will be a drain to every Ridge, and the land of the Ridges will be kept dry. If there were no other manner of plowing the Ridges on the sides of hills, than there is in the plain lands, this method of having open furrows or drains on declivities would be impracticable; because the plough could not turn up the furrows against the hill and against the Ridge also, from the lower side of it. But the easy remedy against this inconvenience is to plow such Ridges in pairs, without throwing any earth into the trenches; and then the Ridges will be plain at top, and the rain-water will run speedily downwards to the next trench, and thence to the head land, and so out of the field. These trenches will be made, as well as kept always open, by plowing in pairs; and this is abundantly more easy than the way of plowing Ridges singly.

Every time of plowing the Ridges must be changed as to the pairs; so that the furrow, which had two Ridges, or lands, turned towards it one time, must have two turned from it the next time; and this method keeps the surfaces of all the Ridges or lands pretty nearly even. This, however, cannot be done on a hill, whose declivity is so great, that the plough is not able to turn a furrow against it; but, in this case, perhaps, it may be sufficient to plow the Ridges obliquely enough for the furrows to be turned both ways.

This plowing in an horizontal manner, on hills, is the best of all others; but our farmers are not to be easily brought into it, though they see thin lands of this kind ruined for want of it; their reasons for not doing it, are, that it would prevent the supposed benefit of cross-plowing; and that they lose more ground by having more furrows between the Ridges, than when they lay their lands flat, where the lands are made much larger than the round Ridges can conveniently be. But these are in reality very erroneous, as well as mischievous opinions; for more mischief than good is done by cross-plowing in general; and, instead of any real loss of land by Ridges, the true state of the case is, that much ground is gained by it; that is, the surface of the earth is increased in quantity; for if a flat piece be plowed into Ridges, and if in earth sixteen feet breadth, there be an empty furrow of two feet; and, yet, by the height and roundness of the Ridges, they have eighteen feet of surface, capable of producing corn equally with eighteen feet, while the piece was flat; there is, then, instead of any loss, one-eighth part of profitable ground, gained by altering the piece from a level into a Ridge.

RI'DING *cast*, in husbandry, a term used by the farmers for a particular method of sowing their grounds, by making two casts upon a ground at the same time. This is not much used, but it is a quicker way than the double cast, which is the method now most used. *Plot's Oxfordshire.*

RIDING *clerk*, one of the six clerks in Chancery, who, in his turn, for one year, keeps the comptrolment books of all grants that pass the great seal. *Blount.*

RING, in angling, an instrument intended to free the hook, when accidentally entangled among weeds. It is a circular piece of lead, of about six inches round, and is fastened to a long packthread, when it is to be used. It is slipped over the end of the angling-rod, and let down into the water where the line conducts it to the hook; the rod and line have then no farther business, but the hook is endeavoured to be disengaged by the pulling this Ring backwards and forwards by the string which is fastened to it; the hook is generally freed from the weed by this means; but if not, and nothing but the breaking the tackle will do, the breach is made in this manner near the hook; whereas, if done without this Ring, it might have happened in some other part of the line, or the rod itself might have been destroyed by it.

RINGS *of flies*, in natural history, the several rounds, or circular portions, of which the bodies of these and other insects are composed.

RING *dove*, in zoology, the name of a bird of the pigeon kind, called by Aldrovand, and other authors, the palumbus torquatus, and, by the Greeks, phassa. Its beak is yellow, its feet naked and red, its legs feathered almost down to the feet. The upper part of its neck has a very regular and beautiful white circle, from which the bird has its name; and its whole neck, above and below this, is beautifully variegated with changes of colours, according as it is opposed to the light. Its head and back are of a dusky blue-grey, and its throat and breast of a grey mixed with purple, its belly of a plain grey. The colours are all deeper and more lively in the male than female. It seldom flies single, but in large flocks, and builds on trees; its food is ivy-berries, and other vegetable matter. *Ray's Ornithology.*

RING *head*, an engine used in stretching of cloth.

RING *tail*, in zoology, the English name for the female of the subbuteo; the male and female, in this species, differing so much in colour, as to be called by two names; the male being called the hen harrier.

RIPIE'NO, in the Italian music, is used in pieces of music in parts, to distinguish those that play to fill up, from those that play throughout the piece. There are, says Mr. Brossard, two kinds of the Ripieno: one plays the part of the little chorus exactly, and does not, therefore, increase the harmony or number of parts. What is to be played by all the musicians is marked with the words tutti or omnes. This sort of Ripieno is found in almost all compositions. The other sort is much better, a different part being played, whereby the number of parts is increased, and the harmony made fuller. Thus in pieces where in strictness two trebles, and bass, and thorough bass are sufficient, because these parts are disposed in such a manner, as that their harmony is complete, when played all together; yet, in order to render the piece more perfect, and to give it more grandeur, a counter tenor, tenor, and often two violins are added, whose parts are entirely different from the other; and the harmony then has seven parts instead of three, and is consequently more complete and full. The parts thus added are properly called Ripieni. *Brossard.*

RI'PPERS, in the wire-works, are the people who attend in the mills, take the prepared small rods of iron, and work at the barrels where they are drawn into wire. *Ray's English Words.*

RI'SING-*timbers*, in a ship, are the hooks placed on her keel; and are so called, because, as they rise in proportion, so her rake and her run rise on her flat floor by degrees.

RI'VER (*Dict.*)—Some Rivers, at certain seasons of the year, swell, so as to overflow their banks, and drown the neighbouring lands.—Of these the most eminent is the Nile, which rises so as to cover all Egypt, except the hills. The inundation begins about the 17th day of June, and increases for the space of forty days, and decreases for as many: during which period the cities of Egypt, which are all built on hills, appear as so many islands.

To these inundations Egypt owes all its fertility; the heavens there affording no rain, or at least none in any respect considerable.—Hence, as the inundation is great or small, Egypt for that year is fruitful or barren.

The

The ancient Greeks, &c. were miſtaken as to the cauſe of this inundation; no body in thoſe days having travelled up to the ſource of the River: but the modern Engliſh and Portugueſe traders into Congo, Angola, Monomotapa, &c. have let us into the ſecret.— From them we learn that the ſpring or ſource of the Nile is in a large lake called Zaire, round which are a great number of huge mountains, called the mountains of the moon. Now, as theſe lie in the ſouthern hemiſphere, their winter will be at the time of our ſummer: but by reaſon of their nearneſs to the equator, being only 10° diſtant from it, they never feel any notable cold: hence it is, that, inſtead of ſnow in the winter, they have rain every day, at leaſt two hours before, and two after noon. In effect, the tops of theſe mountains are always covered with clouds, and the rains almoſt continual. Hence torrents are conſtantly guſhing down from the mountains; all ending in the lake of Zaire: whence they flow into the channel of the Nile, and other Rivers ariſing from the ſame lake, as the Cuamar, the Zaire, &c. Hence the inundation of the Nile.

The other Rivers, which have any notable ſtated inundations, are, the Niger, or Gambia, which overflows at the ſame time with the Nile. Leo Africanus ſays, it begins on the 15th day of June, increaſes for 40 days, and decreaſes as long.—The Zaire, a River of Congo, proceeding from the ſame lake with the Nile, and therefore affected in the ſame manner: the Rio de la Plata in Braſil, which Maffeus obſerves, overflows at the ſame time with the Nile: the Ganges: the Indus; both which laſt overflow in June, July, and Auguſt; at which times the natives ſave great quantities of the water in ponds, to ſerve them the reſt of the year: ſeveral Rivers flowing out of the lake Chiama, into the bay of Bengal, which overflow in September, October, and November. Theſe all bring a very great fertility with them to the ground; the River Macoa in Camboia: the River Parana or Paranaguaſa, which ſome will have to be the ſame with the ſilver River: ſeveral Rivers in Coromandelia, a part of India, which overflow in the rainy months from the great quantity of water iſſuing from the mountain Gatis: the Euphrates, which overflows Meſopotamia certain days in the year. Laſtly, the River Sus in Numidia.

The Rivers moſt celebrated for their length, breadth, ſwiftneſs of current, &c. are — The Nile, which runs almoſt in a ſtraight courſe 2520 geographical miles. The Niger, which runs 2400 miles. The Ganges, 1200 miles. The Ob, 1600 miles. The Jeniſcea in Aſia about the ſame length with the Ob. The River Orellana in America, 60 miles broad at its mouth, and 5000 miles long. The Rio de la Plata, 80 miles broad at the mouth. The Omarannan, another River of Braſil: and the great River of St. Laurence near 2500 miles long.

RIVER *horſe*, in zoology. See HIPPOPOTAMUS.

RIVOLGIME'NTO, in the Italian muſic, is the placing a treble or upper part in the place of the baſs or any low part, or vice verſa. This often happens in double counterpoint, where the treble ſerves for the baſs, or the baſs for the treble; and that in ſuch a manner, that the harmony, though different, remains as correct after this change, as it was in the natural order of the parts.

ROACH, in ichthyology, the Engliſh name of a fiſh, called by the generality of authors the rutilus and rubiculus, by ſome the rubellio. It is a ſpecies of the cyprinus, according to the new ſyſtem of Artedi.

ROA'STING, in metallurgy, is the ſeparation of volatile bodies from thoſe which are more fixed by the combined action of air and fire; and is generally the firſt proceſs in the ſeparation of metals from their ores: it differs from ſublimation only in this, that in this operation the volatile parts are diſſipated, when reſolved into vapours; whereas in that they are preſerved.

ROB (*Dict.*)— It is poſſible, that great improvements might be made, by introducing the uſe of this form among the malt-diſtillers. The great inconveniences attending that, are, that, the malt being of a large bulk, in proportion to its ſaccharine part, and requiring a large proportion of water to extract that ſaccharine part, many large veſſels, ſuch as maſh tubs, coolers, fermenting backs, &c. are neceſſary; and the neceſſary labour on the ſubject is increaſed, and the commodity rendered dearer. The remedy of this ſhould ſeem the introducing a new art ſubſervient to that of the malt-diſtiller, and confining itſelf to the boiling down of malt wort to a Rob, ſo as to ſupply the malt-diſtiller with his ſubject, in the ſame manner as the fine diſtillers are ſupplied with treacle from the ſugar-bakers. By this means the buſineſs of the malt-diſtiller would be reduced to a great degree of ſimplicity, and the ſpirit produced would be alſo much finer than that at preſent; becauſe the ſubject would come tolerably refined to his hands, and purged of his groſs, mealy, and huſky matter, which yields a diſagreeable oil in diſtillation, and is alſo apt to burn the ſtill, and ſpoil the ſpirit. It is poſſible that a ſpirit, purer and finer than that from treacle, might be procured from malt prudently managed.

ROCKS.—Theſe are generally ſuppoſed great enemies to vegetation, and the people of Scotland have been deterred from cultivating many of their beſt lands, from an obſervation that they had a rocky bottom. This is however but a vulgar error among them, for Rocks of a proper kind, and properly diſpoſed, as very many of theirs are, fertiliſe and are beneficial to the land, not hurtful.

In many parts of England we ſee gardens the moſt beautiful that can be imagined, both in regard to flowers and excellent plants, on a ſoil where the bottom is a hard Rock, and the earthy covering not more than a foot, or thereabout, in depth. In ſome of theſe, all the diſadvantages the Scotch complain of, take place, and yet the gardens are fruitful, many of them having lofty hills on the ſouth ſide, the declivity due north, and the Rock perfectly bare next the walls on the north ſide.

The north ſides of theſe hills in this very aſpect, only with the Rock covered with two or three feet of earth, make very good hop gardens, producing a vaſt quantity of a very valuable commodity at a ſmall expence; and it is remarkable, that thoſe gardens which ſtand in this expoſure, inſtead of being ſubject to particular evils, often eſcape thoſe blaſts and other miſchiefs which affect the plantations of the ſame kind on the ſouth ſide of the hills. It might be a very valuable article of trade, if the bleak hills of Scotland, or thoſe of ſome of our northern plantations in America, could be made thus fruitful in ſo uſeful a commodity, and there ſeems only the want of a proper trial.

Another extremely valuable plant that might be raiſed on thoſe barren rocky places, as they are generally ſuppoſed to be, is flax, in places where the deſcent is too ſteep for plowing in the common way. It has been proved that a hand plough with a ſtem of aſh of about ſeven feet long, and a plate on each ſide near the end to turn the turf, a coulter to be let out ſhorter or longer to four or five inches deep, to cut the earth up as deep as it lies upon the Rock, and an iron wheel, may be managed with eaſe and conveniency by two people, and will prepare ground for producing large crops of the fineſt flax. The beſt ſort of flax ſeed of Flanders, ſown on this ſort of ground, ſucceeds ſo well, that, if brought into general uſe, it might give the only advantage that is at preſent wanting to the Scotch Holland manufactory, and make it excel that of all the world beſides. The northern American colonies might alſo furniſh us with the ſame ſort of flax raiſed at a ſmaller expence than almoſt any other vegetable commodity, and coming to a ſure market and at a very conſiderable price.

Agriculture in Scotland is too much neglected, to the great impoveriſhing of the country, and the diſtreſs of a numerous poor, for whom it would find conſtant employment. It is not yet known whether many of the moſt valuable plants for medicinal and mechanic uſes will not proſper as well there, as where there are immenſe ſums made by the raiſing them; and the owners of lands would do well in this ſcheme to try the effect of liquorice, madder, woad, and the like plants on their grounds. Wherever the ground is deep enough, it is pretty certain that madder and liquorice would flouriſh, and the laſt of theſe needs ſo little culture, that, if once planted, it may almoſt be left to itſelf. The rocky bottoms of lands, not too bleak, may alſo ſucceed very well with ſaffron, which is one of the moſt profitable plants that can be cultivated. *Philoſ. Tranſact.* N°. 109.

ROCK-*cryſtal* (*Dict.*)— This kind of cryſtal is the moſt common of all others, and is what the generality of authors deſcribe under the name of cryſtal of the ſhops, being that kept for medicinal purpoſes.

The cleareſt, pureſt, and moſt tranſparent that can be had, ought to be choſen; and, to prove its genuineneſs, it may be tried with aqua-fortis, true cryſtal making no effervеſcence with that menſtruum. *Hill's Hiſt. Mat. Med.*

ROLL, in the manufactories, ſomething wound and folded up in a cylindrical form.

Few ſtuffs are made up in Rolls, except ſattins, gawſes, and crapes, which are apt to break, and take plaits not eaſy to be got out, if folded otherwiſe.—Ribbonds, however, and laces, galloons, and paduas of all kinds, are thus rolled.

To Roll hot.—By an arret of council in 1698, fullers, ſhearmen, &c. in Poictou, are prohibited to Roll any ſtuff hot, either by having fire over or under it, or by heating the rollers, or otherwiſe, on forfeiture of 100 livres for the firſt offence, or of being degraded from the privileges of maſterſhip in caſe of a relapſe.

The ancients made all their books up in form of Rolls, or little columns; and, in Cicero's time, the libraries conſiſted wholly of ſuch Rolls.— The dearneſs of parchment, and the cheapneſs of papyrus, whereof the Rolls were made, was the reaſon that ſcarce any but paper Rolls were uſed.

Voſſius ſays, they paſted ſeveral ſheets end to end, when filled on one ſide, and rolled them up together; beginning with the laſt, which they called umbilicus, and to which they faſtened an ivory or boxen ſtick, to ſuſtain the Roll.— To the other extremity they paſted a piece of parchment, to cover and preſerve it.

Theſe Rolls were placed in the libraries, perpendicularly to the horizon.— The Jews ſtill preſerve the ancient uſage of Rolls for the law, and the other books they read in their ſynagogues.

ROLL *of tobacco*, is tobacco in the leaf, twiſted on the mill, and wound, twiſt over twiſt, about a ſtick or roller.

The generality of tobacco in America is there ſold in Rolls, of of various weights: and it is not till after its arrival in England, Spain, France, and Holland, that it is cut.—Roll tobacco is what is chiefly used both for chewing and rasping.

ROLLER, in zoology, the common name of a bird of the mag-pye kind, called garrulus Argentoratensis by authors, and suspected to be the same with the bird described by Gesner under the name of the blue crow, cornix cærulea, and by Aldrovand under the name of pica marina. Its beak is black and long, somewhat crooked at the end, otherwise like that of the common mag-pye; its eyes are of a greyish hazel colour, and near them are two tubercles bare of feathers. Its rump and part of its wing feathers are of a fine blue, like the ultramarine colours used in painting; the middle of its back is of a reddish brown, and the head is of a bluish green, and its breast and belly are of a whitish blue or dove colour. It is brought to market in Italy, and some other places. *Ray's Ornithology*.

ROLLER, in gunnery, a round piece of wood of about nine inches diameter, and four feet long, which serves in moving mortars from one place to another when near. This is done by raising the fore-part of the bed so high that a Roller may be laid under it; then pushing the bed forwards, and laying another in its way, and another before that, and so on, the mortar is easily moved.

ROMAIN, in husbandry, the name of a plant cultivated in the fields in many parts of the world, particularly in France, and called by our farmers French vetches, or French tares; it is an annual plant but a very quick grower, and is extremely good food for cattle, particularly for horses: they let these creatures feed on it all the forepart of the summer, and then cut it for hay in August or September. Its short continuance in the ground makes it less valuable than saintfoin and clover, but it has this advantage over them, that it will grow on poor ground.

ROMPION.—This kind of bell flower was formerly much esteemed in England for the sweet taste of the roots, and universally cultivated in kitchen gardens; but we at present disregard it, though the French continue to be very fond of it. The seeds are to be sown in a bed of light dry earth in March, and in May the young plants will be of a size to remove, or they may be left when found, only houghing them up to four inches distance; being kept clean from weeds for the remaining part of the summer, they will be fit for eating in the succeeding winter.

ROOK, in zoology, a well known bird of the crow kind.

Rooks are very destructive of corn, especially of wheat; they search out the lands when it is sown, and watching them more carefully than the owners, they perceive when the seed first begins to shoot up its little blade; this is the time of their feeding on it, and they will not be at the pains of searching for it at random in the sown land; for that is more trouble than so small a grain will requite them for; but, as soon as the blades appear, they are directed without loss of time or pains by them to the places where the grains lie, and in three or four days time they will root up such vast quantities of them that a good crop is often thus destroyed in embryo. After a few days the wheat continuing to grow, its blades appear green above ground, and then the time of danger from these birds is over; for then the seeds are so far robbed of their mealy matter that they are of no value to that bird, and it will no longer give itself the trouble to destroy them.

Wheat that is sown so early as to shoot up its green blades before the harvest is all carried in, is in no danger from these birds, because, while it is in a state worth their searching for, the scattered corn in the harvest fields is easier come at, and they feed wholly on this, neglecting the sown grain; but as this cannot always be done, the farmers, to drive away these ravenous and mischievous birds, dig holes in the ground, and stick up the feathers of Rooks in them, and hang up dead Rooks on sticks in several parts of the fields; but all this is of very little use, for the living Rooks will tear up the ground about the feathers, and under the dead ones, to steal the seeds. A much better way than either is to tear several Rooks to pieces, and scatter the pieces over the fields; but this lasts but a little while, for the kites and other birds of prey soon carry off the pieces, and feed upon them. A gun is a good remedy, while the person who has it is present; but as soon as he is gone, they will return with redoubled vigour to the field, and tear up every thing before them.

The best remedy the farmer has is to watch well the time of the corn's being in the condition in which they feed upon it, and, as this lasts only a few days, he should have a boy in constant pay to watch the field from day-break till the dusk of the evening. Every time they settle upon the ground or fly over it, the boy is to halloo and throw up a dead Rook into the air; this will always make them rise, and by degrees they will be so tired of this constant disturbance, that they will seek out other places of preying, and will leave the ground even before the time of the corn's being unfit for them. The reason of their rising at the tossing up of their dead fellow-creature is, that they are a bird extremely apprehensive of danger, and they are always alarmed when one of their comerades rises. They take this for the rising of an out-bird, and all fly off at the signal. *Tull's Horsehoeing Husbandry*.

ROPE, an assemblage of several twists or strings of hemp, twisted together by means of a wheel: of various uses, as in binding, staying, drawing, suspending, &c.

When the Rope is made very thick, it is called a cable, and, when very small, a cord.

The greatest consumption of Ropes is in navigation, for the tackling of ships; where, though Ropes include the whole cordage:

Yet there are several Ropes particularly so denominated: as, the entering Rope, hung at the ladder to help people up.—The top Rope.—A bolt Rope, wherein the sail is sowed.—Buoy Rope, to which the buoy of the anchor hangs.—Guest Rope, to tow the long-boat.—The keel Rope.—The bucket Rope.—Rudder Rope, to save the rudder, if it should chance to be beat off.—Preventer Rope, to save the yard in case any part of tyes should be broke.—Breast Rope, to lash the pannels to the masts.—Guy Rope, to keep the foremast forwards, directly over the hatch-way.—Boat Rope, by which the boat hangs, or is fastened a-stern of the ship.—And port Ropes.

ROPE-MAKER.—This trade is of great account in England, we being noted for making the best cordage for shipping in the world.

The work taken throughout is laborious, as well as dirty; but then it is good pay, a good hand being able to get 4 or 5 shillings a day, especially in war-time.

To a master, who has 2000 l. in cash to turn about, and less will not make any great way, it is very profitable; for most of them get to be rich in a few years, some of whom have had 5000 l, nay, 10,000 l. in trade.

They will take with an apprentice 5 or 10 l, and sometimes they take them without money. They are at work very early in the morning, but then they leave off soon in the evening, nay, commonly in the afternoon.

ROPE-MAKING, the art of making all kinds of Ropes and cordage, for the use of shipping, &c.

Every Rope is composed of a certain number of threads, called by the workmen yarns; these are spun in the following manner:

The workman takes a quantity of coarse hemp, properly prepared, and fastens one part of it to a small iron hook called a jack, several of which are placed in a semicircular board, having small shivers on their axes, by which means they are turned round very swiftly, by the help of a line going round the circumference of a large wheel. When he has fastened the end of his thread to the jack, he walks backwards, spinning it with his thumbs and fore-fingers. When he is come to the end of the spinning yard, another person unties it from the jack, and fastens it to a reel, about which it is wound.

But, in order to give a better idea of the manner of spinning these yarns or threads, we have given a perspective view (*Plate* XXXIX. *fig.* 4.) of a covered spinning yard; but it was thought proper to shorten it, because, if the whole length of the yard had been exhibited, in a view of this bigness, the objects would have been rendered too minute, and the operations very confused.

A, B, are two great wheels with the jacks inserted in semicircular pieces over them, and two men in their proper attitudes turning the wheels. Near the wheel B, a spinner is mounted on a kind of step ladder, in the form of an inclined plane, in order to reach the crooks of the jacks, to one of which he fastens the hemp, in order to spin his thread. The wheel A, being lower, has no step ladder. At this wheel a man is untying the end of a thread belonging to a spinner, who, being arrived at H, the end of the yard, is telling the other that his thread is finished. When the thread is loosed from the jack, it is spliced to the end of another thread spun by the workman C, who is represented holding the end of his own thread in his hand, and moving towards A as fast as his thread is wound up on the reel D. It must be observed that all threads are overtwisted when first taken from the jack; the workman therefore as the thread runs through his hand, lets it untwist a little; and, in order that the thread may be wound tight round the reel, the thread passes through a pulley as at *a*, fixed to the floor of the spinning yard; and is also turned two or three times round a piece of spun-yarn, kept down by a large stone, represented at *b*. The Reel D is turned by a man, and the thread laid regularly on it by a boy, who holds, with a piece of list, the thread, in one hand, guiding it in close spirals round the reel; and, that they may lie smooth upon it, he is continually striking on them with a flat piece of wood. At E, the other extremity of the spinning yard, is represented another reel to receive the threads spun at the wheel B. Near the middle of the yard, at F, is represented a workman spinning a thread from a quantity of hemp fixed on a distaff; and another spinning from hemp wrapped round his waist; also a groupe of children picking up the flakes of hemp fallen on the floor. The utensil G, is called a stake head, and that at I, a rail and hooks; their uses are to support the threads.

The Rope-yarns or threads being thus spun, the next operation is to form them into strands, called skaining, which is done thus: they fix as many reels covered with yarn, either in a perpendicular or horizontal position, as they intend threads in each strand.

 Then

Then taking the end of a thread from each reel, they put them through an iron ring, and draw them out to the intended length of the Rope, faſtening the ſtrands, at one end of the Rope walk, each to a different hook placed in the croſs-piece of the fixed poſt; and at the other end of the walk, they are all faſtened to one hook in a machine called a cart, or ſledge. This account will be much eaſier apprehended from the perſpective view of it on *Plate* XXXV. *fig.* 13, where the reels placed in a horizontal poſition are repreſented at B, B, and in a perpendicular one at C, C. The threads deſigned to compoſe each ſtrand being put through the rings *a*, *a*, the workmen draw them out in the manner repreſented in the figure. Near one end of the yard is placed the fixed poſt D E, ſupported with ſpruts, that it may be able to reſiſt the power applied to it in twiſting the ſtrands, &c. The croſs-piece has ſeveral holes bored, through which the hooks are put, in order to twiſt the ſtrands. N, is the machine called a ſledge, laſhed faſt to the pile *b*, and loaded with ſtones *c*. The cart, as well as the fixed poſt, is ſupported by ſpruts, and its croſs-piece in the ſame manner bored with holes, in order to receive hooks for twiſting the ſtrands; ſo that it is the ſame, but placed on a ſledge, and therefore at liberty to approach the fixed poſt D E. F, repreſents one of the hooks which is paſſed through the holes of the fixed poſt and ſledge to which the ſtrands are faſtened, and by which they are twiſted.

The ſtrands being formed and faſtened to the hooks, as before mentioned, they are twiſted, and the Rope finiſhed in the manner repreſented *Plate* XXXIX. *fig.* 3. The men at K are twiſting the ſtrands of the Rope, and thoſe at P are twiſting them together, or what the workmen call laying the Rope. Each ſtrand at the fixed poſt is faſtened to a ſeparate hook, but at the cart they are all faſtened to one. In order to lay the ſtrands evenly over each other, and prevent their being more twiſted in one part than another, a piece of wood or metal, in the form of the fruſtum of a cone, having grooves at equal diſtances on its ſurface, is put between the ſtrands, and either held by a man, or faſtened to a cart, according as the Rope is large or ſmall. This inſtrument is called by workmen a top, and is repreſented at T, faſtened to the cart S, by lines round a pin going through it; one end of which is ſeen at R. A larger figure of it is delineated on a drawing (*fig.* 2.) ſuppoſed to be faſtened to the wall of the yard; R, R, are the two ends of the pin going through it; in this figure the manner of the ſtrands in the grooves on its ſuperficies is plainly expreſſed: and alſo a ſmall Rope which is faſtened to the pin and turned ſeveral times round the Rope, in order to give it a proper reſiſtance to the ſtrands, which would otherwiſe twiſt together in a very confuſed and irregular manner: and it muſt be obſerved the more the top reſiſts the ſtrands, the cloſer they will be laid together, and the harder the Rope will be twiſted; and, on the contrary, the leſs reſiſtance the ſtrands meet with from the top, the Rope will be twiſted the ſlacker. A larger figure of the ſingle hook by which the Rope is laid is alſo repreſented in the drawing againſt the wall; where G is the handle by which it is turned; the Rope is faſtened to it in the manner repreſented at M, and the ſpace H I, between the the button L and the crank H, is the part which moves in the hole of the croſs-piece of the cart. The button L, when the hook is in the hole of the cart, is placed againſt the crank H, in order to hinder that part of it from touching the croſs-piece.

Another operation, often performed in making Ropes, is worming them, that is, laying a ſmall line between the ſtrands of the Rope, by which means its circumference is rendered more even, and the Rope itſelf becomes nearly a cylinder. This operation they perform in the following manner: when they are laying the Rope, a perſon takes the end of the line appointed for this purpoſe, and, having put it through the eye of a tool called a wooller, faſtens it to the end of the Rope, and having turned the other four or five times round the Rope, holds the wooller very tight, directing the line between the ſtrands, as it is twiſting up by the men on the cart. If the Rope be large, two men are neceſſary for this operation, who perform the ſame by means of a double wooller. The man at Y, *Plate* XXXIX. *fig.* 3, is worming the Rope, or laying the line between the ſtrands; and the two men at Z are performing the ſame operation by means of a double wooller. And on the drawing, ſuppoſed to be hung up againſt the ſide of the Rope-walk, a ſingle wooller is repreſented at X, and a double one at *a*.

Thus have we deſcribed the whole operation of making a Rope which conſiſts of three ſtrands; but, as ſome are compoſed of four, five, and ſix ſtrands, a few obſervations will be neceſſary with regard to thoſe. The operation is indeed the ſame, except that there muſt be as many hooks at the fixed poſt as there are ſtrands, and the top, inſtead of having three grooves on its ſuperficies, muſt have as many as there are ſtrands; and alſo an hole bored in its axis, in order to receive the heart, or number of Rope-yarns twiſted together, in order to fill up the ſpace which would otherwiſe remain empty in the axis of all Ropes conſiſting of above three ſtrands. This ſpace, if not filled up, renders theſe Ropes not only very difficult to be laid, but alſo weaker. And the reaſon is eaſily conceived; for, as there is a vacancy, or empty ſpace, in the axis of the Rope, the ſtrands have nothing to ſupport them; and cannot, therefore, take any uniform arrangement round this empty axis, but by the means of a lateral preſſure againſt one another: now, the better to preſerve the regularity of this arrangement, there muſt be a perfect equilibrium between the ſtrands, which muſt be of an equal bigneſs and poſition, and equally twiſted; without which, there will infallibly be ſome ſtrand nearer to the axis of the Rope than the others; and ſometimes, eſpecially in the Ropes of five or ſix ſtrands, one of them will lodge at the center of the Rope, and the others conſequently roll themſelves on it; in which caſe this ſtrand would do nothing but wreath and twiſt itſelf about, whilſt the others would wrap round it in ſpiral directions.

A Rope of this kind of five or ſix ſtrands would be very bad; for, when it came to be uſed, the ſtrand of the axis muſt carry all the ſtreſs, which would break it; and then the Rope, being now compoſed but of the four or five remaining ſtrands, would loſe the fifth or ſixth of its ſtrength; beſides, the remaining ſtrands would be ill-diſpoſed towards one another, and moſt commonly unfit to unite in ſtrength together.

To avoid theſe accidents, the moſt part of the Rope-makers fill up the ſpace remaining between the ſtrands with a number of Rope-yarns, on which the ſtrands are coiled; theſe cords are called the heart of the Rope. *Plate* XXXIX, *fig.* 1, repreſents the whole operation of laying a Rope of four ſtrands; in which we may obſerve, 1. Two workmen turning the winch of the ſledge. 2. The maſter Rope-maker, who examines if the ſtrands are well laid near the top. 3. A lad who holds the heart which goes through the axis of the top, and fills the ſpace, which would otherwiſe be empty between the four ſtrands. 4. Four Rope-makers, who, together, turn the winches of the fixed poſt. 5. The cart which carries the block is to be drawn along as a ſledge, having no wheels to it, as that before deſcribed: we find both theſe ſorts of carts in the Rope-yards; but, in making uſe of the ſledge-cart, it is neceſſary that the floor be very even.

As to the ſtrength of Ropes or cordage, M. Reaumur takes occaſion, in the Memoirs of the Royal Academy, to conſider the queſtion, whether a Rope of ſeveral twiſts or ſtrands interwoven, for inſtance, ten, have more ſtrength to ſuſtain a weight, than the ten twiſts would have ſeparately, placed parallel over one another: or, which is the ſame thing, whether if each twiſt be capable of ſuſtaining the weight of a pound, the whole cord be able to ſuſtain more than ten?

There indeed appears no great difficulty in the queſtion; the evidence ſeems ſtrong on the ſide of the affirmative: for, 1. By virtue of the twiſting, the diameter of the Rope is made larger than are thoſe of the ten twiſts together; but it is apparently by its thickneſs that a Rope ſuſtains a weight, or reſiſts a fracture.

2. Twiſted ſtrands have not at all, as when parallel, a vertical direction with regard to the weight; ſeveral of them, and even the greateſt part, have oblique directions, and of conſequence do not bear all the ſhare of the burthen they would otherwiſe bear. In effect, they are inclined planes that are only preſſed with a part of the load.

Hence it would follow, that the ſurplus of the ſtrength of the twiſts might be employed in raiſing a larger weight.

On the other hand it is true, that in twiſting the ſtrands ſome are ſtretched, and others left more looſe, and the new tenſion, given the former, ſerves to weaken them, and has of itſelf the effect of a weight: thus they become leſs able to ſuſtain one ſo large. Thoſe more lax, on the contrary, wave in ſome meaſure the action of the weight, for the action is diſtributed equally on the ten ſuppoſedly equal twiſts; and, if ſome, by reaſon of their particular diſpoſition, receive leſs than their quota, the weight will act more forcibly on the reſt, and will break them firſt, as being more tenſe; after which it will eaſily diſpatch the reſt, as not being in ſufficient number to oppoſe it.

This is the ſum of what can be urged for and againſt the twiſting; to decide between them M. Reaumur had recourſe to experiment. The reſult was, that, contrary to expectation, he ſtill found the twiſting diminiſhed the ſtrength of the Rope; whence it is eaſily inferred, that it diminiſhes it the more, as the Rope is the thicker; for, inaſmuch as the twiſting diminiſhes, the more twiſting, the more diminution.

The reſiſtance or friction of Ropes is very conſiderable, and by all means to be conſidered in calculating the power of machines. M. Amontons obſerves, in the Memoirs of the Royal Academy, that a Rope is ſo much the more difficult to bend; 1. As it is ſtiffer and more ſtretched by the weight it draws. 2. As it is thicker; and 3, as it is to be more bent; i. e. as it is to be coiled, for inſtance, into a ſmaller ring.

The ſame author has thought of ways to prove in what proportion theſe different reſiſtances increaſe; that, ariſing from the ſtiffneſs or rigidity occaſioned by the weight which draws the Rope, increaſes in proportion to the weight; and that ariſing from its thickneſs in proportion to the diameter. Laſtly, that ariſing from the ſmallneſs of the gyres, or pullies about which it is to be wound, is indeed greater for ſmaller circumferences than large ones, but does not increaſe ſo much as in the proportion of thoſe circumferences.

On this footing the loſs a machine ſuſtains, by the cordage being eſtimated in pounds, becomes, as it were, a new weight, to be added to that which the machine is to raiſe. This augmentation of weight will render the cords ſtill more ſtiff, which exceſs is to be computed as before.

Thus we ſhall have ſeveral ſums ſtill decreaſing, which are to be added together, and it will be ſurpriſing to ſee what a ſum they will amount to.

Where Ropes are uſed in a machine, all the reſiſtance reſulting from their ſtiffneſs is to be put together, and all that occaſioned by the friction, which will make ſo conſiderable an augmentation to the difficulty of the motion, that a power, which to raiſe a weight of 3000 pounds, by means of a fixed and a moveable pulley, needed only 1500 pounds; muſt, according to M. Amontons, have 3942 pounds, on account of the frictions, and the reſiſtance of the cordage.

ROSA'CEOUS *Flower*, *roſaceus flos*, in botany, a term uſed to expreſs ſuch flowers as are compoſed of ſeveral petals or leaves, diſpoſed in a ſort of circular form, like thoſe of the roſe; ſuch are the flowers of the piony, crowfoot, cinquefoil, &c. In this ſort of flowers the diſpoſition only of the leaves is regarded, their number being of no conſequence. It is very ſeldom that the number is two or four, except in the circæa and onagra. The moſt frequent number of leaves in theſe flowers is five, as ſuch as have four differ from the cruciform flowers, not only in their diſpoſition, but in this, that the number is in the ſame ſpecies indeterminately four, five, or ſix, as is the caſe in the clematitis, the capers, and the ſpecies of rue, whereas in the cruciform ones it is ever conſtant. See *plate* XL. *fig*. 3.

ROSA'RIA, among the Romans, a kind of perfumes, ſo called, either from their being chiefly made of roſes, or becauſe they had a moſt exquiſite odour.

RO'SARY, is a word frequently met with in the ancient hiſtories of Ireland, and uſed to expreſs a peculiar ſort of baſe money coined abroad, in the form of the penny, current in that kingdom; but of ſo much baſer an alloy, that it was not worth quite half the real value of a penny. This and many other ſuch coins were decried, and it was made death to import any of them by Edward the Firſt, in 1300.

ROSE *Fly*, in natural hiſtory, the name given by authors to a peculiar ſpecies of fly found very frequently on Roſe buſhes, and produced out of a baſtard caterpillar, which feeds on the leaves of that tree.

The male of this fly has a long body, the female a ſhort and thick one; ſhe depoſits her eggs in ſmall holes, which ſhe makes in the bark of the young branches, and, for this purpoſe, is furniſhed with a very remarkable inſtrument placed at the hinder part of the body, which is a kind of ſaw. This is a four-winged fly, and is ſo common on Roſe buſhes, that it is ſcarce poſſible to miſs it in any of the ſummer months; and the parts of the branches where it has depoſited its eggs, are ſo vitiated by it, that they alſo are eaſily known. They are uſually ſwelled to a greater bigneſs, than either the part above or below them, and are uſually ſomewhat bent; they are often black on the underſide, and among this blackneſs the holes made for the eggs, and often the eggs in them, may be ſeen. The head and breaſt of this fly are black. Its wings alſo are edged with black, its body is yellow, and its legs yellow, with a few black ſpots.

If theſe flies be obſerved in a ſummer morning, as they are crawling upon the branches of the Roſe-tree, they will ſoon be found at work for the depoſiting of their eggs. Theſe creatures give us a very good opportunity of obſerving the manner in which they perform this, as they are of a very ſluggiſh diſpoſition, and will ſtand ſtill even to be taken between the fingers; ſo that, when one of them is in a proper ſituation, it may be examined, by bringing the eye near it, and by uſing the common magnifying glaſſes, without quitting its place or its work; and, if there be leaves of the tree, or ſmall branches of it in the way, they may be removed without diſturbing the creature. *Reaumur's Hiſt. Inſ.*

ROSE *Galls*, in natural hiſtory, a name given by authors to certain unnatural productions of the roſa ſylveſtris, or dog Roſe, occaſioned by the bites of inſects: there are two kinds of theſe, the one very common, the other more rare.

The ſcarcer kind is uſually found on the young ſhoots, and on the heps or fruit, and is of a woody ſubſtance; the other is hairy and ſpungy, and is found on the old branches. The woody kind uſually appears in the months of June and July, and is always found in cluſters. Theſe are compoſed often, of twelve or more galls of different ſizes and figures, ſome round, others oblong, ſome of the ſize of an olive, and others not larger than a pea. They are of the common ſubſtance of the white wood or blea of trees, and, when ſituated on the fruit, they prevent its ripening and make a very ſingular figure. They are of a reddiſh colour, and are uſually ſmooth and gloſſy, but ſometimes they are beſet with ſhort and fine prickles.

Eſſence of ROSES. There is ſcarce a more valuable perfume in the world than the eſſence of damaſk Roſes, and ſcarce any thing is obtained from its ſubject with more difficulty and in leſs quantity. All eſſences or eſſential oils are, while in the plant, contained in certain veſicles, lodged in different parts, and of different ſtructure; theſe veſicles are in the Roſe particularly ſmall and tender, and are placed very ſuperficially; the conſequence of this is, that there is originally but a very little of this eſſence in the flower, and this is the very ſubject that will be diſſipated and loſt, when the flowers are gathered and thrown in a heap together, as they are ſucculent, and very quickly heat in lying together. To avoid all diſſipation and waſte of this choice eſſence, the Roſes ſhould be thrown into the ſtill as ſoon as gathered, and diſtilled with very little water, and that in a balneum mariæ; the fire is to be continued ſo long as the flowers float ſeparate about in the water; but as ſoon as ever they form themſelves into a cake, and ſtick to the bottom, the diſtillation ſhould be finiſhed, as they then yield no more eſſence. With all theſe precautions, however, it is with great difficulty we can procure any eſſence of Roſes; what we obtain by this diſtillation being chiefly a very odoriferous and fragrant water. In the warmer countries the ſame caution affords a larger quantity of oil, which may be ſeparated and preſerved under the name of the eſſence. In Italy, they make ſome quantity of it, but there it is very dear; a vaſt quantity of the flowers yielding only a very little eſſence, and that being thick and troubleſome in the procuring, as it everywhere ſticks to the veſſels.

It is to be obſerved, that the ſeaſon of the year, as to wet or dry, makes a very great difference in the eſſential oils of all plants; they are always much finer in dry and hot ſeaſons than in cold and moiſt: we find our Roſe-water in England much finer and more fragrant, though diſtilled in the ſame proportion, in hot and dry ſummers than in colder and rainy ones; and Mr. Geoffroy gives an account that he ſucceeded, one very hot and dry year, in the making the eſſence of Roſes in France, in the following manner:

As the Roſes were brought to him freſh gathered, he turned them immediately into the ſtill; and drawing over the water into a glaſs matraſs, when it had ſtood by ſome time, and was perfectly cold, he diſcovered ſome of the eſſence fixed to the ſides of the matraſs, and the ſurface of the water covered with a thin reticular pellicle. All the contents of the matraſs were put to filtre through a paper, ſupported by a fine linen cloth; and the filtrated water was added to new Roſes for many ſucceeding diſtillations, the produce of which was all filtred thro' the ſame paper. After a long courſe of diſtillations, with freſh flowers every time, but ſtill with the ſame veſſels and the ſame water, there was found in the paper of the philtre a quantity of the thick eſſence; this, being carefully waſhed out of the paper with a ſmall quantity of the moſt fragrant of the water, and afterwards ſeparated pure from its ſurface, was very white, and extremely fragrant, and as thick as fine butter. This is not the only eſſential oil which naturally concretes into this firm ſtate; oil of aniſeed, though fluid, when diſtilled, always concretes in the ſame manner on the firſt approach of cold; and another oil of this kind is that of the laurel, which is uſed in ſome places, though very improperly, to give the ſcent and taſte of bitter almonds, or apricot kernels, to foods of different kinds.

Monſieur Homberg has taught us how to gain a larger quantity of the eſſential oil of Roſes than is uſual in diſtillation, by the previous addition of mineral acids, as the ſpirit of ſalt, vitriol, &c. thereto, which increaſe the fermentation, and, joining with the oil, render it more liquid, and eaſier to be raiſed by heat. He adviſed a perfumer, who before ſcarce obtained an ounce of oil from an hundred weight of Roſes, to ſteep his flowers for fifteen days in water made ſharp with ſpirit of vitriol, by which means the perfumer, upon diſtillation, found his quantity of oil increaſed almoſt a third.

The perfumers keep the ſtructure of the veſſel they employ in this diſtillation a great ſecret. Mr. Homberg tells us, it is a large convenient ſtill, that opens in a tube at the top to receive the water which muſt often be poured upon the Roſes to bring over the oil with it; this it does but very ſlowly, and ſo requires that its quantity be large; the ſtill alſo opens below, that the flowers, when they will yield no more oil, may be eaſily taken out; but the principal contrivance is the figure of the veſſel which receives the oil; this is made like an ordinary matraſs, from the lower part of the belly whereof comes a tube, as from an old-faſhioned cruet, and, riſing to the bottom of the neck of the receiver, it bends outwards; ſo that, though the veſſel uſually contains but two or three French pints, it conveniently receives and lets paſs many hundred pints of the Roſe water, without any neceſſity of being changed; for a change would loſe the ſmall quantity of the oil obtained. The water diſtilled runs through a pipe into a ſecond receiver: the oil, being lighter than the water floats upon its ſurface, and adheres to the neck of the veſſels as high as the aperture of the little pipe, while the water runs from the bottom of the firſt receiver into the ſecond. See *Mem. de l'Acad. des Sciences*, 1700.

ROT, *in ſheep*.— This is the greateſt of all the inconveniencies that attend the keeping theſe uſeful animals.

It is a very hard thing to prevent the Rot, if the year prove very wet, eſpecially in May or June. Salt marſhes and lands, where broom grows, are the beſt places of preſervation for them. Sheep are ſometimes all cleared of the Rot, when not too far gone with it, only by removing them into broom fields. Scurvy-graſs, muſtard, and thyme are alſo good for the prevention of it.

Some propoſe the giving ſheep half a handful of bay ſalt every month

month or oftener; and there is great probability that this may be of service; but the rational way of attacking all disorders in cattle, is by considering what are the causes of them. It will appear upon enquiry, that wet seasons are the general occasions of the Rot in sheep, and therefore it would be adviseable for the owners, when such seasons come on, to remove the animals into the driest pastures they can, and then to feed them principally with dry sweet hay, oats, bran, and the like; this would prevent the occasion; and, if they were already a little infected, some salt, given with their dry food, would be a happy means of curing them. *Mortimer's Husbandry.*

ROTCHET, an English name for the fish called by authors cuculus, and more frequently by us the red gurnard. *Willughby's Hist. Pisc.*

ROTOLO, an Egyptian weight of twelve ounces, each ounce consisting of twelve drachms, and each drachm of sixteen carrats. *Pocock's Egypt.*

ROTULA, in natural history, the name of a genus of the echini marini, of the general class of the placentæ. The characters of the Rotula are, that they are flat shells in form of a cake, composed of various flat pieces, and formed into a round, something like that of a wheel; but wanting one or more parts of its outer ring, and radiated or dentated. Their mouth is situated in the middle of the base, and the aperture of the anus in the third region of the axis, and marked with a cinquefoil flower at the summit. The great and obvious character is, however, the dentaged edge.

ROUP, in poultry, is a filthy boil or swelling upon their rumps, known by the staring or turning back of the feathers.

The Roup, if not soon remedied, will corrupt the whole body; to prevent which, the feathers are to be pulled away, the swelling laid open, and the matter pressed out; after which, the part is to be washed with salt and water, or brine. *Rust. Dict. in voc.*

ROWEL (*Dict.*) — The Rowelling of horses is a method of cure frequently had recourse to in inward strains, especially about the shoulders or hips; as also for hard swellings not easy to be resolved.

The operation is thus.—A little slit being made through the skin, about a handful below the part aggrieved, big enough to put a swan's quill in; the skin is raised from the flesh, the end of the quill put in, and the skin blowed from the flesh upwards, and all over the shoulder. — Then the hole being stopped with the finger, the place blown is beaten with a hazel-stick, and the wind spread with the hand all over; then let go. This done, horse-hair, or red sarsenet, half the thickness of the little finger, is put in a Rowelling needle seven or eight inches long; the needle is put into the hole, and drawn through again six or seven inches higher; then the needle is drawn out, and the two ends of the Rowel tied together: anointing it every day, as well as before the putting it in, with sweet butter and hog's grease, and drawing it backwards and forwards in the skin, to make the putrid matter discharge itself more plentifully.

Others, disliking these Rowels, as making too great a sore and sear, use the French Rowel, which is a round piece of stiff leather, with a hole in the midst; laying it flat between the flesh and skin, the hole of the Rowel just against that in the skin; sewing it with a needle and thread drawn through the hole and the skin; cleaning it once in two or three days, and anointing it a-fresh.

RUBIGO, in husbandry, is the name by which the ancients expressed what we call the blight in corn, &c. they give it this name from the resemblance of the colour of the blighted stalks to rusty iron.

They generally thought that it came from heaven, being ignorant of its true cause, which is want of nourishment in the earth. Virgil gives this up as an incurable distemper, and, tells the farmer, that, if his corn is blighted, he must live upon acorns, not supposing that any remedy could be devised for such a distemper.

Palladius gives many receipts to cure the blight, and other distemperatures of corn that come from above, as they imagined at that time. The chief efficacy of these seems to consist in certain secret sympathies and antipathies to fright the clouds away with. The world will easily judge how likely such means as these were to have success.

The ancient farmers generally used prayers, supplications, and sacrifices to their gods on this occasion; and, if these did not succeed, they proceeded to blasphemy and threatenings, and brandished bloody axes against the sky, as a token to their gods to desist from plaguing them, or else to expect no quarter. They used to hang up in their fields and gardens, on these occasions, pieces of red cloth, and the feathers and heart of an owl, as a way to fright the clouds from coming over those places. These people in general, having no true knowledge of the theory of husbandry, had recourse to magic, and used what they thought spells and enchantments on all occasions. Cato, Varro, and even Columella, are full of these ridiculous devices. A better knowledge in the real nature of husbandry has taught us to understand this matter, in a very different manner, and to apply more efficacious remedies to it. *Tull's Horse-hoeing Husbandry.* See BLIGHT.

RUBRICA, in natural history, a red earth used for marking, and in painting. There are two kinds of it, a harder and a softer.

The first, or harder kind, is but little in use, except among the turners in wood, as it does not mark so easily, requiring to be first wetted, and then pressed hard upon the substance to be marked. This is dug in Lincolnshire, Hampshire, and Sussex, and is a hard and dry earth, of a somewhat pale red, like the common pale red bricks; and is of a very regular and close texture, and always composed of a number of thin laminæ, lying closely and evenly on one another. It is of a rough uneven surface, adheres firmly to the tongue, is not easily broken between the fingers, and stains the hands a little; it is of a very astringent taste, and melts pretty readily in the mouth. It is very readily diffusible in water, mouldering to powder, soon after being thrown into it, and makes no effervescence with acids.

The second, or softer kind, is very common, and put to a number of different uses. It makes simply a very good pale red for the painters, and is very serviceable to them in their mixed colours. It is in constant use in many parts of the kingdom for the marking of sheep; and, when washed and separated from its sandy particles, is, by some of our modern druggists, sold under the name of bole-armenic.

It is found in many parts of the world; the best in England is that from several parts of Derbyshire, from whence the colour-shops and druggists of London are supplied; many of the latter thinking this a shorter method than the common one of our bole-armenic makers, of preparing it from a mixture of tobacco pipe clay, and that sort of the red ochre called Spanish brown. See BOLE and BOLUS.

This soft, or common ruddle, is a loose ponderous earth, of a lax texture, and very friable: and of a pale, but tolerably bright red, of a somewhat smooth and glossy surface, soft to the touch, adhering firmly to the tongue, easily broken between the fingers, and staining the hands. It is of a rough austere taste, very readily breaks, and falls to powder in water, and makes no effervescence with aquafortis. *Hill's Hist. of Foss.*

Arsenical RUBY, *rubinus arsenicalis*, in chemistry, a name given to a sublimation of a mixture of arsenic and common sulphur. These two bodies mixed together in different proportions afford very different appearances. If arsenic, mixed with one tenth part of its weight of sulphur, be thrown into a crucible red-hot upon the fire, and covered immediately with a tile, and finally poured out after two minutes fusion, it becomes a solid brittle mass of a very pale yellow. If arsenic be melted, in the same manner, with a fifth part of sulphur, the mass, when cold, will be of a red colour; and finally, if arsenic and sulphur be melted or sublimed together, in equal quantities, the product is a beautiful red transparent mass, called rubinus arsenicalis.

Counterfeit RUBY. — The way to give the true fine red of the Ruby, with a fair transparence, to glasses, is as follows: calcine, in earthen vessels, gold dissolved in aqua regia till it become a red powder. The operation will require many days in a hot furnace; when the powder is of a proper colour, take it out; and, when it is to be used, melt the finest crystal-glass, and purify it by often casting it into water; finally add, by small quantities, enough of this red powder, to give it the true colour of a Ruby, with an elegant and perfect transparence. *Neri's Art of Glass.*

RUFFE, in zoology, the English name of the cernua or small gilded pearch, a fish common in our rivers, and much resembling the pearch in figure.

The Ruffe is called by the generality of authors cernua fluviatilis; and by some chærus acerina and aspredo. It is called by Johnson and Charleton also serollus.

Willughby, as well as these authors, has mentioned the serollus as another species of fish; but it is proved, by observation, that they are evidently the same species. Artedi makes this fish a pearch, or perca; and accurately distinguishes it from the other fish of that genus by the name of the pearch, with only one fin on the back, and with a cavernous head.

This fish may be preserved alive in glass jars with fresh water, and be made very tame. It must be fed, for it cannot subsist on the animalcula of river-water as small dace can.

RUFFE, is also the name of a particular species of pigeon called the jacobine, but is larger, and has a longer beak. The iris of the eye is sometimes red, sometimes pearl-coloured. The feathers of the hood and chain are much longer than the jacobine's, though they do not come down so low to the shoulders of the wings, nor are they so compact and close, but are apt to blow about with every little blast of wind, and fall more backward off the head, and lie in a rough confused manner.

It is a common thing to match the jacobine pigeon with this species, with intent to improve its chain by the length of the Ruffe's feathers; but the event is, that the pigeon is always worse instead of better, being longer-beaked, and looser in its head and chain, without any real advantage. *Moore's Columb.*

RUGGIOLA, a sort of Spanish slate, serving in many places in the room of tiles and bricks. It is a flaky stone, of the nature of some of our grey slates, and is cut out of a mountain near Cordova; a plate of this, being well heated on both sides, will retain its warmth for twenty-four hours.

The people of Cornwal, and some parts of Yorkshire, use a stone, ftone, which is of a talcky nature, to warm themfelves when in bed, applying it at the feet of the bed. This they call the warming ftone from its ufe, and it will retain a fenfible heat fix or eight hours, after once moderately warming. *Plot's Oxfordfhire.*

RUM.—Rum differs from what we fimply call fugar fpirit, in that it contains more of the natural flavour or effential oil of the fugar cane; a great deal of raw juice, and parts of the cane itfelf, being often fermented in the liquor or folution of which the Rum is prepared.

The unctuous or oily flavour of Rum is often fuppofed to proceed from the large quantity of fat ufed in boiling the fugar; which fat, indeed, if coarfe, will ufually give a ftinking flavour to the fpirit, in our diftillations of the fugar liquor or wafh, from our refining fugar-houfes; but this is nothing of kin to the flavour of the Rum, which is really the effect of the natural flavour of the cane. The method of making Rum is this:

When a fufficient ftock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very flowly at firft; becaufe, at the beginning of the feafon for making Rum in the ifland, they want yeaft, or fome other ferment to make it work; but by degrees, after this, they procure a fufficient quantity of the ferment which rifes up as a head to the liquor in the operation, and thus they are able afterwards to ferment and make their Rum with a great deal of expedition, and in large quantities.

When the wafh is fully fermented, or to a due degree of acidity, the diftillation is carried on in the common way, and the fpirit is made up proof: though fometimes it is reduced to a much greater ftrength, nearly approaching to that of alcohol or fpirit of wine, and it is then called double diftilled Rum. It might be eafy to rectify the fpirit, and bring it to much greater purity than we ufually find it to be; for it brings over in the diftillation a very large quantity of the oil; and this is often fo difagreeable, that the Rum muft be fuffered to lie by a long time to mellow before it can be ufed; whereas, if well rectified, it would grow mellow much fooner, and would have a much lefs potent flavour.

The beft ftate to keep Rum in, both for exportation, and other ufes, is doubtlefs that of alcohol, or rectified fpirit. In this manner it would be tranfported in one half the bulk it ufually is, and might be let down to the common proof ftrength with water, when neceffary; for the common ufe of making punch, it would likewife ferve much better in the ftate of alcohol; as the tafte would be cleaner, and the ftrength might always be regulated to a much greater exactnefs.

The only ufe to which it would not fo well ferve in this ftate, would be the common practice of adulteration among our diftillers; for, when they want to mix a large portion of cheaper fpirit with the Rum, their bufinefs is to have it of the proof ftrength, and as full of the flavouring oil as they can, that it may drown the flavour of the fpirits they mix with it, and extend its own. If the bufinefs of rectifying Rum was more nicely managed, it feems a very practicable fcheme to throw out fo much of the oil, as to have it in the fine light ftate of a clear fpirit, but lightly impregnated with it; in this cafe it would very nearly refemble arrac, as is proved by the mixing a very fmall quantity of it with a taftelefs fpirit, in which cafe the whole bears a very near refemblance to arrac in flavour.

Rum is ufually very much adulterated in England; fome are fo barefaced as to do it with malt fpirit; but, when it is done with molaffes fpirit, the tafte of both are fo nearly allied that it is not eafily difcovered. The beft method of judging of it is, by fetting fire to a little of it; and, when it has burnt away all the inflammable part, examining the phlegm both by the tafte and fmell. *Shaw's Effay on Diftillery.*

RUN *of a fhip*, fo much of her hull as is always under water; growing thinner and lanker by degrees, from the floor timber to the ftern-pofts.

This is alfo called the fhip's way afterward.

A fhip is faid to have a good Run, when it is long, and the water paffes cleverly to her rudder, her tuck not lying too low, which is of great importance to her failing—If the water do not come ftrongly to her rudder, by reafon of her being built too broad below, fhe cannot fteer well; and a fhip that cannot fteer well, cannot keep a good wind, nor will have any frefh way through the fea, but will ftill be falling to leeward.

RUNCA'TION, a term ufed in the antient hufbandry, to exprefs the clearing away the weeds from among the corn and other fown plants.

They ufed, when the corn or other plants were an inch or two high, to draw a fort of rake or harrow over the ground indifcriminately over the corn and weeds, and, when this was done, a perfon followed over all the field, and picked up all the weeds with the hand; the treading the young corn, however, by this perfon's feet, and the injury done to it by the rake, were fo great, that the crop always fuffered greatly by it; many of the Romans chofe to omit the ufe of the rake or harrow, as a thing that did as much injury to the corn as to the weeds, and contented themfelves with the fending a perfon to pick up the weeds without it.

This was a fort of firft hint to the horfe-hoeing hufbandry of the moderns, though fo injudicioufly managed, that it was of very little, if any, ufe in its infancy. But had thefe farmers been inftructed to fow their corn in rows, and then to ufe the rake or harrow as we do the hoe, only between thofe rows, they would then have had all the advantage of deftroying weeds by it, and of ftirring the earth, and no injury would be done to the crop. *Tull's Hufbandry.*

RU'NIC, in feveral parts of Sweden, ftones may be met with which were formerly fet up as obelifks in memory of the dead; and thefe monuments are marked with the antient northern letters, called runor, or the Runic characters. In fome places, the characters vary from the Runic, particularly in free ftones found in Helfingland, of which Mr. Celfius has given us a defcription, with an explanation.

From thefe Helfingland infcriptions an alphabet of fixteen letters may be derived, which is very fingular. In other alphabets different founds are generally denoted by different figures; but here the fame character, according to the diverfity of its place and altitude between two parallels, denotes different founds.

But thefe characters, however different they may appear at the firft fight from the Runic, may eafily be derived from them; or, vice verfa, the Runic may be derived from the Helfingic, if thefe be fuppofed the moft antient. The fubtraction of a perpendicular line in the firft cafe, or its addition in the latter, brings the two characters to a near refemblance.

The infcription, which Mr. Celfius confiders, was publifhed in Monf. de la Motraye's Travels, but erroneoufly.

RUNT, the name ufed with the diftinction of places for feveral fpecies of pigeons. Thefe are the Leghorn, the Spanifh, and the Friefland Runt, &c. The columba domeftica Pifarum, Hifpaniæ, et Frifiæ of Moore.

The Leghorn Runt is a ftately large pigeon, feven inches or better in the legs, clofe-feathered and faft-flefhed, extremely broad-breafted, and very fhort in the back. He carries his tail, when he walks, fomewhat turned up like a duck's; his neck is longer than any other pigeon's, and he carries it bending like a goofe or fwan. He is goofe-headed, and his eye lies hollow in his head, with a thin fkin round it, like that of the Dutch tumbler. His beak is very fhort for fo large a bird, and has a fmall wattle on it, and the upper chap falls a little over. It is a very valuable pigeon, but is tender, and requires care.

The Spanifh Runt is the longeft-bodied of all the pigeons; it is fhort-legged and loofe-feathered, and does not walk fo upright as the Leghorn Runt. Thefe are of a great variety of colours, but are apt to have accidents in fitting, from their fitting too heavy, and often breaking their eggs.

The Friefland Runt is a large pigeon, and has all its feathers reverted, or looking as if placed the wrong way.

The Roman Runt is a pigeon of the fame general make with the common kind, but fo large and heavy that it can hardly fly.

The Smyrna Runt is middle-fized, and is feather-footed, and and that to fuch a degree fometimes, as to look as if there were wings upon the foot; the feathers of thefe are fometimes four or five inches long, and often pull the eggs and young out of the nefts. The common Runt is the common blue pigeon kept for the table, and known to every body. *Moore's Columb.*

RUPELLE'NSIS *Sal*, in chemiftry, a name given to a peculiar kind of falt, invented by Mr. Seignette at Paris, and extolled as a very valuable medicine.

The preparation of it was kept a great fecret, till difcovered by fome members of the Paris Academy. It was found to be a fpecies of fal polychreftum, and was properly a foluble tartar compofed of cream of tartar and the fixed falt of common potafhes well defpumated. This falt is of a very fingular nature; for, though it be a true alcaline falt, it yet is capable of cryftallifation, and it does not eafily diffolve in the open air as other fixed falts do; but, on the contrary, it calcines therein like vitriol and the Glauber's falts. *Philof. Tranf.* N°. 436.

Another peculiar property of it is, that, if it be fatiated with vitriolic acids, and the liquor be evaporated, there is obtained a falt which has the figure of Glauber's falt, and all the properties requifite to make Mr. Seignette's falt. In order to which, take falt of kali or pot-afhes of Alicant well purified one pound; diffolve it in water, and add to it cream of tartar half a pound: this is about the quantity ufually neceffary; but the true proportion, in this cafe, can no more be determined than in the making the common foluble tartar, otherwife than by trial every time, either from the falt of kali's having retained more or lefs humidity, or from the tartar's having more or lefs foulnefs. Boil the whole together, in order to diffolve the tartar; and, if the quantity of tartar have been too great after the fermentation is over, filtre the liquor, and, as it cools, the fuperfluous tartar will fall to the bottom; after the feparation of the tartar, evaporate the lixivium over a gentle fire to a proper ftandard, and then fet it in a cool place, and there will fhoot fine cryftals. If the liquor be a little too far evaporated, there will be no cryftals formed, but the whole liquor will congeal into a hard fubftance tranfparent like ice; but, upon diffolving this in more water, it will fhoot as fair as it would have done if properly evaporated at firft.

The virtues of this falt confift in its being an excellent purge; its

its dose is from one to two ounces; and it is to be dissolved in a large quantity of water.

RUPERT'S *Drops*, a sort of glass drops with long and slender tails, which burst to pieces on the breaking off those tails in any parts, said to have been invented by prince Rupert, and therefore called after his name.

This surprising phænomenon is supposed to arise from hence; that while the glass is in fusion, or in a melted state, the particles of it are in a state of repulsion; but, being dropped into cold water, it so condenses the particles in the external parts of their superficies, that they are thereby reduced within the power of each other's attraction, and by that means they form a sort of hard case, which keeps confined the before-mentioned particles in their repulsive state; but, when this outer case is broke, by the breaking off the tail of the drop, the said confined particles have then liberty to exert their force, which they do by bursting the body of the drop, and reducing it to a very peculiar form of powder.

This theory seems to be corroborated by making the drops red-hot, and letting them cool again by gentle degrees in the open air, for then there is no such effect. Yet, it must be allowed, that there is another experiment which seems to impugn this hypothesis; and that is by grinding away any part of the drop upon a grindstone, when the remaining part continues entire; though there appears no reason why it should not break and burst into dust, if the internal parts be the cause of it; since by this means they must needs be set at liberty, in the most ample manner possible, unless it be that, in grinding, the vacuities between the internal particles are filled up with the matter worn off from the stone; and, by this means fixing the parts of the glass next the stone, they destroy their repulsive force; constituting as it were another sort of hard external case, which confines the internal particles no less than the other did.

The history of these drops is this: they were first brought into England by prince Rupert, out of Germany, and shewn to king Charles the Second, who communicated them to the Royal Society at Gresham College; and a committee, appointed on this occasion by the society, gave the following account of them: They must be made of green glass well refined, for, till the metal, as the glass-men call it, is perfectly refined, they never succeed if made of it; but always crack and break soon after they are dropped into the water. The best way of making them, is to take up some of the metal out of the pot upon the end of an iron rod, and immediately let it drop into cold water, and there lie till it is cold. If the metal be too hot when it is dropped into the water, the business does not succeed, but the drop frosts and cracks all over, and falls to pieces in the water, and every one that does not crack in the water, but lies in it whole till it is quite cool, is sure to be good: there is great nicety in the hitting a due degree of heat in the metal, and the workmen who best know their business cannot promise before-hand which shall succeed, but often two fail for one that hits right. Some of them frost over the surface without falling to pieces, and others break into pieces before the red-heat is quite over, and that with a small noise; others break soon after the red-heat is quite over, and that with a small noise; others break soon after the red-heat is over, and make a great noise, and some neither break nor crack till they seem to be quite cold; and others hold together while they are in the water, but fly to pieces with a smart noise when they are taken out of it; some do this on the instant, others an hour or two after, and others will keep several days, nay weeks, and at last fall to pieces without being touched. *Neri's Art of Glass, by Merrett.*

If one of them be taken out of the water while it is hot, the small part of the neck, and so much of the thread or string it hangs by, as has been in the water, will upon breaking fall into small parts, but not the body, though it have as large cavities in it, as those which burst in pieces.

If one of these drops be cooled in the open air hanging on a thread, or on the ground, it becomes like common glass in hardness, solidity, and all other its qualities, and has nothing of the nature of the drops cooled in water.

When a glass drop falls into the water, it makes a hissing noise, the body of it continues red a pretty while, and there proceed from it many eruptions like sparkles that crack, and make it leap up and move, and several bubbles arise from it till it cools; but, if the water be ten or twelve inches deep, these bubbles diminish so in the ascending, that they vanish before they attain the superficies of the water, where nothing is to be observed but a little thin steam.

The outside of the glass drop is close and smooth like other glass, but, within, it is full of spungy cavities and blebs. The figure is a sort of oval or pear-like shape, such as pearls are pointed in, the bottom of which is rounded, and the top terminates in a long neck which is usually variously bent and crooked. Almost all those that are made in water, have a little protuberance or knob, a little above the largest part of the body, and most commonly placed on the side towards which the neck ends, but sometimes it is upon that side that lies uppermost in the vessel where it is made.

If the water be hot into which the glass drop is thrown, it always cracks and breaks in the water, either before the red-heat is over, or very soon after. If dropped into oil, they do not miscarry so often as when dropped into water: they produce also a great number of large bubbles, and continue longer bubbling than when dropped into water: those made in oil have also fewer blebs, and smaller than those which are made in water; and frequently they are smooth all over, not having those knobs which the others have. Some part of the neck of these also, and part of the small thread that is quenched in it, breaks like common glass; but, if the neck be broken off near the body, and the body held all the while close in one's hand, it will crack and break all over; but even then it flies not into so small parts, nor with so smart a force and noise as those do which are made in water, and the pieces will hold together till they are parted, and there then appear long streaks or rays upon them, pointing towards the center of the body, and thwarting the little blebs in it.

If the drops are dropped into vinegar, they frost and crack, so that they are sure to fall to pieces before they are cold, and the noise of their falling in is more loud and hissing than in water, but the bubbles are not so remarkable.

In milk they make no noise nor any bubbles that can be perceived, and never miss to frost and crack all over, and fall to pieces before they are cold. In spirit of wine they bubble more than in any other of the liquors, and while they remain entire, they tumble to and fro, and are more agitated than in other liquors, and they never fail to crack and fall to pieces; and by that time five or six of them have been dropped into this spirit, it will be set on a flame, but it receives no particular taste from them.

In water wherein nitre or sal armoniac have been dissolved, they succeed no better than in vinegar. In oil of turpentine, they first broke as in the spirit of wine, and the second set it on fire, so that it could not be used again. In quicksilver, being forced to be sunk by a stick, it grew flat and rough on the upper side; but the experiment could not be perfected, because it could not be kept under till it cooled. In an experiment made in a cylindric glass like a beaker, filled with cold water, out of seven that were tried, one only succeeded, the rest all cracking and breaking to pieces; and it was observed, in this experiment, that at the first falling of the drop into the water, and, for some time after, while the red-heat lasted, red sparks were shot forth from the drops into the water; and that, at the instant of the eruption of those particles, and of the bubbles which manifestly break out of it into the water, it not only cracks, and that sometimes with a considerable noise, but the body moves and leaps about, and that as well in those which succeed as those that break in the water.

A blow with a small hammer, or other hard body, will not break one of these glass drops, if struck upon the body; but, if the tip only of the neck be broke off, it flies to small particles, which easily crumble into dust; and, if it be broken, when the particles have liberty to disperse themselves, they will fly every way in an orb, in the manner of a granado.

If they are ground down ever so low into the body with water and emery, they do not fly; but rubbed on a dry tile, they usually fly to pieces as soon as the bottom is a little flatted, though sometimes they bear rubbing away deeper; and some, when rubbed half down, have been laid by without bursting, and have flown to pieces a little while after without being touched.

If one of them be broken in the hand under water, it strikes it more smartly than if in the open air; and, if it be broken near the surface of the water, the particles it flies into do not disperse themselves into an orb, as in the air, but all fall regularly and evenly to the bottom; and they burst in the same manner in the exhausted receiver of the air pump as in open air. One of these drops being fastened into a cement, all but a part of the neck, and then the tip of it broken off, it made a pretty smart noise, but not so great as if broken in the hand; and though, on examining, it appeared to pieces within, and its colour turned greyish; yet, the outside remained smooth, tho' cracked, and being taken in pieces, the parts of it rose like those of the flaky bodies, talc, or the like; the flakes were many of them conical in shape, and were also so cracked, that they easily fell into dust.

Another drop fastened into a ball of cement of half an inch in thickness, upon the breaking off the tip of it, burst the ball in pieces like a granado. And, when attempted to be bored by a lapidary, as they bore pearls, they fly to pieces as soon as the tool enters them, in the same manner as they do when the tip is broken off.

These were the several experiments tried on them by the gentlemen of the Royal Society, and these all tend to prove the before-mentioned account of their bursting to be true; and, indeed, none more than the dry and wet grinding of them; the wet emery, in the latter case, making a coat in the place of that it wore away; and the dry powder of tile in the former scarce answering the same purpose, and at best but very imperfectly, and preserving the body together only for a small time.

RUSH, *juncus*, in botany, the name of a genus of plants, whose characters are:

The flower is of the rosaceous kind, consisting of several petals, disposed in a circular form. From the center of the flower arises a pistil, which finally becomes a trigonal fruit or capsule, which opens three ways, and usually contains a number of roundish seeds.

Petrified RUSHE. — What is usually called by this name is a kind

kind of fossil coral. But we have in England also another not uncommon substance, frequently called by the same name; this is an incrustation of sparry matter, in form of a stony crust on the outsides of real Rushes; though, in this case, it is no real petrifaction, but only a covering of this stone-like matter. Incrustations and petrifactions are usually confounded together, and the generality of people do not attend to the distinction, which is, that, in a real petrifaction, the stony matter penetrates the very substance of the body, as is the case in the petrified wood of Ireland and other places; whereas, in these incrustations, the substance itself remains unaltered within, and its outer part alone is covered with the stony substance: this is the case with what is called petrified moss at Scarborough and in other parts of England; and this is the case in regard to what we call sometimes petrified Rushes. These being water plants, and growing by the sides of springs, loaded with spar, often fall in, and become covered over with it. We have near Kettering, in Northamptonshire, a spring which does this very quickly: a gentleman who tried the experiment, but putting in some Rushes, at about thirty yards from the source, found them in one day covered with a thin skin of spar; but, after lying some months there, it formed itself into a crust of half an inch thick, round them; and was so hard that it would not break by being thrown violently on the ground; but all this while the Rushes were not petrified, but only incrusted. *Woodw. Cat. Foss.*

RUST *of corn*, in husbandry, the name given by our farmers to a disease in corn or other vegetables, in which their stalks and leaves seem burnt up, and appear of a sort of Rust colour.

Wheat is blighted at two seasons, first in the blossom, and then its generation is prevented, many of the husks being empty in the ear, and the rudiments of the grains not impregnated: secondly, wheat is blighted when the grains are brought to maturity; and in this case they become light, and are of little value for making of bread, having scarce any flower in them.

The first of these cannot happen in England from frosts, because our wheat is not in flower till the month of June; but it is long and continual rains that chill the blossoms, and in this manner prevent their fertility: this, however, does not often happen to us; these rains are not common at this season of the year; and, if they were, this country lying much of it open, the winds dislodge these drops of water from the ears, and prevent the mischief they would do there.

Lammas wheat does not retain these drops so long as the bearded or cone wheat; and, in consequence of this, in the terrible blight in England, in the year 1725, the bearded wheat received infinitely greater mischief than the Lammas wheat.

The second kind of blight from light ears, is, that which is more frequent, and more general with us; this brings the greatest scarcity of wheat, and the cause of this is plainly want of nourishment of the grain, by whatever means that want is occasioned. Several accidents kill the plants, or injure their health, and in that case the grains are not filled; lightning does great mischief to the farmer in this kind, as is plain by the several black spots and patches in fields of corn, in years when there has been more lightning than usual. This is a disaster that must be quietly suffered, since it can neither be prevented nor remedied; but the other causes of blights, which are most general, and do the most damage, may be prevented in some measure at least.

One great and common cause of the blight is the lodging or falling of corn; in this case the stalks are broken near the ear, and the vessels are hurt which should carry up the nourishment to the ear. In this case, there can just juices enough pass for the keeping the plant alive, and bringing it to its full height, but it is languid all the time, and the grains can never be filled with flour. The earlier in the season this lodging of the stalks happens, the thinner and poorer the ears will be: hence it happens, that when dung and tillage have brought a wheat land into so good a state, that in April and May it seems to promise the farmer five or six quarters of wheat, it shall all be destroyed by falling in June, and scarce yield him five bushels, and this is so thin and lank, that the expences of reaping and thrashing are more than its value. The wind is generally accused of the throwing down these stalks, but this does not seem to be truly the case; the wind may press upon the plants; but the cause of their giving way to it is a weakness in their stalks, and this seems either owing to the want of nourishment, or the want of air, or of the sun's rays, and perhaps the want of all three together. A rich acre will maintain a crop of five quarters standing, while a poor acre will not be able to support such a crop, as would have yielded only about three quarters, had it stood. This is a proof of want of due nourishment being one great cause of the falling. Air is necessary to the nourishment of all plants, wheat in particular requires a very free air. It succeeds best in open hilly places where the wind comes freely to it, and shakes off the drops of water from the leaves, as well as their own recrements; and it is plain, that a great quantity of the sun's rays is necessary to keep the wheat strong; because in the hotter countries it is not so subject to fall, as it is with us, and in other northern countries.

There is another cause of the blight, which is the wheat's coming too late into blossom. It should blossom in the beginning of June, because there is not otherwise time during the hot weather for it to pass through the different stages to the perfection of the grain.

The causes of the blight being thus known, the cure or prevention may be attempted by the farmer on much more rational grounds than it was among the antients. It is advantageous to hasten as much as possible the time of blossoming of the corn, and to protract as long as we can the ripening of the grain, that it may have sufficient time to fill and swell.

The earliest sown wheat is generally observed to escape the best, and this is owing to its coming soonest into blossom. The antients used to let their sheep feed upon the corn while young in the blade, by way of preventing it from lodging or falling afterwards: some of our own farmers use this method also; and it is true, that the corn is prevented from falling by this; but the remedy is as bad as the disease, for the stalks are not made very strong by this practice, but the ears lighter. They therefore do not weigh down and lodge the stalks indeed, but they are in some sort blighted by this means, and the disease is caused by the means used to prevent it. This feeding down the wheat with sheep retards the time of its blossoming, and the only advantage of early sowing is thus taken away by it: what grows after the eating of the sheep is a sort of latter crop, and is always weaker and later than the first. The longer the corn remains on the ground, the more nourishment it requires from it; and, in this unnatural remaining on the land, there is no proper supply provided.

The general remedy for all the cases of the blight is the modern method of horse-hoeing husbandry. In this the hoe stirs up the ground as often as the farmer pleases, and every such stirring gives new life and nourishment to the plant: this was a supply of food for the ear, may be given, whenever it is necessary, and the wide intervals left for the hoe in the drilling the wheat; for this sort of husbandry gives a free passage for the sun and air to all the plants.

The most general blight of all that happen in these cold countries is caused by insects, which some think are brought in the air by an east-wind, accompanied by moisture, a little before the grain is filling with that milky juice which hardens into flour. These insects deposit their eggs within the outer skin or rind of the stalks; and, when the young ones are hatched, they feed on the parenchyma, and eat off many of the vessels which should convey this juice; then the ear is deprived of it, and must in consequence be thin and poor, in proportion to the number of the vessels eaten, and as the insects happen to come earlier or later; for sometimes they come so late, that the grains are sufficiently filled with this milky juice before they have any power to hurt the vessels.

In this case, though the straw, when examined by the microscope, appears to have its vessels eaten and torn, and to be full of black specks, which are caused by the same insects, yet the grain is plump and full. This is one of the many cases in which the early sown wheat escapes the blight. It has been seen, that, of the crop of wheat in the same field, some of which has been sown earlier and some later, though there has been no difference in the whole, yet the early sown wheat has been full-eared, and the late sown has been light-eared; and both have had their stalks equally eaten and spotted by the insects.

A proof that these mischievous insects are brought by the east-wind, is, that the corn on the eastside of hedges is often found blighted, and destroyed by them, while that on the westside of the same hedge is unhurt. Some suppose they are bred in the earth, and crawl up the stalks, because some whole fields are subject to them, and others escape them wholly; but this is more probably owing to the difference of the situation of these fields, as they are more or less exposed to the east.

Some wheat is more liable to be hurt by this insect blight than another, and the best remedy in this evil is to plant fields, which are most exposed to these blights, with such wheat as is least subject to be injured by them. The white cone, or bearded white, which has its stalk or straw like a rush, not hollow, but full of pith, except near the lower part, where it is very thick and strong, is very proper on this occasion; it is probable that this plant has sap vessels, that lie deeper, and so are not to be destroyed like those of common wheat: the stalks of this are often found spotted with black, which shews that the insects have been there, and yet the ears are are found full, and the grains plump in them.

There is another kind of blight, called by the farmers moor loor; this is occasioned by the earth's falling away from the roots of the wheat, and is cured by throwing up small furrows against the rows in the drilling method. The horse-hoeing husbandry is best of all others calculated to prevent blights, and to cure them when they happen; but, as there are some years when all wheat is blighted, even at these times, the horse-hoeing husbandry has an advantage; for, when the stalks fall, they never lie absolutely on the ground in this case, but the air has room to play between them; but the common sown wheat has not this advantage. The ears in the blighted wheat of the drilled kind are not so light nor poor as in others,

thers, but make the farmer ſome amends in the corn, though greatly leſs than in the common produce. *Tull's Horſe-hoeing Huſbandry.*

Corn is always more ſubject to blights after a wet ſummer than at any other ſeaſon; the reaſon ſeems, that, the roots being continually drenched with water, the plant runs up to ſtalk, and has very little ear, and the corn is never large or full.

It is obſerved, that when the mildews riſe, or blights fall, they generally infeſt only one kind of grain, ſometimes wheat, ſometimes oats, and ſometimes barley only; and the ſame ſort of obſervation holds good in regard to fruit; ſometimes only apples are blighted, ſometimes only pears, ſometimes cherries, and ſo on. *Mortimer's Huſbandry.*

RYE, *ſecale*, in botany.—This ſort of grain ſucceeds very well on any ſort of dry land, even on the moſt barren gravel or ſand. The farmers ſow it about the beginning of September, after a ſummer's fallow, in the drieſt time they can. Two buſhels of ſeed is the quantity generally allowed to an acre of land; but if it be ground newly broken up, or if it be ſubject to worms, they then allow a peck more to the acre. A little ſprinkling of dung, or mud, upon Rye-land, will greatly advance the crop, though it is laid but half the thickneſs that it is for other corn; its produce is commonly about twenty buſhels upon an acre.

The farmer knows it is ripe when the ſtraw is yellow, the ear bends, and the grain feels hard. It is not apt to ſhed the ſeeds; and therefore, if there are many weeds among the crop, it may be left lying upon the ground, or gravel, as they call it, eight or nine days after it is cut, before it is bound up, if the weeds are not dry ſooner: for, otherwiſe, they will grow moiſt in the barn, and cauſe the whole to give, and not to thraſh well, and ſometimes they will make it muſty.

As it is a grain that will grow in the ear ſooner than any other if it be wet, care muſt be taken, if rain falls after it is cut, to turn it as it lies upon the ground every other day, and at the ſame time to keep the ears as far from the earth, and as much above the ſtubble, as may be; this will prevent the miſchief. If it be pretty clear of weeds, it may be houſed as ſoon as it is cut. If either this grain or wheat lodge upon the ground, it is beſt to cut them, even though they are not ripe; for the ſtalk being broken will yield no more nouriſhment to the ear.

There is another very eſſential uſe to the farmer made of Rye. April is the ſeaſon of the year when food is of all others the ſcarceſt for cattle, eſpecially for ſheep and lambs: on this occaſion ſome ſplit the ridges of the wheat ſtubble, and ſow them with Rye; they harrow this in, allowing about a buſhel to an acre; they feed the ſheep with this in April, and in May they plow it up for fallow. *Mortimer's Huſbandry.*

In many parts of France there have been certain years, in which this grain, from no apparent cauſe, has proved noxious, and ſometimes even poiſonous. Mr. Perrault, travelling through Sologne, was informed that the Rye of that province was ſometimes ſo corrupted, that thoſe who eat of the bread that had much of the corrupted grain in it, were ſeized with gangrenes in different parts of the body, which was not preceded by any fever, inflammation, or any conſiderable pain; and that the gangrened parts uſually fell off after a time of themſelves, without the aſſiſtance of chirurgical inſtruments.

The grains of Rye thus degenerated are black on the outſide, and tolerably white within; and, when they are dry, they are harder and cloſer than the natural good grain: they have no ill taſte, but ſometimes they have a viſcous metallic like honey hanging to one end of them. They grow longer than the other grains in the ſame ear, and are found, from one or two, to ſeven or eight in the ſame ear. Some have ſuppoſed that theſe were not the proper ſeeds of the plant, but ſome other extraneous bodies that got in among them; but it is evident, from a cloſe inſpection, that they are really the genuine ſeeds only altered by ſome accident; the coats, and the furrow, and even the germen for the young plant, being entirely the ſame as in the natural ſeeds.

The places where the Rye is found to degenerate in this manner, are all a dry and ſandy ſoil. In theſe places there is ſcarce any ſoil in which more or leſs of theſe large ſeeds are not found among the others, but, when there are but few of them, the ill effects are not perceived. The ſeaſon when the degeneracy is greateſt, and the effects the worſt of all, is, when there have been exceſſive rains in the ſpring, and there come on exceſſive heats in the ſucceeding ſummer.

The bread which is made of the Rye that holds ever ſo much of this bad corn, is not diſtinguiſhable from other Rye bread by the taſte, and ſeldom produces its ill effect, till ſome conſiderable time after it is taken. Beſides the gangrenes already mentioned, it not unfrequently brings on other bad conſequences, ſuch as drying up the milk of women who give ſuck, and occaſioning ſometimes malignant fevers, accompanied with drowſineſs, ravings, and other dangerous ſymptoms. The part uſually ſeized by the gangrene is the legs, and this often in a very frightful manner. The arms are the parts moſt ſubject next, but all the other parts of the body are ſubject to it.

The firſt ſymptom of this approaching gangrene is a ſtupefaction and deadneſs in the part; after this there comes on ſome pain, though not violent, and the ſkin becomes livid; ſometimes the ſkin ſhews no mark of it, but the pain and ſwelling increaſe; and it is neceſſary to make an inciſion into the fleſh to find the gangrened part. In the more deſperate caſes, the only remedy is the taking off the part; and, if this is neglected, the fleſh is all waſted, and the ſkin becomes black, and clings round the bones, and the grangrene appears again in the ſhoulders.

The poorer people are only ſubject to this diſeaſe; and, as they principally eat the Rye bread, and as thoſe years when there is moſt of this bad grain among the ears of Rye produce moſt of theſe diſorders, it has been judged certain that the Rye is the occaſion of it. It may deſerve enquiry, however, whether that grain may not be innocent of the miſchief, and its degeneracy and the diſtemperature attributed to it may not both be the effect of the ſame bad conſtitution of the air. If it proves, on enquiry, that only thoſe who eat of the Rye are ſubject to the diſeaſe, it will ſeem a proof of its really being owing to it; and in this caſe the miſchief may be prevented by the ſifting the grain before it is ground, the degenerated grains being ſo long that they will all remain in the ſieve that lets the other through. The experiment has been made on the ſpot, by giving the flower of the corrupted grains alone to animals; but it is ſaid, they have been killed by it. *Phil. Tranſ.* N°. 130.

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SABÆ'ANS *, Sabæi, the adherents to Sabaiſm; a ſect of idolaters much ancienter than Moſes and the Jewiſh law.

* The word is ſometimes alſo written Sabians, Sabaites, Zabæans, Zabians, Zabaites, Tſabæans, Tſabians, and Tſabaiſts.

The Sabæans were very numerous throughout the eaſt: in later times they have mixed ſomething of Chriſtianity with their ſuperſtition. They ſet a great value on the baptiſm of St. John; whence they have been alſo denominated Chriſtians of St. John.

Some, indeed, doubt whether the Sabæans be the ſame with the Chriſtians of St. John; but Father Angelo de St. Joſeph, a Carmelite miſſionary, and Maracci, in his notes on the Alcoran, aſſert it expreſly. Be this as it will, Mahomet, in his Alcoran, and the Arabian authors ſince him, make frequent mention of them. Beidavius, in his comment on the Alcoran, repreſents them as a kind of mean between the Chriſtians and the Maguſians, who are the followers of the Magi, among the Perſians: he adds, that they pretend to be of the religion of Noah.—Keſſæus notes, that they pretend to be in poſſeſſion of the books of Seth and Enoch, though they own none of the books of ſcripture.

Some charge them with worſhipping the ſtars; and others, the angels, or dæmons. Maimonides attributes both to them, as is obſerved under the article Sabaism.

Abu Joſeph Aſchæus and Keſſæus place the Sabæans about Charan, or Charres, and Ghezira in Meſopotamia; which opinion is confirmed by this, that their books are in the Chaldee tongue, though in a character very different from the Chaldee.

Hottinger ſets aſide the common derivation of Sabæan from צבא militia, hoſt; and will not have it the name of a ſect of religion, but of a people in Arabia Felix, the deſcendants of Saba, grandſon of Cham.—But the critics, to a man, conſpire againſt this opinion.

SA'BAISM, an ancient kind of idolatry; the firſt that ever entered into the world.

Sabaiſm conſiſted in the worſhip and adoration of the ſtars; or, as the ſcriptures call them, צבא שמים tſeba ſchamaim, ſeba ſchamaim, i. e. hoſt, or militia of heaven; whence ſome moderns formed the word Sabaiſm, to denote the worſhip of the heavenly bodies, and that of Sabæans for the worſhippers. See SABÆANS. But as the Hebrew word, whence theſe are formed, is wrote with a צ tzade, which ſome expreſs in the modern tongues by an s, ſome by a z, others by ts, and others by tz; hence ariſe a great many different manners of writing the word among different authors. Some, for inſtance, writing Sabæans, others Zabians, or Zabæans, or Zabæiſts, as Buxtorf; others Tſabians, others Tſabæans, &c.

Maimonides makes frequent mention of this idolatry in his More Nevochim: it was very general, he obſerves, in the time of Moſes. The retainers hereto taught, that God was the ſpirit of the ſphere, that is, the ſoul of the world. Abraham, he adds, was brought up in the doctrine of the Sabæans, who admitted no other gods but the ſtars, and who, in their books, many of which have been tranſlated into Arabic, maintain expreſly, that the fixed ſtars and planets are inferior gods, and the ſun and moon the ſuperior ones. Abraham at length, he tells us, oppoſing theſe errors, firſt aſſerted the exiſtence of a Creator diſtinct from the ſun. The king of the Cuthæans clapped him up in priſon; but, he ſtill perſiſting, that prince, from an apprehenſion of his diſturbing the ſtate by teaching a new religion, confiſcated his goods, and baniſhed him to the extremities of the eaſt.—This relation, he tells us, is found in a book intitled, הצבורה הנבטיה the religion of the Nabathæans.

He adds, that the Sabæans, to the adoration of the ſtars, joined a great reſpect for agriculture; ſet a high value on cattle and ſheep; and taught that it was unlawful to kill them. He even adds, that they worſhipped dæmons, under the form of goats, and eat the blood of animals, though they judged it unclean, merely becauſe they imagined it was the food of dæmons.

This is a ſummary of what that Rabbin gives us concerning Sabaiſm; from whence, it is eaſy judging of what ſome people tell us, that Sabaiſm is a mixture of Judaiſm, Chriſtianity, Mahometaniſm, and Paganiſm. The truth is, the worſhip of the ſtars was eſtabliſhed long before not only Chriſtianity, but even before the law of Moſes. Not but ſome of the later Sabæans have given into divers articles of almoſt all religions.

SA'BBATH (*Dict.*)—The Chriſtians alſo apply the word Sabbath, by extenſion, to the firſt day of the week, popularly called Sunday, or the Lord's-day; as inſtituted by the apoſtles to take place of the Jewiſh Sabbath, and by us obſerved in remembrance, not of the creation, but of the work of redemption's being compleated by our Saviour's reſurrection on that day.

Thoſe who diſpute the divine appointment of a Chriſtian Sabbath, yet allow the moral neceſſity thereof as a wiſe deſignation of time for the recruiting of our bodies, and, at the ſame time, keeping up a ſenſe of the great benefits we have received from God, and a ſpiritual temper of mind. By allowing ſix days to labour, the poor has time to earn his bread, and the man of buſineſs time to diſpatch his affairs. Had more time been allotted to labour and buſineſs, and none to reſt; our bodies would have been too much fatigued and waſted, and our minds too long engaged about worldly matters, ſo as to have forgotten divine things. Greedy people, without ſuch an injunction, would ſcarce have ſpared their own bodies, much leſs their ſervants, ſlaves, cattle, &c.—The creation, therefore, would have ſuffered, had it not been provided for by the inſtitution of a Sabbath.

SABI'NA, *ſavine*, in botany, a genus of plants, whoſe characters are:

The leaves reſemble thoſe of the cypreſs, but are more compact; the berries are verrucoſe; it has a very ſtrong and ſingular ſmell.

Savine is an ever-green ſhrubby tree, that ſeldom grows very tall, having the branches ſet cloſe together, cloathed with narrow, ſhort, ſomewhat prickly leaves, pretty much reſembling cypreſs, of a very ſtrong ſmell; among theſe, after the tree is old, and has ſtood long in a place, grow ſmall, moſſy, greeniſh flowers, which are ſucceeded by ſmall flattiſh berries, leſs than thoſe of juniper, of the ſame blackiſh blue colour. It is planted in gardens, where it ſeldom produces fruit, and has therefore generally been reputed barren.

Savine is hot and dry, opening and attenuating, and a powerful provoker of the catamenia, cauſing abortion, and expelling the birth. It is very good to deſtroy worms in children. Mr. Ray recommends the juice of it, mixed with milk, and ſweetened with ſugar, as an excellent medicine for that purpoſe; beaten into a cataplaſm, with hog's lard, it cures children's ſcabby heads.

Boerhaave, in his Chymiſtry, aſſerts, that a water, prepared from ſavine by repeated cohobations, is a moſt excellent ecbolic, emmenagogue, and promoter of the hæmorrhoids; that it is heating, and a moſt excellent medicine, if uſed diſcreetly. He farther informs us, that the chymical oil of ſavine is a moſt powerful promoter of the menſes, when their retention proceeds from a languor and debility only.

A cataplaſm, made of the ſeeds of ſavine, bruiſed with ſal-gem and oil, is ſaid to be good for an anchyloſis; and a cataplaſm of the ſame leaves, mixed with honey, is frequently applied to the umbilical region, in order to deſtroy worms in the belly.

Theſe plants may be propagated by laying down their young branches in the ſpring; which, if duly watered in dry weather, will take root in a year's time, and may then be tranſplanted out, either into a nurſery, or the places where they are to remain: they may alſo be propagated by cuttings, which ſhould be planted on a moiſt ſoil about the beginning of October; which, if duly watered in dry weather, will take root, and the autumn following may be removed, as was directed for the layers.

The time for tranſplanting theſe plants is the ſame with laurels, lauruſtinus, &c. obſerving to do it in moiſt weather, laying a little mulch upon the ſurface of the ground, about their roots, to prevent their drying: after they are rooted, they will require no farther care but to keep them clear from weeds, and to dig the ground about their roots every ſpring, which will greatly promote their growth.

SA'BLE, in zoology, the name of the animal whoſe fur is ſo much valued, and ſold under the ſame name. It is a creature

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of the weazel kind, and called by authors mustella zibellina. See the article Zibellina.

Sable *mouse*, in natural history, the name of an animal found in Lapland, and in other cold countries; many extraordinary things are related of the manner of living of these creatures.

They are of the bigness of a squirrel, and their skin is streaked with brown and black; there are also some spots besides the streaks; the black is a very fine deep colour, the brown is pale; they have two very sharp teeth above, and two below of the same kind; their feet are like a squirrel's, and they have no tail; they are usually very fat and fleshy, and are so quarrelsome and fierce an animal, that if a stick be held out to them they will bite at it, and will hold it so fast, that they may be tossed and swung about in the air by it without letting it go. In their march they usually keep a direct line from north-east to south-west, and always travel in thousands in the same troop. The whole number forms a square body, and they march only from the time of the twilight to the morning, lying still all the day.

They march in lines, which are some ells distant, but always exactly parallel to each other, so that the places they have gone over look like the furrows of a plowed field. If they meet with any thing in their way that might deter another animal, it never stops them; but, though it be fire, a deep well, a pond, a torrent, or a bog, they, without hesitation, venture through, and by that means many thousands of them are destroyed, and are found dead in the morning, in the waters, or otherwise.

If they be met swimming over lakes, and attacked by men in boats, with the oars, boat hooks, or other instruments; they neither retreat nor offer to run up the oars, but hold on their course; and if they be put out of it they presently return into it again. When they are met in the woods or fields, they set themselves upon their hinder feet, and make a sort of squeaking noise, somewhat like the barking of a dog; they will leap up at a man, and rise as high as his head, and in this manner they will defend their line a long time; but, if they find themselves overpowered, they will disperse and run into holes, or any other places of secrecy, making a noise, which sounds something like the word biob, biob.

They never come into a house, nor meddle with any thing that we eat; if they chance to come to a house in their way, there they stop till they die; but, if they come to a stack of hay or corn, they eat their way through.

When they march over a meadow, they do it great damage, by eating the roots of the grass; but, if they encamp there, they wholly destroy the produce; the land looks like a place where there had been a fire, and the whole surface looks as if strewed with ashes.

They are said to be very fruitful, bringing forth eight or nine at a time; but it is certain, at least, that they bring forth more than one, for, in their marches, it is not unusual to see a female with a young one in her mouth and another on her back. They seem no great delicacy to creatures of prey. If dogs or cats kill them they eat only the head, and when a bird of prey seizes them it only feeds on the entrails; it is said only on the heart: the poor Laplanders, however, in want of other food, eat the whole body, and say it is as well tasted as a squirrel. In the severity of winter these creatures lie under the snow, and have their breathing-holes as the hares, and other inhabitants of these places use to have. The Laplanders are always glad to see these creatures on their march, for it always foretels plenty of more valuable creatures among them: the same cold, that sends these out, sending also a number of fowls, squirrels, foxes, and other animals the same way. Wormius has written a complete treatise on this animal, calling it mus Norwegius; this is reprinted at large in his Museum. *Phil. Transf.* N°. 251.

SA'CCHARUM *saturni*, sugar of lead, in medicine, is recommended by some internally for dysenteries, and hæmorrhages of all kinds; but the generality of the world condemn it, as containing all the poisonous qualities of the metal it is made from in their highest degree.

Externally, it has been long famous for its virtues in the erysipelas, in inflammations of all kinds, and in embrocations. It is used also in small quantities in collyriums for the eyes; it deterges, dries, and cicatrises ulcers; and in gonorrhœas is mixed in injections with great success.

It is well known that this salt made with the common vegetable or mineral acid, when distilled, will not give back the acid again, but only yields a water without any sharp taste and an inflammable oil; but if it is made into the animal acid of pismires, whether procured by distilling those insects fresh, or by throwing large quantities of them into water till it is sufficiently impregnated, it will, on distillation, yield back the same proportion of acid of the same strength. *Philos. Transact.* N°. 68.

SA'CRIFICE (*Dict.*)— The manner of sacrificing among the ancient Hebrews, is amply described in the books of Moses. That in use among the Romans is as follows:—In the choice of the victim, care was taken it were without blemish or imperfection, its tail not too small at the end; the tongue not black, nor ears cleft; and the bulls such as had never been yoked. The victim being pitched upon, they gilt his forehead and horns, especially if a bull, heifer, or cow. The head they also adorned with a woollen infula, whence hung two rows of chaplets, with twisted ribbons; and on the middle of the body a kind of stole, pretty large, hung down on both sides: the lesser victims were only adorned with bundles of flowers and garlands, together with white tufts or garlands.

The victims, thus made ready, were brought before the altar; the lesser were not led in a string, but driven to the place: the greater were conducted in an halter; if they made any struggle, or refused to go, the resistance was taken for an ill augury, and the Sacrifice set aside.—The victim, thus brought before the altar, was examined very circumspectly, to see if there were no defect in it: then the priest, being clad in his sacerdotal habit, and accompanied with the sacrificers and other attendants, and being washed and purified according to the ceremonies prescribed, began the Sacrifice, with making a loud confession of his unworthiness, acknowledging himself guilty of divers sins; for which he begged pardon of the gods, hoping they would be pleased to grant his requests.—These confessions were like those of the Hebrews; with this difference, that the Pagans confessed the frailty of mankind, and owned their faults; the Jews confessed chiefly the greatness of God, accompanying it with hymns and musical instruments.

The confession over, the priest cried aloud, Hoc age, i. e. Compose yourselves, and mind your business; and presently an usher, holding a rod in his hand, called commentaculum, went through the temple, and made all those withdraw, who were not initiated in the mysteries of religion, or such as were excommunicated.

The custom of the Greeks, from whom the Romans borrowed theirs, was, that the priest, coming to the altar, should ask aloud, Τίς τῇδε? Who is here? The people answered, Πολλοὶ κ᾽ ἀγαθοί, many good persons: then the usher went through the temple, crying, Ἑκὰς, ἑκὰς, ἔστε βέβηλοι, that is, out with the wicked. The Romans commonly used the words, nocentes, profani, abscedite.— All those who were driven out of the temples among the Greeks, were comprehended under these general words βέβηλοι, ἀμύητοι, ἀκάθαρτοι. The profane being withdrawn, they cried, favete linguis, or animis, and pascite linguam, to require silence, and attention during the Sacrifice.

These ceremonies ended, the chief sacrificer being sat down, and the rest of them standing, the magistrates or persons, who offered Sacrifice, came before him, and presented him with the first-fruits and victim, and sometimes made a short discourse, by way of compliment; as we find Homer makes Ulysses do, when he presented the high-priest with Iphigenia to be sacrificed.— As any person came to present his offering, he washed his hands in a place appointed in the temple for that purpose.

Lastly, when the offering was made, the priest that officiated, perfumed the victim with incense, and sprinkled it with lustral water; and having washed his hands, and got up again to the altar, he prayed to the god to whom he presented the Sacrifice, with a loud voice, that he would accept of those offerings, and be pleased with the victim he sacrificed to him for the public good, and for such and such things in particular.— In the close of the offertory and prayer, made by the priest to the gods, he came down the steps of the altar, and, from the hand of one of his assistants, received the sacred paste, called mola salsa, made of barley or wheat flour, mixed with salt and water, which he threw upon the head of the victim, sprinkling a little wine upon it, which was called immolatio.— Servius says, the priest scattered little bits of this paste upon the head of the victim, the altar where the sacred fire burned, and the knives, by way of consecration. He then took wine in a vessel called simpulum, and having tasted it himself first, and made his assistants do the same, to shew that they partook of the Sacrifice, he poured it between the horns of the victim, pronouncing these words of the consecration, Mactus hoc vino inferis esto; Let this victim be improved and honoured by this wine. This done, he pulled off the hairs from between the horns, and threw them into the fire; and commanded the victimarius, who asked him, Agon', Shall I strike? to knock down the victim with a blow on the head with an hammer or ax; upon which, another assistant, named popa, presently thrust a knife into his throat; whilst a third received the blood, wherewith the priest sprinkled the altar.

When the victim was slain, they flead him, if it was not a burnt offering, for then they burned skin and all; took the flesh off the head, and adorned it with garlands and flowers, fastened it to the pillars of the temples, as well as the skins, as ensigns of religion; carrying them about in procession in public calamities.—Not but that the priests often wore the skins, and others went to sleep upon them in the temples of Æsculapius and Faunus, that they might receive favourable responses in their dreams, or be cured of their maladies. They then opened the victim's entrails, and after circumspectly viewing them, to draw presages therefrom, according to the art of the aruspices, they floured them with meal, and sprinkled them with wine, and made a present of them to the gods, reddebant exta diis, by throwing them into the fire in small bits, boiled or parboiled; and hence the entrails were called porricæ.

The entrails being burned, and the other ceremonies finished, they believed the gods to be satisfied; and that they could not fail to find their vows accomplished, which they expressed by the word litare, q. d. all is finished, and well done; whereas non litare, on the contrary, intimated there was something wanting to the perfection of the Sacrifice, and that the gods were not appeased.— The priest afterwards dismissed the people with these words, Ilicet.

Hence it may be observed, that the Sacrifices consisted of four principal parts; the first called libatio, or the pouring a little wine upon the victim; the second immolatio, when, after they had scattered the crumbs of salted paste thereon, they killed it; the third, redditio, when they offered the entrails to the gods; and the fourth, litatio, when the Sacrifice was perfected, and accomplished without any fault.

SA'CRILEGE (*Dict.*)— The ancient Christian church distinguished several sorts of Sacrilege, which were punished with different kinds of censures.

The first kind of Sacrilege was, the diverting things, appropriated to sacred uses, to other purposes. 'If any one, say the apostolical canons, either of the clergy or laity, take wax or oil out of the church, let him be cast out of the communion, and make restitution, with the addition of a fifth part'. The same censure is denounced against such as apply to their own use the sacred utensils of gold, silver, or linen. The fourth council of Carthage excommunicates those persons, as guilty of Sacrilege, who withhold from the church such donations as are left to it by the deceased. And whether a man retracted what he himself had given to the church, or detained what was given by others, or robbed her of what she was actually possessed of, it was all the same species of Sacrilege, and equally punished with excommunication.

Another crime, punished under the name of Sacrilege, was, robbing the graves, or defacing and spoiling the monuments of the dead. The imperial laws made this offence capital.

Another sort of men, who were accused and condemned as sacrilegious persons, were those, whom they commonly called traitors, because they delivered up their bibles, and the sacred utensils of the church, to the Pagans, in the time of the Dioclesian persecution. The first council of Arles makes it deposition for any clergyman to be guilty of this base piece of treachery.

A fourth species of Sacrilege was, the profaning the sacraments, the churches, altars, holy scriptures, &c. There are some instances of turning churches into stables. We may reckon also all sorts of idolatry and divination, magic, and the abuse of the scriptures for lots, charms, and amulets, among this species of Sacrilege.

Fifthly, the molesting or hindering a clergyman in the performance of his proper office, is, in the civil law, called Sacrilege; and, by a law of Honorius, all such criminals were to be notified by public officers to the governor of the province, who was to proceed against them, and punish them as capital offenders.

Lastly, the ancients reckoned it Sacrilege to deprive men of the use of the scriptures, or the sacraments, particularly of the cup in the Eucharist.

The Romish casuists acknowledge these several species of Sacrilege, excepting only the last, which, for a very obvious reason, they never mention. But they call many things Sacrilege, which the ancients reckoned no crimes at all; as the laying taxes or tribute upon ecclesiastics, by the civil power, without consent of the Pope; for which secular princes are excommunicated by the famous bull in Cœna Domini: as also the bringing ecclesiastical persons, for any crime, before the secular tribunals. Some other things, very laudable in themselves, they brand with the odious name of Sacrilege; as, the removing images out of places of divine worship.

SA'DDLE, in the manage, a kind of stuffed seat, laid on the back of a horse, for the convenience of the rider.

The origin of the Saddle is not well known: Gorop. Becanus attributes its invention to the Salii, a people among the ancient Franks; and hence, says he, came the Latin sella, a Saddle.

It is certain that the ancient Romans were unacquainted with the use either of Saddle or stirrups; whence Galen observes in several places, that the Roman cavalry, in his time, were subject to several diseases of the hips and legs, for want of having their feet sustained on horse-back. And, long before him, Hippocrates had noted, that the Scythians, who were much on horse-back, were troubled with defluxions in their legs, because of their hanging down.

The first time we hear of Saddles among the Romans, was anno 340; when Constantius, endeavouring to deprive his brother Constantine of the empire, made head against his army, and, entering the squadron where he himself was, threw him off his Saddle, as we are informed by the historian Zonaras.— Before, they made use of square pannels; such as we see in the statue of Antoninus in the capitol.

The use of Saddles was first established in England, by a law of Henry VII, whereby the nobility were obliged to ride on Saddles.— It is but very lately that the Irish have taken to it.

There are various kinds of Saddles; as the

Running SADDLE, a very small one, with round skirts.

Burford SADDLE, which has the seat and skirts plain.

Pad SADDLE, of which there are two kinds; the one made with burs before the seat, the other with bolsters under the thighs.

French pad SADDLE, the burs whereof come all round the seat.

Portmantua SADDLE, furnished with a cantle behind the seat, to keep a carriage off the rider's back.

War SADDLE, furnished with a cantle, and a bolster both behind and before.

SADDLE-GALLED, is when a horse's back is hurt, or fretted with the Saddle.

It is cured by bathing the part with urine, or warm wine: when the sore is large, they bathe it with aqua secunda, strewing over it the powder of old ropes of flax, and consuming the proud flesh with vitriol or colcothar.

SAGE *Apples*, a name given by naturalists to a sort of soft gall or protuberance, found frequently on the leaves and stalks of Sage in the eastern part of the world, and much resembling the soft gall of the oak leaf, called the oak apple.

These are both owing to the same cause, the puncture of an insect of the fly kind, which deposits its eggs in the wound; and the worms or maggots, hatched from those eggs, feed on the inside of the gall, and occasion a preternatural derivation of juices to the part, whence it swells and assumes this form. The leaves of many other plants are also liable to the same accident, particularly those of ground-ivy, on which there grows eatable galls of this kind. The Sage apples are so frequent in the east, that they are brought to market at Constantinople, and eaten as delicacies.

SA'GENE, a Russian measure equivalent to seven English feet. Five hundred Sagenes make a werst. *Phil. Transf.* N°. 445.

SAGITTA'RIA *alexipharmica, arrow-root, dart-wort.*— This plant has a root two or three inches in length, geniculated, of the thickness of a man's thumb, white, and of a conic figure, every interval or space between the joints being half an inch in length, and every joint sending forth several fibres two or three inches long, for attracting nourishment. From the root arise various leaves on pedicles three inches in length, and of a good breadth, embracing one another, or the outer ones wrapping themselves about the inner, and surrounded with a white ring at the place of apposition. The leaves are four inches long, and two inches broad, near the round base, where they are broadest, and are thin, fibrous, and grassy, and of a greenish-yellow colour. In other respects it is like the canna Indica.

Sir Hans Sloane observed this plant in the gardens of Jamaica and the Caribbee Islands. It was transplanted to Jamaica from the island of Dominica, and is highly valued, on account of its alexipharmic virtue, and its efficacy against wounds inflicted by poisoned darts and arrows; for which purpose it is frequently used by the Indians, who bruise the herb, and apply it to the injured place. *Raii Hist. Plant.*

SAIL, in navigation, an assemblage of several breadths of canvas, or strong hempen cloth, sewed together by the lists, and edged around with a cord; fastened to the yards and stays of a vessel, to make it drive before the wind, which bears thereupon.

There are two kinds of Sails; the one square, generally used in large ships or vessels.— This has various names, according to the various masts it is fastened to; as the main Sail, fore Sail, the mizzen Sail, the sprit Sail, &c.

The others are triangular, called smack Sails, and by some Latin Sails, because chiefly used in Italy, and in flat-bottomed vessels; though they are also used on the mizzen-masts and stays of other vessels.— They need but few ropes, and little wind; but are dangerous, and not to be used in foul weather.

There are ordinarily ten Sails in large vessels; which number is increased at bottom by the addition of bonnets, and at the sides by case Sails.

A vessel is said to set Sail, to go with full Sail, to make all her Sail, that is, to open all her Sails. To be under Sail, is to have set Sail, &c.

SAILS, also denote the vanes of windmills; or the arms or flights, whereby the wind has its effect on windmills.— These are either horizontal or perpendicular.

SA'ILING (*Dict.*)— Sailing, in a more confined sense, is the art of conducting a vessel from place to place, by the working or handling of her sails and rudder: though what is done, by means of this latter, is more properly called steering or guiding.

To bring Sailing to certain rules, M. Renau computes the force of the water, against the ship's rudder, stem, and side; and that of the wind against her sails.— In order to this, he 1. considers all fluid bodies, as the air, water, &c. as composed of little particles, which, when they act upon, or move against any surface, do all move parallel to one another, or strike against the surface after the same manner. 2. That the motion of any body, with regard to a surface on on which it is to ſtrike, muſt be either perpendicular, parallel, or oblique. In the firſt caſe, the body ſtrikes with all its force, which will be greater or leſs, according as the body moves ſwifter or ſlower. In the ſecond caſe, the line of motion *a b*, *Plate* XLI. *fig.* 1. will not affect the ſurface at all; becauſe it is no way oppoſed to it; nor can the moving body ſtrike upon it, or touch it. In the third, if the line of motion. A D, be oblique to the ſurface D C, ſo that the angle of incidence be A D C, then the motion of the body in the line A D may be reſolved into two directions, *viz.* into A E or B D, and A B. But the direction or line of motion A E, being parallel to the ſurface D C, cannot affect it at all; ſo that the whole motion of the body A, in that oblique manner of ſtriking on the ſurface, will be expounded by the perpendicular line A B. And if D A be made the radius of a circle, whoſe center is at D, B A will be the ſine of the angle of incidence, A D C.

Hence it is deduced, that the force of a particle of air or water, as A, ſtriking againſt the ſurface D C, which may repreſent either a ſail or the rudder of a ſhip, in the oblique direction A D, will be to the perpendicular force thereof, as B A is to D A: that is, as the ſine of the angle of incidence is to the radius.

And ſince what is thus true of one particle, ſingly conſidered, will be true of all the particles of any fluid body collectively; it will follow, that the force of the air or water, ſtriking perpendicularly upon a ſail or rudder, to the force of the ſame, in any oblique impingency, will be, as the ſquare of the radius to the ſquare of the ſine of the angle of incidence: and, conſequently, that all oblique forces of the wind againſt the ſails, or of the water againſt the rudder, will be to one another, as the ſquares of the ſines of the angles of incidence.

If the different degrees of velocities be conſidered, 'it will be found, that the forces will then be as the ſquares of the velocities of the moving air or water; that is, a wind that blows thrice as ſtrong, or moves thrice as ſwift as another, will have nine times the force upon the ſail.— And it being alſo indifferent, whether you conſider the motion of a ſolid in a fluid whoſe particles are at reſt; or of thoſe particles moving all parallel againſt a ſolid that is at reſt; the reciprocal impreſſions being always the ſame; if a ſolid be moved with different velocities in the ſame fluid matter, as ſuppoſe water, the different reſiſtances which it will receive from that water will be in the ſame proportion, as the ſquares of the velocities of that body.

Let H M, *fig.* 2, repreſent a ſhip, C D the poſition of the ſail, and A B the courſe of the wind blowing towards B. Draw B G perpendicularly to the ſail, and G K perpendicular to the line of the keel produced H M K. By what is ſaid above, the ſail C D will be driven by the wind A B, according to the direction of the line B G. So that, if ſhe could divide the water every way with the ſame facility, as ſhe doth with her head, the ſhip would go directly to the point G, along the line B G. And, if H K repreſent her direct courſe, ſhe would have got forwards the length B K, and ſideways ſhe would have gone the quantity G K. But, as her length is much greater than her breadth, ſo ſhe will divide the water, or make her way in it with more difficulty with her ſide, than with her head or ſtern; on which account, ſhe will not run ſideways ſo far as K G, but fall ſhort of it in proportion to the ſaid difficulty of dividing the water with her ſide, that is, if the reſiſtance ſhe finds in her paſſing through the water ſideways, be to that of paſſing lengthways, ſuppoſe, as ten to one, then will not the ſhip get ſideways above a tenth part of the line G K.

Wherefore, if K G be found to G L, in the ratio of the reſiſtance of the ſide to that of the head, and the line B L be drawn; the ſhip will go to the point L, along the line B L, in the ſame time as it would have gone to G, if it could have divided the water every way equally.— This part, K L, is called the drift, or lee-way of a ſhip, and the angle K B L is her degrees of lee-way; as the angle A B K expreſſes how near the wind ſhe lies.

After this, the author proceeds to demonſtrate, that the beſt poſition or ſituation of a ſhip, ſo as ſhe may make the leaſt lee-way, but go to wind-ward as much as poſſible, is this: that, let the ſail have what ſituation it will, the ſhip be always in a line biſſecting the complement of the wind's angle of incidence upon the ſail; that is, ſuppoſing the ſail in the poſition B C (*fig.* 3.) the wind blowing from A to B, and conſequently the angle of the wind's incidence on the ſail A B C, and its complement C B E; then muſt the ſhip be put into the poſition B K, or move in the line B K, biſſecting the angle C B E. He ſhews farther, that the angle which the ſail ought to make with the wind, i. e. the angle A B C, ought to be but twenty-four degrees; that being the moſt advantageous ſituation to go to wind-ward, the moſt that is poſſible. And, in order to bring this to bear in practice, he directs to put marks to the ſheets, braces, and bow-lines of the lower ſails, to know when they are in their beſt ſituation; and then, even in the night, when the marks of a brace or of a ſheet ſhall come to the cleat, one may be pretty well aſſured, that the ſail trims well.

To this might be added, many curious things from Borelli de Vi Percuſſionis, concerning the different direction given to a veſſel from the rudder, when ſailing with a wind, or floating without ſails in a current; in the former caſe, the head of the ſhip always coming to the rudder, and in the latter always flying off from it.

SAINTFOIN, *ſanum*, or *ſanctum fœnum*, the name given by the French, and continued by us to a ſpecies of plant, frequently uſed for the food of cattle, either freſh or dried; it is called holy-hay, or wholeſome hay, from its excellent nutritive quality. The ſtalks of the plant are commonly about two feet long, but they grow ſometimes to five or ſix feet, and it has tufts of red flowers of three, four, or five inches in length.

This plant will make a forty times greater increaſe in poor ground than the common turf; and this is owing to its having a long perpendicular root, of that kind, called tap roots, which ſinks to a great depth to attract its nouriſhment. The length of this root is ſcarce to be credited by any but thoſe who have ſeen it; it is frequently drawn out of the ground to the length of twelve or fourteen feet, but it is ſaid to be often thirty feet or more in length.

The farmers have a general opinion, that this plant never ſucceeds well in any land, where there is not an under ſtratum of ſtone, or chalk, or ſome other hard matter, to ſtop its running; but that otherwiſe it ſpends itſelf in root, and comes to nothing above-ground. This is an error too groſs to need much refutation. It is certain, that, the roots being to plants what the ſtomach and guts are to animals, the more and larger roots any plant has, the more nouriſhment it receives, and the better it thrives.

Saintfoin always ſucceeds where its roots run deep, and the beſt crops of all are produced upon lands where there is no hard under ſoil to obſtruct their paſſage. An under ſoil of clay may kill the plants, by retaining the water, and chilling and rotting their roots.

The long root of Saintfoin has, near the ſurface, many horizontal roots iſſuing from it, which extend themſelves every way; there are of the ſame kind all the way down, as the roots go, but they grow ſhorter and ſhorter all the way. Any dry land may be made to produce this valuable and uſeful plant, though it be ever ſo poor, but the richeſt and beſt land will produce the beſt crops of it. The beſt way of ſowing it is by drilling, but the earth muſt be very well prepared, and the ſeed well ordered, or elſe very little of it will grow. The heads of theſe ſeeds are ſo large, and their necks ſo weak, that, if they be much more than half an inch deep, they are not able to riſe through the incumbent mould; and, if they are not covered, they will be malted, as the farmers expreſs it; that is, it will ſend out its root while it lies above-ground, and be killed by the air; and whether the farmer plants bad ſeed that will not grow, or good ſeed that is buried or malted, the event will be the ſame. The ground will be underſtocked with plants. A buſhel of ſeed to an acre of land is full twenty ſeeds to each ſquare foot of land; but, as there is ſome difference in the largeneſs of the ſeeds, there is no abſolute certainty as to this calculation. The worſt ſeaſons for planting it are the beginning of winter, and the drought of ſummer; the beſt is the beginning of the ſpring; and it is always ſtrongeſt when planted alone, and is not ſown together with corn, as is the practice of ſome farmers. If barley, oats, or any other corn, ſown with the Saintfoin, happen to be lodged afterwards, it kills the young Saintfoin. If it be planted with any other corn, it is beſt done by drilling in the horſe-hoeing way; in this caſe it is not much liable to be killed by the lodging of the corn, as the drilled corn ſeldom falls at all, and, when it does, never falls ſo low as the ſown corn.

The quantity of ſeed to be drilled upon an acre of land will depend wholly upon the goodneſs of it; for there is ſome ſeed of which not one in ten will ſtrike, whereas in good ſeed not one in twenty will fail. The method of knowing the goodneſs, is, by ſowing a certain number of the ſeeds, and ſeeing how many plants are produced by them. The external ſigns of the ſeeds being good are, that the huſk is of a bright colour, and the kernel plump, of a light grey or blue colour, and ſometimes of a ſhining black. The ſeed may be good, though the huſk be black, as that is owing ſometimes to the letting it receive the wet in the field, not to its being half rotted in the heap.

If the kernel be cut a-croſs, and appear greeniſh and freſh, it is a certain ſign that it is good. If it be of a yellowiſh colour, and friable, and look thin and pitted, they are bad ſigns. The quantity of ſeeds allowed to the acre in the drill way is much leſs than that by ſowing, and is to be computed according to the number of plants that are to be allowed in that ſpace, allowing for the common caſualties. It is not neceſſary to be exact in this calculation, or to ſay whether two, three, or four hundred plants are to be allowed to a ſquare perch; neither is it poſſible to know beforehand the preciſe number of plants that may live out of thoſe that come up; for ſometimes the grub takes them when they have only the two firſt leaves, and the crop is greatly diminiſhed by this means. Four gallons of good ſeed to an acre of land will cover it with plants, when judiciouſly managed.

Single plants of Saintfoin make the greateſt crops; but the farmers, in general, plant them ſo cloſe, that they ſtarve one another. The ſingle plants always run the deepeſt, and thoſe which do ſo will always draw moſt nouriſhment. The plants which ſtand crowded ſtarve one another, and often die after a few years; but the ſingle ones grow to a vaſt bigneſs, and are every year better and better.

The beſt way to calculate how many plants are to be allowed to a perch, is to compute how much hay each ſingle large plant will produce; for, if kept ſingle, and well cultivated, they will all be large ones. Without culture, theſe plants never arrive at a fourth part of the ſize that they do with it. The hay of a large ſingle cultivated plant will weigh more than half a pound, and a hundred and twelve plants upon a ſquare perch, weighing but a quarter of a pound a piece, one with another, amount to two tons to an acre. If Saintfoin be planted on ſome ſorts of land early in the ſpring and hoed, it will ſometimes produce a crop the following ſummer; in a garden the ſeeds ſown in February will yield plants of two feet high that will flower in the month of June following; and, though March be froſty, the young plants ſeldom ſuffer by it. This ſhews, that this plant is naturally a quick grower; but the farmers uſually plant it on poor or cold land, and give it too little culture, which make it backward, and ſlow of growth with them. The poor land, uſually allotted to this plant, alſo makes it generally yield but one crop a year, but on a rich land it will yield two very good crops annually, with a moderate ſhare of culture and management.

The farmer who expects to make a profit of this plant muſt not expect a good crop the firſt year. Nothing is ſo injurious to Saintfoin as its ſtanding too thick; if it be ſown ſo thick as to cover the ground the firſt ſummer, the plants will ſtarve one another for ever after; but, if the owner will be content to place them ſo thinly as to have but a ſmall crop the firſt year, they will increaſe prodigiouſly, and every ſucceeding crop will be better and better. When Saintfoin is well hoed, it will grow as much in a fortnight as it would otherwiſe do in ſix weeks; and this quick growing is of advantage to it every way, not only making the plants large, but of better nouriſhment to the cattle, whether they are eaten green or made into hay.

The proper diſtance to drill this plant for the horſe-hoeing huſbandry is at double rows with eight inch partitions between them, and thirty inch intervals between every two and two. Theſe intervals need only be hoed alternately, leaving every other interval for making the hay on. This method of hoeing is of vaſt advantage, and poor land by means of it will always produce two crops a year. The land is always to be perfectly cleared of graſs before the ſowing the Saintfoin, and the lumps of earth carefully broken. But no harrowing is to be allowed after it is drilled, for that would bury it; and it is not proper to roll it at all, unleſs for the ſake of barley, when they are ſown together; and when that is done, it ſhould be with a light roller and in dry weather. This ſhould be done lengthwiſe of the rows, and as ſoon as it is drilled; if it be not done at this time, it is beſt to ſtay three weeks before it is done, that the necks of the young Saintfoin may not be broken. No cattle are to be ſuffered to come in the firſt winter upon the Saintfoin, after the corn is out, among which it was ſown. Their feet would injure it by treading the ground hard, as much as their mouths by cropping it, and it would never come to good. Sheep ſhould not be ſuffered to come at it, even the following ſummer and winter. One acre of drilled Saintfoin, conſidering the difference of the quantity and goodneſs of the crop, is worth two acres of ſown Saintfoin on the ſame land, though the expence of drilling be twenty times leſs than that of ſowing. The firſt winter is the time to lay on manure after the corn is reaped off. Pot-aſhes, or the like, are very proper, and a ſmall quantity of them will do, as there are at this time no other plants to partake of the benefit, but the young crop has it all; and the young plants, being thus made ſtrong at firſt, will continue ſo, and be long the better for it.

It is obſerved, however, that in the drilling and horſe-hoeing way there is no neceſſity for any manure at all. Some farmers ſow eight or ten buſhels of the ſeed of Saintfoin to an acre along with their corn, with intent that it ſhould kill all the other weeds; but the conſequence is, that the plants ſtand cloſe, and ſtarve one another, and are no bigger than where the plant grows wild on the hills in Calabria, where it is ſo ſmall and ſeemingly deſpicable a plant, that it ſeems a wonder that any body ſhould be tempted to think of cultivating it: yet, when rightly managed, it ſeems capable of being as uſeful a plant as any in the world. Where theſe plants ſtand ſo thick, they draw out all the nouriſhment from the ground, in a few firſt years, and ſo die, though manured ever ſo carefully. Six or ſeven years ſeems their greateſt duration; whereas, when the ſeed is drilled in, and the plants are horſe-hoed, they will be as ſtrong and vigorous as ever, at thirty years ſtanding.

Some people who have turned their thoughts to huſbandry, have been of opinion, that the cytiſus would ſucceed better with us than the Saintfoin; it is probable enough that it would grow well; but the labour of ſheering it would, with us, where the pay of ſervants is ſo dear, run away with the greateſt part of the profits of the crop.

Lucerne is another thing which many have thought of introducing among us in the place of Saintfoin, but it requires ſo much care to ſuit it with a proper ſoil, that, whatever are the profits of it, it never can be ſo general as Saintfoin. *Tull's Horſe-hoeing Huſbandry.*

Saintfoin ſucceeds beſt alſo in high grounds, which is a great advantage in the article of making it into hay, as it has greatly more advantage of the ſun, and leſs to fear of miſchief from wet than graſs which grows in low grounds. On the high grounds the wind will dry more in an hour than it will in meadows that lie low in a whole day; and often the crops of Saintfoin make a very good hay in the ſame ſeaſons in which all the graſs hay is utterly ſpoiled. The ſun on the high grounds has alſo a more benign influence, and ſends off the dew there two hours earlier in the morning, and holds it up as much longer in the evening; by theſe advantages, the Saintfoin has more time to dry, and is made with half the expence of common hay.

All kinds of hay differ greatly in their goodneſs, according to the manner in which they are made; but the hay of Saintfoin differs more than all.

There are properly four kinds of the Saintfoin hay, differing according to the times of cutting them. Theſe are, firſt, the virgin hay; ſecondly, the bloſſomed hay; thirdly, the full grown hay; and fourthly, the thraſhed hay. The firſt of theſe, or virgin hay of Saintfoin, is the beſt of all, and excepting lucerne, has not its equal in the world. The Saintfoin for this hay muſt be cut before it begins to bloſſom; for when it ſtands till full blown, the moſt volatile ſpirituous and nutritive parts of its juices are ſpent on the generation; and this being done at once, the ſap is greatly depauperated, and the plant can never afterwards recover the ſtrength, vigour, and nutritive qualities it had at that time. The exact time of cutting this is, when a few of the bloſſoms, which are forwarder than the reſt, are beginning to look red. Saintfoin, cut in this ſtate, even though the weather prove bad, may be made up in ſmall ricks, and a chaff baſket drawn in the middle of each; this eaſy care will prevent it from firing; and, though the colour be a little altered, it will be as good and nouriſhing, as if made at the moſt favourable ſeaſon. Working ſtone-horſes have been kept for the whole winter on this hay alone without corn, and they are ſo fond of it, that they will refuſe beans and oats mixed with chaff in the common way for it.

Sheep will alſo be fatted in pens in winter with only this hay and water, better than with peaſe, oats, and the like; and, if the hay be weighed to them, and the whole expence and profit computed, the clear profit will be found to amount to four pounds a ton. Theſe creatures make no waſte in this way of feeding, but eat up every morſel of the ſtalks, though ever ſo thick, for they are always brittle, and are as well taſted as the reſt.

The bloſſom hay is very beautiful to the eye, and of a very ſweet ſmell; but it does not fatten the ſheep as the virgin hay does, nor can working horſes be kept fat upon this without an admixture of ſome corn.

The land ought to be well tilled for the virgin hay; for, if it ſtands on a poor land, without much culture, it will not be above four or five inches long before it flowers, and will therefore yield but a poor quantity, and will ſpring up again, but very ſlowly, for another crop; but, when on good land and well tilled, it will yield at this time two or three tons to an acre, and will ſpring up immediately very ſtrong for a ſecond crop.

This virgin hay is ſeldom ſold, it being worth a much greater price than the common, and is uſually kept by the farmer for his own uſe.

SAINTS, Sancti, in the Romiſh church, holy perſons deceaſed, and, ſince their deceaſe, canoniſed by the pope, after ſeveral informations and ceremonies.

One of the points wherein the Roman Catholics and Proteſtants differ, is, that the former addreſs, invoke, ſupplicate Saints, &c. to intercede for them; whereas the latter hold it ſufficient to propoſe their good examples for our imitation.

The number of Saints, allowed as ſuch, in the Romiſh church, is prodigious: Father Papebroche reckons ſeventeen or eighteen hundred to have died on the firſt of June, only. Indeed, the crowd of Saints wherewith their martyrologies are ſtocked, is ſcandalous, even to the more ſober of their own communion. Father Mabillon, in an expreſs diſſertation on the Worſhip of unknown Saints, obſerves, that honours are given to Saints, who, perhaps, were not Chriſtians; and whoſe names were never known. Hence, being under a neceſſity of giving them names, they are therefore called baptiſed Saints. He adds, that they every day beſeech Saints to intercede for them with God, when it is much doubted, whether they themſelves be in heaven.

Father Papebroche and his aſſociates have been a long time employed in writing the lives and acts of the Saints: they range them each on the day of the year wherein they died: for the firſt ſix months they have publiſhed twenty-four volumes in folio; and ſince Papebroche's death, in 1714, his ſucceſſors have publiſhed two more.

SAL *Aquarum*, in natural hiſtory, a name given by many of the ancient writers to the nitre of the ancients or natrum.

They

They had this salt principally from Egypt, and called it, in their works, the produce of the evaporated waters of the Nile; for this reason Hippocrates sometimes calls it Sal Ægypti, and sometimes Sal in aquis crescens, a salt growing in the waters.

SAL *circulatum*, in chemistry, a term used by Paracelsus for a preparation of sea-salt, of which he distinguishes two kinds, under the name of circulatum minus and circulatum majus. These seem to have a great affinity with the famous alkahest or universal solvent, so much talked of in the works of this author, and his successor Van Helmont.

The circulatum minus was a liquor procured by a tedious process from sea-salt; this salt, he says, is that body in which nature has placed the greatest perfection; and from this he, by incredible industry, procured a liquor which he calls a perpetual oil, and to which he also gives the name of the ens primum of salts. He calls it the highest and most successful of all salts, and declares that all poisons are subdued by it; and that being brought to the utmost degree of purity and subtility, it pervades all bodies, and readily dissolves them, itself remaining unaltered in the action. These are all properties expresly attributed by Helmont to the famous alcahest.

The circulatum majus, however, we are told, by the same author, was much more powerful and much more difficult to be obtained. This he calls the matter of mercurial salt, and the living fire. He acknowledges that the highest fire and celestial fire lie hid in common mercury, and says the quintessence of mercury is celestial fire: by this and a great many other enigmatic expressions in this writer, there is room to believe, that the alcahest, described by Helmont, is a preparation of mercury and sea-salts. *Boerh. Chem.*

SAL *diureticus*, a form of medicine of the nature of the terra foliata tartari, introduced into practice by the late College Dispensatory. The method of preparing it is this: take of any alcaline fixed salt a pound, boil it in four or five pints of distilled vinegar in a gentle heat. When the fermentation is over, pour on more distilled vinegar; and, when the fermentation arising from this addition is over, pour on still more, and proceed thus till the moisture being nearly all evaporated, fresh vinegar being added will excite no more fermentation: this generally happens when about ten quarts have been used; then evaporate to a dryness; the salt will be impure, and must be melted, for a small time, with a gentle heat, afterwards dissolved in the water, and filtred; if the melting has been rightly performed, the strained liquor will be pellucid as water; then evaporate this in a gentle heat to a dryness, and you will have a very white salt, soluble either in water or spirit of wine. *Pemberton's London Disp.*

SAL *marinum regeneratum*, in chemistry, the name given to a sea-salt, produced by adding an alcali to its acid spirit of salt drawn by distillation. The process is thus: dilute four ounces of oil of tartar, with three times its weight of fair water; put this mixture into a tall glass body, and heat it, and drop into it any of the kinds of spirit of sea-salt, whether Glauber's, or that prepared with bole; shake the vessel now and then, and continue to drop in the acid till the alcaline liquor is sated, and there rises no more effervescence; filtre the liquor, and evaporate to a pellicle, and set it by to crystallise, and there will be procured crystals of perfect sea-salt, in all things agreeing with common salt. *Boerh. Chem.*

SAL *martis*, salt of iron.—A chemical preparation which is made as follows: mix together a quart of water and eight ounces of oil of vitriol; pour the oil of vitriol in by a little at a time; and, having put this mixture into a glass vessel, add to it filings of iron, four ounces. When the ebullition is over, evaporate the liquor to a pellicle, and set it to shoot; there will be found a green vitriol or salt in fair crystals, which dry for use.

This salt is one of the most powerful preparations of iron; it opens obstructions of all kinds, and strengthens the viscera; it is an excellent medicine in cachexies, obstructions of the spleen and liver, and in suppression of the menses; it is also found good against worms.

The best manner of giving it is in solution, half an ounce in a quart of water, four ounces of which is a dose; and, if drank in the manner of the natural chalybeate waters, it will be found to excel most of them in its good effects.

SAL *mirabile*, Glauber's salt. See *Glauber's* SALT.

SA'LEP, in the materia medica, the root of a species of orchis. Salep should be chosen clean, firm, and hard; it is very little liable either to decay, or sophistication.

The people of the East are extremely fond of Salep; they look upon it as one of the greatest restoratives and provocatives to venery in the whole vegetable world.

That Salep is the root of an orchis, no way differing from our common orchis's in virtue, but owing its appearance to the manner of preparing it, and, consequently, that Salep may be prepared from the roots of orchis of our own growth, Mr. Geoffroy has proved in the following manner: He considered, that the method of curing one root in the eastern parts of the world was probably the same with that used in all; and observing that Kæmpfer had described the manner in which the Chinese prepare their ginseng to make it pellucid, which was by first steeping, or macerating it in water, and afterwards carefully drying it; he determined to attempt the curing the roots of the common orchis, in a method not unlike that used to the ginseng, in order to make Salep of it. The Salep, which we receive from Turkey, is a root of a white or reddish colour, according to its different age; and, as we receive it, is always transparent. As to our own orchis, if we attempt to dry the roots in the common way, they never will appear at all like the Salep, but will become shrivelled up and brown, and will always retain, or be ready to imbibe, from a humid air, a great quantity of moisture. To prepare these, in imitation of the Salep, Mr. Geoffroy chose the largest, plumpest, and fairest roots he could find; these he nicely skinned, taking off the whole outer rind; then throwing them into cold water, he suffered them to macerate there some time; after this he lightly boiled them; and after this taking them out of the water, and draining them, he had them strung upon threads, to be dried in a warm and dry air. When the roots were thoroughly dried, they were very transparent, and resembled pieces of gum tragacanth, and continued dry and hard. The roots thus prepared may be kept ever so long in a dry place, and will never attract humidity, or become mouldy and rotten; as they will always do in wet weather, if dried in the common way with their skins on.

The orchis roots thus prepared may be reduced to powder: this powder will dissolve away in boiling water, and a scruple of it will make a bason full of jelly, in the manner of the Turkish Salep. This jelly is an admirable medicine in all the cases, in which Salep is prescribed, and may be rendered agreeable by the addition of wine, sugar, spice, &c. and the powder may be given with great success in asses milk, for diseases of the breast.

If the water, in which the roots have been boiled, be evaporated over a gentle fire in an earthen vessel, there will remain an extract of a viscous texture, and a very agreeable smell, resembling that of a meadow of flowers when the wind blows over it. *Mem. de l'Acad. Scienc. Par.* 1740.

SALICA'RIA, *spiked willow-herb*, in botany, a genus of plants, whose characters are:

The calyx is tubulous, striated, and multifid; the flowers are rosaceous, hexapetalous, and grow out of the upper incisures on the inside of the tubulated calyx, almost in a series of whorls, and are furnished with a multitude of stamina, sometimes no fewer than eighteen. The ovary, which is adorned with a long tube, that has an apex shaped like a bason, when ripe, becomes an ovated, bicapsular shell involved in the calyx, and full of small seeds.

It grows in marshy places, and by the banks of rivers, and flowers in July. The herb, which is used in medicine, is an ophthalmic. The distilled water is a present remedy for wounds, punctures, and sugillations of the eyes, as well as dimness of sight and all other infirmities incident to those parts. It is a specific in inflammations. *Raii Hist.*

The decoction of the herb is an excellent remedy for the epidemic diarrhœa of Ireland. *Threl. Synop. Hib.*

SALICO'RNIA, *jointed glasswort*, or *saltwort*, in botany, a genus of plants whose characters are:

It hath an apetalous flower, wanting the empalement; for the stamina (or cives) and the embryoes grow on the extreme part of the leaves: these embryoes afterwards become pods or bladders, which for the most part contain one seed.

These plants grow on the sea-coast in many parts of Europe, and upon the shores in several places in England, which are washed every tide with the salt-water; but rarely planted in gardens, because it is very difficult to make them grow in any other situation, than in salt-marshes, and on the shores, where the salt-water frequently flows. Of these plants there seem to be two or three varieties, which appear remarkably different; but are not supposed to be distinct species.

The inhabitants near the sea-coast, where these plants grow, cut them up towards the latter end of summer, when they are fully grown; and, after having dried them in the sun, they burn them for their ashes, which are used in making of glass and soap. These herbs are by the country people called kelp, and are promiscuously gathered for use.

From the ashes of these plants is extracted the salt called sal kali or alcali, which is much used by the chemists.

The manner of gathering and burning of these herbs is already mentioned under the article of KALI in the Dictionary; so I shall not repeat it in this place.

In some parts of England these herbs are gathered and picked for samphire, though it is very different from either of these.

SA'LII (*Dict.*)—There were two companies or colleges of Salii: the ancient established by Numa, called Palatini; the latter by Tullus Hostilius, called Collini and Agonales. Though Servius tells us, there were two kinds instituted by Numa, the Collini and Quirinales; and two others by Tullus, the Pavorii and Palorii.

In singing, they used a peculiar ancient song, called Saliare carmen; and, after the ceremony, were entertained with a feast: whence Saliares epulæ, and Saliares dapes, passed into a proverb for good eating.

Their chief, called præsul, and magister Saliorum, was one of their number: it was he led the band, and begun the dance; the rest imitating all his steps and motions.—The whole company was called collegium Saliorum.

Sext. Pompeius makes mention of Salian maids, virgines Saliares, hired for the purpose, and joined with the Salii, wearing a kind of military garb, called paludamentum, with high round bonnets

bonnets like the Salii, and, like them, performing facrifices with the pontifices in the palaces of kings.

M. Patin takes it, there is a figure of one of the Salii on a medal of the Saquinian family; who, befides the buckler in one hand, holds the caduceus in the other. — But his look appears too grave and fedate, and, befides the buckler he holds, does not feem to be an ancyle, as being quite round and not indented any where. And again, why fhould a prieft of Mars, the god of war, be reprefented with a caduceus, the emblem of peace? It is probable, therefore, this is no figure of any Salius, as Patin imagines.

SALINE *Principle*, a term ufed by the chemical writers, to exprefs a conftituent part of feveral mixed bodies, on which their exiftence in that form depends; and which, though always exiftent in them, and always feparable by art, is yet not perceivable in many of them in the complex. See PRINCIPLE.

SALINE *Earths*. The chemifts under this, as a general head, reckon all thofe Saline and earthy fubftances, which are calcined or burnt in the fire; as all the kinds of lime, pot-afhes, foot, and the like; thefe being fo many mixtures of falt and earth; and all falts appearing to them, indeed, on a rigorous examination, to be only earths of different natures, which, when reduced to a certain degree of fubtility or finenefs of parts, fo as permanently to diffolve in water, are then emphatically denominated falts. *Shaw's Lectures.*

SALIVATION (*Dict.*) — There are many ways of raifing a Salivation, and all by mercurial preparations. The preparations which I have ufed myfelf, fays Turner, as the fafeft and moft commodious, are calomel and mercurius dulcis fix times fublimed, given inwardly, in the milder pox; or the fame being fafter radicated, and got into the bones, the crude mercury externally, in the way of unction.

The mercurius vitæ, arcanum corallinum with the red, yellow, and green precipitates (however in ufe with fome) I think too churlifh, and fcarce fafe for tender conftitutions; nor indeed can I fee any reafon for their ufe, whilft we have better and lefs hazardous medicines to fupply their room.

In falivating by the internal method, to an adult perfon, of a tolerably good habit, as to his ftrength, and who has not been much ufed to the medicine, I generally give fifteen grains of calomel with a little conferve of rofes in the morning, and the like dofe in as much of diafcordium without honey, at night, which I prefer to the larger given once, or, as cuftomarily, twice a day; becaufe it is now lefs liable to run fuddenly thro' them, or too haftily fublime, and endanger them that way, by the inflammation. Befides, in this gradual way of proceeding, it comes on more certainly, eafily, and alfo more fecurely to the patient; the effect of each dofe affording opportunity of forefeeing readily, what more be requifite, and when you muft intermit, if not entirely forbear its farther exhibition.

I know a phyfical writer hath lately acquainted us, that we are each time to double the dofe of calomel; as for the firft, fifteen grains, for the fecond half a drachm, for the third a drachm, and fo till the fpitting comes on; but I would advife, that no perfon take this author for his guide in this affair, left inadvertently he deftroy his patient, together with his own reputation.

After three, four, or five days of this management, we ufually obferve the fauces to inflame, the infide of the cheeks to become tumid, or high and thick, being ready to fall in betwixt the teeth, upon fhutting of the mouth; the tongue looks white and foul, the gums alfo ftand out, the breath ftinks (which is a favourable omen of its coming on) and in general, the whole infide of the mouth appears fhining, feems as it were parboiled, lying in furrows, as it appears, after ftrong fpirits have been retained in the mouth. They now begin to refufe their nourifhment, while the tongue, gums, and cheeks are fwelled, and fo fore that they cannot chew, efpecially folid food, but muft be now content with liquids and the fofter aliments. Befides, they are often fick at the ftomach, and frequently puke, or bulk up a thin phlegm, another promifing forerunner of a good Salivation, when the pukes are moderate and eafy, and come by intervals. But, if attended with cardialgia, or violent pains and torture at the ftomach, perpetual and inceffant reachings, fainting and cold fweats, nothing is more dangerous.

The infide of the mouth beginning to appear thus whealed, you may expect foon after to find it ulcerated, efpecially about the falival glands; and then it may be proper to defift for a day or two, if not give over, that you may the better obferve the increafe of the ulcers, what floughs are likely to be raifed, and of what depth and dimenfion they are like to prove; from which a near conjecture may be made of the duration as well as quantity of the fpitting, now begun; the confiftence of the effluent lymph being at the fame time confidered.

When the Salivation is thus raifed, the patient ought to be encouraged to proceed chearfully; and to be fometimes refrefhed with a little mulled wine, of what fort he likes beft; but red is preferable, if there be any tendency to a diarrhœa, adding a third, and fometimes one half of water. Let his diet be a fmall chicken broth, water-gruel, and panada; his drink a fmall fack-whey, or poffet-drink, with a draught of good fmall-beer and a toaft between whiles: but, in gripes or a loofenefs, the white drink, prepared of calcined hartfhorn or rice-water; alfo the decoction of the fhavings of hartfhorn and ivory, boiled with a cruft of bread, and fweetened to the patient's tafte, are to take place of the reft.

Thus having given him fome few days refpite, if after the coming on of the ptialifm, you find him hearty, and his chops but moderately fwelled on the outfide, and not very fore within, the ulcers not increafing, and few and no floughs appearing, the flux alfo inconfiderable in quantity, you may now again give him a fcruple of calomel in diafcordium, as he goes to reft, repeating the fame for two or three days following, as you find occafion.

When in this way he has taken about half an ounce of calomel (though there is feldom occafion to go fo high) with but little alteration as to the fwelling or forenefs of his mouth, and as little appearance of the ptialifm; his pulfe and other circumftances, with refpect to any ill fymptom attending, favouring the fame, he may may be vomited with eight, nine, or ten grains of the turpeth mineral by itfelf, only made into a bolus with conferve of rofes, or farther mixed up with half a fcruple, or fifteen grains of the calomel, encouraging the operation with fmall draughts of common poffet-drink between whiles, upon each motion to reach; but without loading his ftomach, as is cuftomary in other emetics, left, happening to run downwards, it invert the order or courfe of its intended operation. The fame vomit, if found requifite, may be repeated two or three days after, which at thefe times often anfwers our end, by raifing the humours towards the jaws, and forwarding the Salivation much more effectually, than more dofes of the calomel, fimply repeated, would have done; and if, after this, it fhould fo happen, as in fpite of all endeavours to the contrary, it fometimes will, whether from fome fingular idiofyncrafy, the tenacity of the lymph, or fome defect in the glandular fecretion, that the fpitting will not rife to any quantity, notwithftanding the tumefaction, inflammation, ftench, and putrefaction, and fometimes ulceration alfo in the patient's mouth, you muft forbear and purge it off. The relief of the patient muft now be attempted fome other way, as by giving calomel once or twice a week, and purging it off again next day, or two days after; and on the intervening days, direct fome other antivenereal fpecific, fuch as the alterative pill of gum guaiacum, diaphoretic antimony, and the æthiops mineral, with a good ftrong decoction of the woods, well chofen and energetic, fuiting alfo with the temperament of the patient; as, if cold and phlegmatic, the fcobs of guaiacum; if hot and dry, the farfaparilla and China roots; which, however flighted by fome as infignificant, yet obferved with a ftrict difcipline, as to the other non-naturals, have certainly very great advantages attending them, as well perfpiring the noxious particles, and drying up the fuperfluous ferum by the one, as contemperating the acrid and four juices by the other. By this method, duly profecuted, though it may be fomewhat longer, the purpofe may be at length effected, which by the former was not to be obtained. Some have remarked, that thofe perfons who are purged with great difficulty, are with great difficulty falivated; which may arife from the fame caufe, the toughnefs of the humours, and flower fecretion. Although, in the evacuation downwards, we often find thin, choleric, and dry bodies are more eafily moved by lenients, as common oil, manna, lenitive electuary, caffia, diaprunnum, even a bit of frefh butter, or fat broth, than by ftronger purgatives of fcammony, colocynth, and the like.

When the ptialifm proceeds fuccefsfully, it may be left to take its courfe, till it declines fpontaneoufly, which, in proportion to the ulcers or thicknefs of the floughs about the parts of the mouth, may happen at the expiration of one and twenty days, or fometimes a month from the time of its firft rifing, which is ufually long enough to fubdue this difeafe, after it is confirmed. I faid, from the time of its rifing, or fpitting perhaps a pint and a half a day, till it comes to three, four, or five pints, in twenty-four hours, and fo gradually goes off again; for often the firft four or five days, and fometimes a whole week is fpent in bringing it to the firft proportion.

Befides this way of Salivating by the calomel, in the more ftubborn and rebellious pox, attended not only with cruel nocturnal pains, gummata, tophs and nodes, but alfo rotten or foul bones; where the patient has been long ufed to the taking of calomel, or a like mercurial preparation internally, and has perhaps been often falivated by fuch preparations to no purpofe, it is better to attempt the cure by falivating with the unction, in which little regard is to be had as to the choice of the ointment with which the quickfilver is to be incorporated, fince the ftrefs is entirely laid on the quickfilver. In this method, as well as in the other by calomel, care muft be taken not to proceed too haftily.

If you have one ounce of the quickfilver to three ounces of axungia (which is the proportion I have ufually obferved) about an eighth part may be ufed night and morning; letting the patient rub it gently, with his own hands, into his limbs before the fire, beginning from his ancles up his fhins to his knees, all round his joints; and fo to his thighs, which are prefently after to be covered clofe up with his yarn ftockings and

and flannel drawers; then let him use the remainder of this eighth part about his elbows, and so to his shoulders, wiping his fingers and hands clean about the glands of his armpits, or those of his groin: his body being all the while defended from the cold air, by a screen or blanket hung behind him, and after wrapped up warm in his flannels, as he must also be in the other method of salivating; such I mean as a flannel shirt or shift, waistcoat and drawers, a cap and muffler pinning up thereto behind, and covering well his throat, chin, and cheeks before, to keep these parts from the cold air, which above all is highly necessary.

Some also anoint the trunk, especially the spine; but I always found the pores of the other parts sufficient to let the globules of the mercury into the blood; and it is not material by what particular pores it had first its admittance.

For those who are very weak, once a day may suffice; but the robust and strong may be anointed twice, or, which is as well, and will save trouble, divide the unction into four parts, and consume one part about him every night, after which let him enter into a warm bed, with flannel sheets or blankets, disposing him to a gentle breathing sweat, with a draught of warm posset-drink, mace-ale, or, if very feeble, a cup of his mulled wine; by which the pores being opened, the mercurial particles may have the freer entrance.

It is usual to increase the mercury and ointment to four times the quantity, which we have directed. Thus Harvey prescribes one pound of axungia to be mixed with three ounces, and sometimes six ounces of quicksilver, adding also a little white hellebore and crude antimony in fine powder, pretending thereby to forward the Salivation, and increase the force of medicine in mastering any malignity. Mr. Wiseman's composition was also six ounces of mercury to one pound of the other materials, of which he used one ounce, or two ounces at a time, once or twice a day, for four, six, or eight times, according to the patient's strength, and the ease or difficulty of raising the flux. Hildanus directs six ounces of mercury to twenty ounces of axungia, and the other ingredients. But I can see no reason for using so much axungia, provided a half, or a fourth part of it, be sufficient to convey the quicksilver into the blood; nor to what end any other ingredients should be added to the axungia, unless the turpentine, being, as I conceive, more like to hinder, especially the species or powders, by stopping up the pores, than to forward the operation. But, leaving every one to follow the proportion he likes best, in relation to my own, I must farther observe, that if after the third unction, supposing the whole divided into four parts, the patient begins to complain of his mouth, or that the inside thereof appears ulcerated, you must stay a day or two to see the effect of what is already done, before you proceed farther. The like must be observed when gripes, or bloody stools, approach. But if the spitting comes not on, and no supervenient symptom contra-indicates, you may expend the remaining fourth part in like manner; and perhaps, in some bodies, there may be occasion for a half, or full as much more. However, it will always be found safest to proceed leisurely, when you have gone thus far, and sometimes to wait a day, two or three, before you continue the unctions; since, although at first it may seem as if the medicine had taken no effect, you may soon after find it sufficient. For, though a day or two after the fourth unction, the flux may be longer than usual in coming forwards, and the excoriations about the chops or inside of the mouth appear inconsiderable, yet in a day or two more they may be seen to spread and increase to a copious spitting, beyond what was expected. But when after rubbing in an ounce, or an ounce and a half of the mercurial ointment, the Salivation appears not, it may also be necessary here to administer a dose or two of the turpeth mineral, at a day or two days distance; and, where there are gummata, tophs, and nodes, you are in the unction more especially to rub the ointment well into these parts, laying over them afterwards the emplastrum de ranis, with a double quantity of mercury. This will both help the resolution of them, and encourage or keep up the ptialism, which being arrived to the quantity of four, five, or six pints, in a day and night, is accounted a sufficient discharge. Yet this is no absolute rule to go by, or upon which we can safely pronounce the patient whole and sound, any more than the quantity of the medicine to be used can be limited to any one certain, or constant proportion. Since we have known some who have spit more, yet miss their cure; whilst others who have come very short of such a quantity, have notwithstanding obtained theirs. However, during the Salivation this way raised, upon its too sudden declension (though it commonly happens that, the sloughs being deeper, and their mouths sorer, they usually spit longer than by proceeding internally with the calomel) it is often expedient to give a scruple of the same, every day, or every other day, for two or three times, as there may be occasion; and, towards the conclusion, you are to purge your patient with two or three ounces of the common infusion of senna, and one ounce of the syrup of buckthorn, or, for those that are very weak, an infusion of sliced rhubarb, senna leaves and tamarinds, with salt of tartar, adding to the strained liquor one ounce of the best manna, or solutive syrup of roses, which may be repeated once or twice a week for two or three times; and, when he is a little easy, his chops growing pretty well, he may be permitted to eat a little meat, as the flesh of a chicken or rabbit, also veal or mutton, but well roasted, without sauce or gravy. About this time also, it is usual to sweat them, at least before they go abroad, in their bed, or stove, or under the cradle, with spirit of wine burning just by, to be continued as their strength will bear, for an hour or two, and to be repeated at two or three days distance, if there be occasion, observing that the most care be now taken, that your patient be not injured by the cold air, and that he gradually cool himself, by lessening or withdrawing the heat or bed cloths he lies under, lest, getting cold, he make some fresh complaint of pains, which though arising from this new occasion, he may impute to the old one; and think the worse of his cure for some time.

During his sweat, let him rub his body thoroughly with warm napkins, conveyed to him in the bed; and, when faint, let his spirits be kept up with three or four spoonfuls of some proper cordial julap, or a draught of his burnt wine.

In order to promote this diaphoresis, he may take a little Venice treacle, with a scruple of the cinnabar of antimony, or half a scruple of bezoar mineral, upon which let him drink a draught of his diet-drink, made as hot as he can bear it. This drink he ought to be strictly confined to, for three weeks or a month after he comes out of the Salivation, that having by this evacuation secured his body from any relics of the disease, or its remedy, the redundant serosity remaining after the colliquation may be dried up, before the blood is supplied with fresh nutritious juices. By the neglect of this circumstance, and by running over hastily to their wonted liberty and custom of living, they too suddenly fill their blood with a load of improper and unsuitable juice, at this time in a weak infirm state, and, despising their purging, sweating, or diet, as needless pieces of formality, or an useless penance, too often incur the misfortune of an unhappy relapse. *Turner*.

SA'LIX, the willow. See the article WILLOW.

SAL'MON, *salmo*, a well known fish. It is distinguished from other fish of the truttaceous kind by these characters: it is of an oblong body covered with very small scales, a small head, a sharp nose, and a forked tail. Its back is bluish; the rest of its body whitish, or reddish, and usually spotted. Its under jaw is bent upwards, and that sometimes so much as to make itself a sinus in the upper, by constant motion, and sometimes to perforate it.

The Salmon is first produced from its parent's spawn in fresh rivers, thence it goes into the sea to acquire its growth and feed, and, at the time of its full growth, and in the season for spawning, it removes into the fresh waters again.

The Salmon in the different stages of its life and growth has different names. The Latins called it, when young, salar, when of a middle growth sario or fario, and only when full grown salmo. In England the fishermen have names for it in every year of its growth. In the first it is called a smelt, in the second a sprod, in the third year a mort, in the fourth a fork-tail, and in the fifth a half fish; finally, in the sixth it is called a Salmon. This is the common agreement of our fishermen, though there are some who say the Salmon comes much sooner to its full growth. *Willughby's Hist. Pisc.*

The Salmon is bred in rivers, but goes every year from thence into the sea; and at a certain season of the year it always returns up into the fresh water again; and what is remarkable, is, that, so far as observation has been able to trace them at any time, the same shoals of Salmon always return into the same river out of which they swam, not into any other; so that the people who live on the Salmon fishery are not afraid for their rivers being cleared, by all the fish in them going down into the sea, for they know that they will all return up to them again at a proper time. When the Salmon has once entered a fresh river, he always swims up against the stream, and often will go an hundred leagues up a river in the large and long rivers; and the people at this vast distance from the mouth have the pleasure of taking a fish, that is properly in part of the sea kind. It is also remarkable, that the rivers which most abound with Salmon do not make the seas, about their mouths, any more abound with them than others, particularly the harbour of Brest affords no Salmon; though the river Chateaulin, which discharges itself into it, is the richest Salmon river in France.

Another singularity, in regard to the Salmon, is their swimming up the rivers together in such vast numbers. It is to be allowed, indeed, that herrings, mackarel, and many other fish, do in the same manner appear on the coasts at certain seasons in prodigious numbers; but the reasons for their coming together, in these quantities, are much more easily explained than that of the Salmon's doing so. The herrings, when they come in such prodigious shoals to the coasts of Normandy, have been found to be allured thither in these numbers by a prodigious quantity of a particular sort of sea worms which are their favourite food, and which are found to cover the whole surface of the sea at that time. Rondeletius has described these insects under the names of sea caterpillars; they always appear in the months of June, July, and August, which are the herring seasons at that part of the world; and probably the same cause will be found to bring them to other places, if sufficiently enquired into, as these and some other fish

fish come to certain places in shoals to get food. The Salmon do it, in order to propagate their species. The spawn of the Salmon is never deposited but in rivers, and, at the time that these fish are found up the rivers, it is only with this intent; the females go first, and the males follow as far as the others please to lead them, which is usually to some convenient place in shallow water, where the spawn, when deposited, is not buried under too great a quantity of water, but has the advantage of a continual warmth from the sun's heat.

Salmon do not equally frequent all rivers, though they may seem to us equally proper for their reception. There are two rivers which open themselves into the harbour of Brest, very near one another; the one of these is famous for the quantity of Salmon in it, and the great advantage of the fishery; the other never has any of these fish in it. It most probably is owing to their finding plenty of food, and proper places for the depositing their spawn in the one of these rivers, and not in the other, that makes this regular choice. *Des Landes, Trait. Phys.*

SALMON *trout*, the English name of the fish called trutta lacustris by Gesner and other authors. It is caught in lakes in mountainous countries, and grows to a very considerable size, sometimes to thirty, forty, or fifty pounds weight. It resembles the trout in figure, but its belly is very flat, and has, as it were, a long furrow or cavity running the length of the belly. Its back and head are of a very beautiful bluish green colour; and the whole fish, especially its back and the upper parts of its sides, are marked with numerous black spots. Its back fin is also spotted with black, and its scales are small and silver-coloured. *Gesner de Pisc.*

Bay SALT. — This Salt is of two kinds: the first drawn from sea water, as is practised in France, Spain, and Portugal, and many other hot countries; the other from the water of salt springs, or lakes, as in the Cape Verd islands, in the island of Tortuga, Turks island, and many other parts of America.

The first kind is, in time of peace, imported into Great Britain in very large quantities, and our colonies and fisheries in America commonly supply themselves with the latter.

Bay Salt is not extracted from Sea water in the colder parts of Europe, as on the coasts of Germany, Denmark, and Sweden, but in places situated in a more southern climate, as on the coasts of France, Spain, and Italy. Some marine bay Salt has also, of late years, been made in England at Limington, and in some other parts of Hampshire, and in the Isle of Wight: but in these places it is only made in drier summers, and then rather by accident than design, it being collected from ponds, which were originally made for heightening of sea-water, or reducing it into a strong brine by the heat of the sun, in order to lessen the expence of fuel, in boiling it into white Salts. *Brownrig of Salt.*

The ponds, in which this Salt is made, nearly resemble a rude kind of Salt marsh, described by Agricola, in which the sea-water is received into a pool, and thence by a trench is conveyed into several pits dug in the earth; and, when it has stood some time in these pits, it is suffered to run out into others, and so on, till the brine is strong enough to crystallise.

This is the case in our English Salt works; but the French marshes, in which a vast quantity of bay Salt is annually prepared, are made in a much more artful manner. A full account of which is given in the *Philosophical Transactions*, N°. 51. See SALT *marsh*.

The several kinds of bay Salt, made in the different parts of the world, are found to differ greatly from one another in several particulars; as first, in the size of the crystals, which is owing to the heat of the sun, and the time it lies in the pits. The French cream of Salt, and the blown Salt of the isle of May, are fine and small-grained. The Portugal Salt is larger grained than that of France; and that of Tortuga is larger than either. Secondly, in purity. As all bay Salt has some mud, slime, or the like, in the making, and some kinds are mixed with the bittern Salt, or what is called Epsom Salt; they are all more white while dry, and more pellucid when moist, and they differ in colour, according to the earth which makes the bottoms of the pits. Thus, some of the French bay Salt is grey, some reddish, and some white, according as a blue clay has lined the pits, or a red, or white one. Fourthly, some kinds of bay Salt are more apt to contract a moisture from the air than others: it is sometimes owing to the smallness of the grain, and sometimes to a mixture of a calcarious or alcaline Salt with it. And, fifthly, some kinds have an agreeable smell in large heaps; such are the Portugal and the Hampshire bay Salts; and this seems owing to the sea-water they were made from, having a bituminous matter in it. Sixthly, It differs greatly in taste, according to the various foreign mixtures it contains; and it will often alter in taste, and other qualities, by long keeping. Thus the Salt of Peccais is so bitter, when new made, as not to be eatable, but after keeping a while it becomes very pleasant. This is owing to its containing at first a large portion of the bittern Salt, or Epsom Salt, which liquifies in keeping, and, running off in form of a fluid, leaves the rest of a good taste. In general bay Salt is much fitter for use, after it has been kept some time in a dry place, than when it is first made.

From the accounts already given of the bay Salt of other countries, and the manner of preparing it, it seems evident, that our being obliged to purchase it of other nations is the effect of our want of application to the making it ourselves; since it is evident that it may be very well made, both in England, and in many of our American colonies.

In England, a very advantageous sort of works might be set on foot in the following manner: a number of Salt pits should be made in a row in the marsh, and their bottoms lined with plaister, or some strong cement that will not easily break up; and, by this caution, the Salt may be drawn white and pure like the Portugal kind, not grey like the French. Over each pit covers should be made of thin boards, or rather of canvas painted white, and stretched on frames of wood; and these should be fixed to strong posts, erected on the north side of the pits, and contrived to be easily drawn back to them, in the manner of draw-bridges. These covers, thus fixed, may be let down over the pits, in manner of a shed or pent-house, in rainy weather to keep the brine from being diluted with fresh water; and in dry weather they may be raised almost to a perpendicular, but inclining a little towards the south, so as to form a wall with a south aspect; and thus they would serve for a double use, being a covering to the pits in rainy weather, and reflectors of the sun's heat in fair. The reflexion of so large a body of the sun's rays, in the course of a bright day, would greatly promote the evaporation of the brine; and the hinges, on which the reflectors turn, being placed at ten inches from the ground, when the reflectors stand upright, there will be a space under them, through which the air will continually flow in a brisk current, and this will greatly promote the evaporation of the water.

The passages of communication between the pits must be narrow and winding, and must be wholly stopped up in wet weather, that no fresh water run into the brine. This channel should be covered also with boards, and at the entrance of the pits there must not be a pond, as is the custom in France, but only a narrow covered trench running parallel with the side of the pits which is opposite to the reflectors; and the pond, which forms the entrance of the pits in the French Salt marshes, must in these be detached from them, and, instead of it, there must be formed a fourth brine pond, communicating with the third by a long and narrow channel.

If these contrivances should be reduced to practice in England, the Salt will probably crystallise much faster there than in the French marshes, and the brine may be kept as deep, and even deeper than in the French pits; and a shower of rain will only retard the work for the small time in which it is falling; whereas, in the French works, it throws them back three or four days, as no Salt can be formed till all the water it brought be evaporated.

Four cisterns may be dug adjoining to the brine pits, to admit the brine in the Salt ponds, when the weather is very rainy; and as to the Salt water in the reservoir, if it should be found necessary to preserve it from rain in cisterns, when so much rain falls, as to make it fresher than sea-water, it may be let out and sea water admitted in its place. And in order to promote the evaporation, and to make the Salt water in the reservoir fitter to supply the first brine pond with brine of a due strength, it may be proper, by means of a small fire engine, continually to force up the Salt water in the reservoir, as often as occasion requires, and by means of a diverger, fitted to the engine, to make it descend again into the reservoir, like a shower of rain; by which means, the evaporation of the watery vapours will be greatly promoted, after much the same manner as is practised in several of the Salt works in Germany, where the brine is very weak. *Brownrig of Salt.*

Thus by augmenting the force of the sun's heat, and of the air, by promoting the evaporation of the watery vapours, and preventing the brine from being diluted with rain, it is very probable that, during the summer season, double the quantity of Salt might be prepared at an English work with these contrivances, than is now usually prepared at a French Salt marsh of equal magnitude.

Besides these methods of managing sea-water, it is certain that very large quantities of bay Salt might be prepared in England, with great ease, from the natural brine of Salt springs, and from the common fossil or rock Salt of Cheshire dissolved in weak brine, or in sea-water. Upon the whole, bay Salt might thus be made here at a moderate price, and in sufficient quantities to supply both the nation itself, and all our colonies.

Brine SALT, a name given to that sort of common Salt which is not made from sea-water, but from the water of Salt wells and springs. Great quantities of this Salt are made in most of the inland countries, as in Germany, Switzerland, Hungary, and in some parts of France and England.

The ancient methods of boiling of brine into Salt, in Cheshire and Worcestershire, are accurately described in the Transactions of the Royal Society; and the method, formerly used in Staffordshire, is delivered in Dr. Plot's History of that country; but the method, now generally used in England, is this:

The brine, being received from the well into a large cistern, is thence received, as occasion requires, into the Salt pan. These pans are of the same form with those used in the boiling of sea Salt, and usually hold about eight hundred gallons: in some places these are made of iron, and in others of lead.

 When

When the brine is put into the pan, a little blood is mixed with it, in order to clarify it, and leaden pans are placed at the corners, to receive the ſcratch, or calcarious earth, that ſeparates from it in the boiling. An ounce of blood is ſufficient for eight hundred gallons of brine. As ſoon as it is boiled, it is carefully ſkimmed, and afterwards it is ſuffered to boil very briſkly for ſome time, till the Salt is granulated; after this the ſcratch is ſeparated, and the fire ſlackened, till the whole Salt is formed.

When they have ſeparated the ſcratch, and the Salt is ready to cryſtallife, they put into the pan ſeveral ſorts of ſeaſonings, as they call them, ſuch as ale, butter, and the like, which they ſuppoſe correct the bad qualities of the brine, and make the Salt of a ſmaller grain. After this they boil it very gently, and when as much Salt is formed, as will fill two or three of their wicker baſkets, they rake it up to the ſides of the pan, and fill it into the baſkets, placing them over the leach trough, that the brine may drain into it from the ſalt. The Salt taken out they call a draught of Salt, and the operation a clearing of the pan. In this manner they draw the Salt, and clear the pan five or ſix times during each proceſs, leaving at laſt only a few quarts of brine at the bottom of the pan. The baſkets, into which they put the ſalt out of the pan, are called alſo barrows: they uſually contain about a buſhel of ſalt, and are of a conic figure, open at the baſe. The whole proceſs of working a pan of brine uſually laſts about twenty-four hours. After the Salt has drained an hour or two in the baſkets, it is removed into the hot-houſe over the furnace, where it remains four or five hours to be thoroughly dried, and is then taken out of the baſkets, and laid up for ſale. In all the Engliſh Salt works, the leach brine, which is what remains in the pan after the Salt is cryſtalliſed, and what drains from the Salt in the baſkets, is not thrown away, as it is in Germany, but is added to the pan next to be boiled. And, beſides the Salt made in this manner, they have, at moſt of the Engliſh Salt works, a different kind, which they call ſhivery Salt.

They have alſo another kind of Salt, made up in form of ſugar loaves in ſmall wicker baſkets, which is thence called loaf Salt, or baſket Salt. This is the whiteſt, drieſt, and fineſt-grained of any Salt, and is therefore greatly eſteemed at table. In preparing this Salt they uſe ſome reſin, and other additions, to break the grain, and render it very ſmall; others alſo, to this purpoſe, boil it the more briſkly and ſtir it briſkly all the while. But in Cheſhire, where the beſt baſket Salt is made, they uſe no particular proceſs about it, but only take the third draughts of every pan, which always are the pureſt Salt; and they do not ſuffer theſe to lie ſo long in the pan, as when they make Salt of a larger grain, but take it out before it can form large cryſtals: by this means they have it of a fine ſmall grain, and they then preſs it it hard down into the wicker baſkets, and, when dried in the ſtove, they let it remain in the baſkets for ſale. *Brownrig of Salt.*

Not long ſince Mr. Lowndes publiſhed a method of greatly improving the Engliſh brine Salt, ſo as to make it at leaſt equal to the French bay Salt.

The method is this: let a brine pan, containing about eight hundred gallons of liquor, be filled with brine to within an inch of the top; then make and light the fire, and, when the brine is juſt lukewarm, put in either an ounce of blood from the butchers, or the whites of two eggs. Let the pan boil with all poſſible violence, and, as the ſcum riſes, take it off. When the freſh or watery part is pretty well decreaſed, throw into the pan the third part of a pint of new ale, or the ſame quantity of the grounds of any malt liquor. When the brine begins to grain, add to it the quantity of a ſmall nut of freſh butter, and, when the liquor has ſtood half an hour longer, draw out the Salt. By this time the fire will be greatly abated, and ſo will the heat of the liquor; let no more fuel be thrown on the fire, but let the brine gently cool, till a perſon can juſt bear to put his hand into it; keep it in that degree of heat as nearly as poſſible, and when it has worked for ſome time, and is beginning to grain, throw in the quantity of a ſmall nutmeg of freſh butter, and about two minutes after that ſcatter throughout the pan, as equal as may be, an ounce and three quarters of common alum, pulveriſed very fine; then inſtantly, with the common iron ſcrape-pan, ſtir the brine very briſkly in every part of the pan for about a minute; then let the pan ſettle, and conſtantly feed the fire, ſo that the brine may never be quite ſcalding hot, yet always a great deal more than lukewarm; let the pan ſtand working thus for about three days and nights, and then draw it, or take out the Salt. The brine remaining will, by this time, be ſo cold, that it will not work at all, therefore freſh coals muſt be thrown upon the fire, and the brine muſt boil for about half an hour, but not near ſo violently as before the firſt drawing; then with the uſual inſtrument take out ſuch Salt as is beginning to fall, and put it apart; then let the pan ſettle and cool. When the brine becomes no hotter than one can juſt put one's hand into it, proceed as before, and let the quantity of alum not exceed an ounce and a quarter, and about eight and forty hours after draw the pan, and take out all the Salt. *Lowndes's Brine Salt improved.*

This is Mr. Lowndes's proceſs; only he afterwards directs cinders to be chiefly uſed in preparing the fires, the better to preſerve an equal heat; and by that means alſo he propoſes ſaving a conſiderable expence, aſſerting, that at preſent cinders are ſo little valued in Cheſhire, as to be thrown out into the highways. Mr. Lowndes adds, that, in a pan of ſize beforementioned, there may be prepared, at each proceſs, ſixteen hundred pounds weight of Salt from the beſt brine in Cheſhire, and one thouſand and ſixty-ſix pounds from the ordinary brine of that county. This, as the proceſs continues five days, is a little more than five buſhels and a half of Salt a day, from the beſt brine, and a little more than four buſhels a day from the ordinary kind.

Sea SALT (*Dict.*)—The moſt convenient works for the making this Salt are conſtructed in the following manner: the ſaltern is erected at ſome convenient place near the ſhore; it is a long and low building, conſiſting of two parts, one called the fore-houſe, and the other the pan-houſe or boiling-houſe. The fore-houſe ſerves to receive the fuel, and cover the workmen; and in the boiling-houſe are placed the furnace, and the pan in which the Salt is made. And in ſome places they have two pans, one at each end of the building, and the fuel and place for the workmen are the middle. The furnace opens into the fore-houſe by two mouths, and from theſe is carried up a wall to prevent the aſhes from flying to the Salt pans, and in this is a door of communication between the two houſes. The body of the furnace conſiſts of two chambers, divided from one another by a brick work called the mid feather, which from a broad baſe terminates in a high edge nigh the top of the furnace, and, by means of ſhort pillars of caſt iron fixed upon it, ſupports the Salt pan. The pans are oblong and ſhallow, the common meaſure being fifteen feet in length, twelve feet in breadth, and ſixteen inches in depth; they are commonly made of plates of iron joined together with nails, and the joints filled with a ſtrong cement; and the bottom of the pan is prevented from bending down, or changing its figure, by hooks faſtened to ſtrong iron bars which are placed acroſs it.

Between the ſides of the pan and the walls of the boiling-houſe there runs a walk five or ſix feet broad, where the workmen ſtand to draw out the Salt. The roofs are wood, and are faſtened with pegs of wood, nails mouldering away into ruſt in a few months.

Not far diſtant from the ſaltern on the ſea ſhore, between full ſea and low water mark, they make a little pond in the rocks, or with ſtones in the ſand; this they call a lump, and from this pond they lay a pipe; through which, when the ſea is in, the water runs into a well adjoining to the ſaltern, and by this well they pump it into troughs, by which it is conveyed into their ſhip or ciſtern, in which it is ſtored up till they have occaſion to uſe it.

The ciſtern is built cloſe to the ſaltern, and may be placed moſt conveniently between the boiling-houſes on the backſide of the fore-houſe. It is made either of wood, brick, or clay, and ſhould be covered with a ſhed, that the Salt-water in it may not be weakened by rains, and ſhould be placed ſo high that the water may conveniently run out of it into the pans. When the ſea-water has ſtood in the ciſtern till the mud and ſand are ſettled from it, it is drawn off into the Salt pan; and, at the four corners of the Salt pan, where it is ſupported by the brick work, and conſequently the flame does not touch its bottom, there are placed four ſmaller leaden pans and ſcratch pans, which, for a Salt pan of fifteen feet, are uſually about a foot and half long and a foot broad, and three inches deep. Theſe have a bow or circular handle of iron, by which they may be drawn out with a hook when the liquor in the pan is boiling.

The Salt pan being filled with ſea-water, a ſtrong fire of pit-coal is lighted in the furnace, and then, for a pan which contains about fourteen hundred gallons, the Salt-boiler takes the whites of three eggs, and incorporates them all with two or three gallons of ſea-water, which he pours into the Salt pan, while the water contained therein is only lukewarm, and mixes this with the reſt by ſtirring it about with a rake. In many places they uſe inſtead of eggs the blood of ſheep or oxen to clarify the ſea-water; and in Scotland they do not give themſelves the trouble of clarifying it at all. As the water heats, there ariſes a black frothy ſcum upon it, which is to be taken off with wooden ſkimmers. After this, the water appears perfectly clear, and, by boiling it briſkly about four hours, a pan loaded in the common way, that is about fifteen inches deep, will begin to form cryſtals upon its ſurface. The pan is then filled up a ſecond time with freſh ſea-water; and, about the time when it is half filled, the ſcratch pans are taken out and emptied of a white powder, ſeeming a kind of calcarious earth, which ſeparates itſelf from the ſea-water, during its boiling before the Salt begins to ſhoot. When theſe have been emptied, they are again put into their places, where they are afterwards filled again. This powder, being violently agitated by the boiling liquor, does not ſubſide till it comes to the corners of the pan where the motion of the maſs is ſmaller, and it there falls into theſe pans placed on purpoſe to receive it.

The ſecond filling of the pan is boiled down after clarifying in the ſame manner as the firſt, and ſo a third and a fourth; but in the evaporation of the fourth, when the cryſtals begin to form themſelves, they ſlacken the fire, and only keep the liquor ſimmering. In this heat they keep it all the while that the Salt is granulating, which is nine or ten hours. The granules or cryſtals all fall to the bottom of the pan; and when the water is almoſt all evaporated, and the Salt lies nearly dry at the bottom, they rake it all together into a long heap on one ſide of the pan, where it lies a while to drain from the brine, and then is put into barrows and carried to the ſtore-houſe, and delivered into the cuſtody of his majeſty's officers. In this manner the whole proceſs is uſually performed in twenty-four hours, the Salt being commonly drawn out every morning. This is the method in moſt of our Salt works, but in ſome they fill the pan ſeven times before they boil up the Salt, and ſo take it out but once in two days, or five times in a fortnight. In the common way of four boilings, a pan of the uſual ſize, containing one thouſand three-hundred gallons, they draw from fifteen to twenty buſhels of Salt every day, each buſhel weighing fifty-ſix pounds.

When the Salt is carried into the ſtore-houſe, it is put into drabs, which are partitions, like ſtalls for horſes, lined at three ſides, and the bottom with boards, and having a ſliding board on the foreſide to draw up on occaſion. The bottoms are made ſhelving, being higheſt at the back, and gradually inclining forwards; by this means the brine, remaining among the Salt, eaſily ſeparates and runs from it, and the Salt in three or four days becomes ſufficiently dry; in ſome places they uſe cribs and barrows, which are long and conic wicker baſkets for this purpoſe, and in ſome places wooden troughs with holes in the bottom. The ſaline liquor which remains after the making of Salt is what is called bittern.

The ſides of the pans in which the Salt is made, are ſoon cruſted over with the ſame ſort of matter formed into cakes or cruſts, that falls in powder into the ſcratch pans; this the workmen call ſtone ſcratch; they are obliged to cleanſe the pans of it once in a week or ten days, otherwiſe they will be burnt: in England they do this with iron picks, but at Hall in Saxony they have a much better method; for they then take out the pans, and, turning them bottom upwards, burn ſtraw under them, by which means the matter of the cruſt looſens itſelf, and after this it falls off on being ſtruck with a mallet or hammer. *Brownrig of Salt.*

In Lancaſhire, and ſome other parts of England, ſea Salt is made in this manner: they pare off, in dry weather, in ſummer, the ſurface of the flats, which are covered at full ſea, and bare when the tide is out. When they have procured heaps of this, they put it into troughs, and pour freſh water on it; this waſhes off the Salt that hung about the ſand, and is received ſo impregnated into veſſels ſet underneath the troughs. So long as this liquor is ſtrong enough to bear an egg, they put on more water; when an egg ſinks in it, they throw the ſand out of the troughs, and put in freſh from the heaps. The water thus impregnated with Salt they boil in leaden pans, and evaporate to a dryneſs, the Salt remaining behind. *Ray's Engliſh Word.*

Salt upon SALT, a name given to a kind of common Salt prepared by the Dutch, of great uſe in preſerving herrings and other fiſh, and to which they principally owe their advantages in their herring trade. The Dutch prepare two kinds of refined Salt, one of a ſmall grain, intended for the uſe of the table, and called butter Salt. They export large quantities of this to the countries upon the Rhine, and into other parts of Germany. The other kind is a very ſtrong and pure Salt, and is of the largeſt grain of any boiled Salt, now made: this laſt they call the St. Ubes or Liſbon Salt, from its reſemblance to the pure bay Salt made in thoſe places.

The Salt, which they refine, is altogether marine bay Salt, and they chiefly have it from France and Spain; but they find, by experience, that any one kind of bay Salt does not anſwer their purpoſes ſo well as two or more kinds; they therefore frequently mix three parts of Cadiz Salt with one part of that of Souſton, which is of great ſtrength, but very dirty, and of a green colour, and does not coſt above half the price of the Spaniſh Salt; for diſſolving the bay Salt, they uſe ſea-water, which they bring in lighters to Dort and Rotterdam from below the Brill or Helvoet; out of theſe lighters it is craned into cellars, and is thus impregnated with bay Salt to a certain degree of ſtrength, which they determine by hydrometers made for that purpoſe. After the heavy droſs of the Salt is ſubſided to the bottom of the cellar, the clear brine is pumped up into the Salt pan through a mat, which retains the light ſcum, ſtraws, or other impurities, which floated on the ſurface of it. Theſe Salt pans are of iron, of a round figure, and commonly forty feet in diameter, and eighteen inches deep. Theſe pans are placed over a hearth furnace, and the only fuel they uſe in the boiling the Salt is dry turf. The fire is kept up ſo high, that the liquor boils briſkly all the time, and, if any ſcum ariſes, they carefully take it off, but they uſe no clarifying mixtures. A little before the Salt begins to granulate, they add to the pan a lump of butter, of the bigneſs of a walnut, and half a pint of ſour whey, which has ſtood at leaſt half a year. When theſe things are perfectly mixed in by a good ſtirring, they ſhut the doors and windows of the houſe, that no air can blow in cold, and the houſe is kept thus hot all the time that the Salt is forming. This method is not new, or peculiar to the Dutch works, for Agricola deſcribes an apparatus of board, to keep the cold air out of the Salt pan all the time that the Salt is forming; and the Germans uſe it in many places at this time.

It is out of this ſame brine, and by the ſame proceſs, that they make the table Salt and the ſtrong Salt; only towards the end of the proceſs they make this difference, if the pan is to be wrought into table Salt, the brine is kept gently ſimmering during the whole operation, and all is finiſhed in twenty-four hours; but, if it be to be made into the ſtrong Salt, they ſlacken the fire to ſuch a degree, that the operation takes up three days. In both caſes they let the ſalt remain in the pan till the whole is finiſhed; they then rake it out with wooden rakes, and after it has drained a while in wooden drabs, it is fit for uſe. The mother brine, of which there always remains a large quantity in the pan after the ſtrong Salt is made, as alſo the drainings of the drabs where the Salt is put, is reſerved to be boiled up into table Salt; but the mother brine of the table Salt becomes more ſharp and bitter after every proceſs, and is finally thrown away. *Brownrig of Salt.*

Sedative SALT, a name given by the modern chemiſts to a Salt, of the virtues of which they boaſt much. Thoſe who firſt deſcribed it gave the proceſs for making it in a very enigmatical manner; and their ſucceſſors invented many different ways of preparing it. The truth is, that all mixtures of borax with the vitriolic acids furniſh us with a ſedative Salt, as do alſo the mixtures of borax with ſpirit of nitre or of ſea Salt.

Vitreous SALT, in chemiſtry, a term uſed by ſome modern chemiſts for a kind of Salt, which, till of late, has wanted a name, and which is found in and ſeparable from the fixed alcaline Salts of vegetables.

It is bitter, hard, fixed, and not alcaline, and of a cryſtalline or gloſſy appearance.

The method preſcribed by Boerhaave for the procuring it with moſt eaſe, is this: put ſix pounds of the beſt pot-aſhes into a clean glaſs, add thereto twenty pints of cold rain water, ſtir them together with a ſtick, and ſuffer the whole to reſt. When the aſhes are thoroughly diſſolved, gently decant the clear lixivium, and there will be found at the bottom, mixed with the fæces, a number of ſmall greyiſh granules, of a bitter taſte, and of an almoſt glaſſy brittleneſs and hardneſs; theſe are the Salt required, and contain no alcaline quality; but, to obtain it in greater purity, diſſolve ſix pounds of pot-aſhes in fourteen-times their weight of water; filtre the lixivium while hot, and make it perfectly clear; then put it into a glaſs veſſel ready heated, and moiſtened, and ſuffer it to ſtand; a duſky cruſt will ſoon begin to ſhoot to the bottom and ſides of the glaſs, and will gradually become thicker and thicker; at length when no more appears to ſhoot, pour off the liquor, and there will remain behind a Salt like the former, but purer, and in larger quantities: if the remaining lixivium be boiled a little, and ſet to cryſtalliſe again, it will afford a ſmall quantity more of this Salt; but after this it will yield no more; whence there ſeems to be only a certain and determinate quantity of this Salt contained in the alcali. If this Salt be put into a veſſel of rain water and ſhook about, it does not diſſolve, only the alcali waſhes off, and the Salt remains purer than before: after this, it is to be gently dried and kept. *Boerhaave, Chem.*

SALT *marſh, ſalina*, a place where Salt is made, of which there are many natural ones in the hotter countries, where the ſea, exhaling the water of Salt lakes, leaves the Salt dry and ready for uſe at the bottom, without any art or labour of man to make it: thus, in Muſcovy and ſome other places, there are whole fields of Salt.

The countries, however, where this is not naturally performed, may effect it by art, and make ſaline or Salt marſhes, where they may uſe the ſun's heat to great advantage. This is annually done to great advantage in France, and there is no reaſon why we may not do the ſame, either at home or in our American colonies, though it has not yet been attempted.

In order to make a ſaline or Salt marſh, a low plat of ground muſt be choſen, adjoining to the ſea, and diſtant from the mouths of large rivers, and this muſt be near ſome convenient harbour for veſſels. The ground muſt be free from freſh water ſprings, and out of the reach of land floods, and if poſſible ſhould have a clayey bottom; and finally, it muſt be well defended from the ſea, either by natural or artificial banks of earth of a proper ſtrength and thickneſs.

The ground thus choſen muſt be hollowed out to three ponds or receptacles. The firſt into which the ſea-water is uſually admitted may be called the reſervoir. The ſecond receptacle, which is to be divided into three diſtinct ponds, communicating with each other by narrow paſſages, and containing brine of different degrees of ſtrength, may be called the brine ponds; and the third receptacle is to be furniſhed with an entrance, between which and the brine ponds there is to run a long, narrow, and winding channel; the reſt of it is to be divided into ſmall and ſhallow pits, containing a very ſtrongly ſaturated brine, which in them is to be converted into Salt, and they may therefore very properly be called the Salt pits.

The firſt receptacle or reſervoir muſt have a communication with the ſea by a ditch, defended on each ſide by walls of brick or ſtone, and made of ſuch a depth, that by it all the water of the reſervoir and other parts of the Salt marſhes may be able to run out at low water, and by it, alſo, the ſea may be admitted into it at high tide. So that at neap tides the marſh may be filled with ſea-water to the depth of ten inches in the reservoir; and, consequently, at higher tides, to the depth of two feet, when there is occasion to overflow the marsh, as is always to be done in the winter season, when there is no Salt to be made; for, by this means, the wood work is kept from decay, and the clay bottom from injuries by frost. The ditch between the reservoir and the sea must have a flood-gate, by which the sea water may be admitted, retained or let out as occasion may require. *Brownrig of Salt. Phil. Trans.* N°. 51.

The several ponds or receptacles must not have all their bottoms upon the same level, but must be made of unequal depths, so that the first receptacle or reservoir may be eight inches and a half deeper than the Salt pits in the third receptacle. The three brine ponds also situated between the reservoir and the Salt pits must be of unequal depths. The next adjoining to the reservoir must be the deepest, and that which is nighest the Salt pits the shallowest, but all of them must be shallower than the reservoir; and the three receptacles being thus constructed, the water standing at the same height in them all, and forming with its surface one continued plain, will be ten inches deep in the reservoir, when only an inch and half in the Salt pits.

The length and breadth of the brine ponds and reservoirs are to be at discretion; but it is best to err in making them too large, and in general they ought to be so large as to furnish the Salt pits with a constant supply of brine, fully saturated with Salt; and, for this purpose, it is necessary to have them of different dimensions, in different countries, according to the degree of heat.

The bottoms of the reservoir and brine ponds are to be lined with any kind of lean and tough clay, or earth, that will hold water; and the French use a red, or blue clay, to be had in in the neighbouring grounds. With them, the blue always succeeds better than the red, which colours the Salt much more; but in order to have a perfectly pure Salt from this kind of manufacture, the bottom should be lined with some clean cement, which will hold water perfectly, and will not be easily broken up. Id. Ibid.

The salina or marsh being thus constructed, the saltmen, at the proper season of the year, open the flood-gate when the tide is out, and drain off all the stagnating water; when this is done, they repair the bottom of the marsh in several places, where it is found necessary, and cleanse the several receptacles from mud and dirt: after this they admit the sea-water, at the next high tide, till it floats the whole marsh, and stands at about ten inches high in the reservoir. In a day or two most of the water in the Salt pits is exhaled, and what remains is a very strong brine; they then let in more sea-water at the two or three following tides, and so take care to admit as much water fresh into the marsh as has been wasted in vapour by the heat, constantly raising it to the height of ten inches in the reservoir, and, consequently, to an inch and a half in the Salt pits; and when the weather is extremely hot, or there are sharp drying winds, they fill them something higher than this.

All the parts of the marsh are thus supplied with water out of the reservoir, but the sea-water which is let into the reservoir, is not confusedly let into the other water or brine of the ponds and Salt pits; for, as the several parts of the work communicate only by narrow channels, it is provided, that the Salt water flowing out of the reservoir never returns to it again, but gently flows along till it arrives at the second brine pond, and from that to the third, being forced forwards by the sea water received from time to time into the reservoir: during this slow course, the watery fluid always flies off in great quantity by exhalations, and the brine is continually preparing for crystallisation, as it flows along gently, growing all the way stronger and stronger, as it approaches the Salt pits; so that, when it at length enters these pits, it is fully saturated with Salt; and particular care is taken to guard the entrance of the Salt pits by a long and narrow channel, by which means the strong brine contained in these pits is prevented from returning back, and mixing with the weaker brine in the brine ponds; care is also taken, that the strong brine in the Salts pits is spread out very thin, and exposed to the sun and air with a large surface, by which means the water more quickly exhales from it, and the Salt is left concreted into crystals. These crystals, or Salt, the workmen in France draw out every day, and dispose them at length together in a pyramidal heap, which they cover over at the top with thatch or straw, and so preserve them from the injuries of weather. Thus at a small expence and trouble a Salt is prepared, which is found very fit for all domestic uses; and France is furnished with a very profitable article for exportation into other countries.

Glauber's purging SALT (*Dict.*)— Though this be a well known preparation, and the result of a mixture of a vitriolic acid with marine Salt, and the world has supposed it could be no other way found than by such an union made by art; yet Mr. Heliot has communicated to the academy of sciences at Paris, an account of its being found in vitriol alone, without the addition of any foreign matter.

The common green vitriol or copperas is well known to be made in England, by an union of the sulphureous acid of the common pyrites and iron. Old iron is thrown into large quantities of a solution of the pyrites, that it may be dissolved; and the union produces a concrete in the form of a regular salt. This Salt we well know contain a sulphureous matter; whether that be obtained from the pyrites, or from the iron that enters its composition; since, in the distillation of its oil, there ever escapes a very strong and penetrating scent of sulphur through the junctures of the vessels.

There are also some vitriols, particularly the common Swedish kind, which may very probably be aluminous; since the yellow shining gold-like marcasite from which it is made, yields in its native state true sulphur in distillation, and afterwards affords vitriol in the lixivium, after the remainder has been long exposed to the air; and, finally, it yields also alum, by the addition of urine and pot-ashes to what they call the mother water of vitriol.

Mr. Lemery has shewn, that after a moderate distillation of green vitriol, a salt of the nature of alum may be drawn by a lixivium from the colcothar; and, besides this, Mr. Heliot has found in that colcothar, a vitrifiable earth, and a genuine Glauber's Salt. Those who are at all acquainted with chemistry, know that Glauber's Salt is a concrete composed of the vitriolic acid and Sea salt, and it is generally received as a certainty that any other acid joined to sea Salt cannot afford this concrete; therefore, if Glauber's Salt is to be produced from sea Salt alone, and yet is proved to be found in pure vitriol; it must follow, that pure vitriol does contain sea Salt, or at least, that substance which is the basis of sea Salt: and this will prove a less singular observation, if it can be evinced, according to Becher, that all the known Salts owe their origin to marine Salt.

Mr. Lemery, in order to procure his aluminous salt from vitriol, does not push his distillation too far, that the acid may remain engaged and entangled in that earth, by the union with which it is to form this salt, which is afterwards to be separated by lixiviation; but Mr. Heliot pushes the distillation to the utmost degree with a violent fire of three or four days and nights, such as Kunckel prescribes, for the divesting vitriol of all its acid, that the remainder in the retort may contain little or no salt at all. He took eighteen pounds of English vitriol, which he calcined to a redness, and by that means reduced it to six pounds. This quantity, though put in a covered earthen vessel, acquired nine ounces in weight from the humidity of the air in two days; and in this state it was put into a German retort, and urged to that degree by the violence of fire, for so long a continuance, that the remaining black mass, though treated with all the care imaginable, and washed by repeated lixiviation, yielded only two ounces and a half of Salt, and that of a very earthy kind. About nine ounces of phlegm had been separated at the beginning of the distillation, but when the white vapours began to appear, the vessels were all closed, and so kept to the end of the operation; the produce of which was an icy oil of vitriol, which was found in a black crystalline form.

The success of the operation, as to the procuring this icy oil of vitriol, depends on the nice luting the junctures of the vessels, so as to prevent all communication with the external air; for otherwise the vapours attract a moisture from the air, which renders them fluid in the receiver.

The receiver must also be placed at a considerable distance from the retort, that it may be cool enough to condense the vapours, and large enough to prevent their exploding for want of room; for though the preceding calcination has carried off the more valuable parts, yet there remains matter enough for great explosion, and for the formation of a substance not less inflammable, than crude sulphur, were the acid in a less proportion.

The best method is to fit to the neck of the retort a receiver with two necks; the one of which receives that of the retort, and the other is received into a capacious single receiver, of the common kind.

The icy oil is not easily got out of the receiver, for it exhales so strong a sulphureous vapour, that if it be placed lower than the operator's head, it would suffocate him in a moment.

This icy oil is black, because it carries over with it a quantity of that oily matter, which no vitriol is ever entirely free from, and which is always found in the mother water, as it is called, of vitriol, after the repeated crystallisations of the salt from it; and it is well known, that any inflammable substance, in ever so small a quantity, will turn the purest oil of vitriol black; nor is this all, for the acid spirits also, when urged by a violent fire, carry over with them iron, or at least such particles as are capable of becoming iron. This is easily demonstrated in either the common or the blackest crystals of the icy oil of vitriol; for, if these be dissolved in a large quantity of pure distilled water, and allowed to stand seven or eight days, there always precipitates to the bottom of the vessel a sediment, which, after it has been calcined, has many particles which readily answer to the magnet. Besides this oily matter, and these particles of iron, the oil of vitriol carries with it also a white, heavy, and crystalline substance, of the nature of earth, which may be separated, by means of spirit of wine, from

from oil of vitriol, ever so well rectified. The same sort of earth is also found in the Salt, which is extracted from the caput mortuum, left after the distillation of the icy oil. The lixivium, made by this author from the remaining mass, left after the distillation of the icy oil of vitriol, was exposed to the air, in a glass cucurbit, for the space of six months; and the saline liquor, concentrated by evaporation in a sand-heat, became green, and would by no means crystallise. The first saline pellicles had a saline but earthy taste; these precipitated by degrees of themselves, and were finally succeeded by others, which tasted acid, but not greatly so. This liquor being evaporated to a dryness, an ounce of the remainder was put into a retort, and four ounces of oil of vitriol were put on it, with one ounce of water, to forward the dissolution; this was kept in digestion twenty days, at the end of which time the liquor acquired a green colour, which shewed that there were yet in the mass metallic parts for it to dissolve: this was finally distilled with a gentle heat to separate the phlegm, and afterwards the fire was increased to drive over the acid; the oil of vitriol came over as strong, as it was when put on, but much more sulphureous. The distilled oil, being returned upon the salt, with the fresh addition of a small quantity of water, became so hot, that the vessel could not be held in the hand; which had not been the case in the first mixture, at least not in any sensible degree. Several more cohobations made it yet more and more acid, and at length it became so caustic, as to leave an eschar on being just touched upon the tongue.

The green colour, which the acid first received, became at length changed into a blue one, which gave suspicion that there was copper, as well as iron, in the vitriol. This might appear strange, as it was English vitriol that was used; but Kunckel has proved by experiments, that there is some copper in all vitriol, even in the English; nay, he advances, that in the vitriol of iron, made with oil of vitriol, and filings of that metal, there may always be discovered some portion of copper; and, in fine, that there is no iron but contains some portion of copper, and no copper but contains some portion of iron.

After the sixth cohobation of this blue liquor, there remained a granulated and filamentous saline sediment, on the surface of which there was a small quantity of a yellow sublimation, resembling flower of sulphur; warm water, being poured upon this matter, became of a greenish colour; and this, being digested in a sand-heat, became afterwards reddish, and precipitated to the bottom a white and very heavy powder; which, on a series of examinations, proved to be of the nature of that opake white stone, usually found among the ores of metals, and called by the Germans quartz. The saline liquor, from which this was separated, became yet redder, by longer digestion, but, when cold, it turned to a fine green.

This liquor, being concentrated, by evaporation, to the quantity of two or three ounces, was put into a glass vessel, with its pellicle, which soon precipitated itself to the bottom, in form of a thin crust, covering the surface of the glass in the manner of a wet paper. In five or six weeks time, there became formed in this vessel, both at the bottom and sides, a number of large crystals, of a beautiful green colour, and, as the liquor dried away, these mouldered into a brownish red powder. In fine, there appeared, in the remainder of this liquor, another sort of crystals; these were white and transparent, and were formed in square columns, with their extremities cut in the manner of those the pyramids of the columns of Glauber's Salt; they had also a better taste, and left a remarkable sense of coldness on the tongue. These appeared indisputably, by these and all other trials, to be true Glauber's Salt. *Mem. de l'Acad. Scien. Par.* 1738.

It is to be observed, that, though Glauber made this Salt known about the middle of the preceding century, yet Kunckel in his Laborat. Chymic. assures us it was known in the electoral house of Saxony an hundred years before. However this be, we owe the knowledge of it to Glauber, who called it admirable; and it soon acquired, and has ever since maintained, the reputation of an excellent internal medicine in many cases.

Glauber's Salt may be obtained from borax, by mixing oil of vitriol with it. Mix four ounces of borax with one ounce and one drachm of oil of vitriol; upon sublimation, this gives the sal sedativum of Homberg, and the residuum, exposed to a strong fire, affords Glauber's Salt. This operation may be shortened very much, for, instead of sublimation, the salt may be obtained by crystallisation, in light foliated laminæ. This Salt, whether prepared by sublimation or by crystallisation, has the property of dissolving in spirit of wine; and, if this spirit of wine be set on fire, the flame is green. Spirit of wine has no effect on borax, and the oil of vitriol, digested with it, does not make its flame green. Therefore it is necessary, in order to give this greenness to the flame, that borax should be united to an acid. *Philos. Trans.* N°. 436.

SALT-*petre*. See NITRE, *Dict.* and *Sup.*

SAMARITANS (*Dict.*)—Salmanazar, king of Assyria, having conquered Samaria, led the whole people captive into the remotest parts of his empire; and filled their place with colonies of Babylonians, Cutheans, and other idolaters. These, finding themselves daily destroyed by wild beasts, desired an Israelitish priest to instruct them in the ancient laws and customs of the land they inhabited. This was granted them; and they thenceforth ceased to be incommoded with any beasts. — However, with the law of Moses, they still retained somewhat of their ancient idolatry. The Rabbins say, they adored the figure of a dove on mount Gerizim.

Be this as it will, it is certain, the modern Samaritans are far from idolatry: some of the most learned among the Jewish doctors own, that they observe the law of Moses more rigidly than the Jews themselves.—They have a Hebrew copy of the Pentateuch, differing in some respects from that of the Jews; and written in different characters, commonly called Samaritan characters; which Origen, Jerom, and other fathers and critics, ancient and modern, take to be the primitive character of the ancient Hebrews; though others maintain the contrary. The point of preference, as to purity, antiquity, &c. of the two Pentateuchs, is also disputed by the modern critics.

The Samaritans are now few in number; though it is not very long, since they pretended to have priests descended directly from Abraham. They were chiefly found at Gaza, Neapolis (the ancient Sichem) Damascus, Cairo, &c. They had a temple, or chapel, on mount Gerizim, where they performed their sacrifices.

Joseph Scaliger, being curious to know their usages, wrote to the Samaritans of Egypt, and to the high-priest of the whole sect, who resided at Neapolis. They returned two answers to Scaliger, dated in the year 998 of the Hegira of Mahomet. These answers never came to the hands of Scaliger. They are now in the French king's library, and have been translated into Latin by father Morin, priest of the oratory; and printed in the collection of letters of that father in England, 1682, under the title of Antiquitates Ecclesiæ Orientalis. M. Simon has inserted a French translation, in the first edition of Ceremonies & Coutumes des Juifs, by way of supplement to Leo de Modena.

In the first of these answers, wrote in the name of the assembly of Israel in Egypt, they declare, that they celebrate the passover every year, on the fourteenth day of the first month, on mount Gerizim; and that he who then did the office of high-priest, was called Eleazar, a descendant of Phineas, son of Aaron.—At present they have no high-priest. In the second answer, which is in the name of the high-priest Eleazar and the synagogue of Sichem, they declare, that they keep the sabbath in all the rigour wherewith it is enjoined in the book of Exodus; none among them stirring out of doors, but to the synagogue. They add, that on that night they do not lie with their wives; that they begin the feast of the passover with the sacrifice appointed for that purpose in Exodus; that they sacrifice no where else but on mount Gerizim; that they observe the feasts of harvest, the expiation, the tabernacles, &c. They add further, that they never defer circumcision beyond the eighth day; never marry their nieces, as the Jews do; have but one wife; and, in fine, do nothing but what is commanded in the law: whereas the Jews frequently abandon the law to follow the inventions of their rabbins.

At the time when they wrote to Scaliger, they reckoned one hundred and twenty-two high-priests; affirmed that the Jews had no high-priests of the race of Phineas; and that the Jews belied them, in calling them Cutheans, whereas they are descended from the tribe of Joseph, by Ephraim.

The truth is, the Jews impose abundance of things on the Samaritans: they frequently confound them with the Sadducees, as if they were infected with their errors.—Rabbi Benjamin, who lived in the XIIth century, confirms the best part of what we have said of the Samaritans: he observes, they had priests of the tribe of Aaron, and who never married with any but those of the same tribe: that they sacrificed on mount Gerizim, where they had an altar of stone raised by the Israelites after passing over Jordan. He adds, that they are of the tribe of Ephraim; that they change their habit to go to the synagogue, and wash before they put it on.

SAMARITAN *Medals*, (*Dict.*)—These medals have been infinitely canvassed by the critics, both Jewish and Christian; particularly rabbi Alascher, rabbi Bartenora, rabbi Azarias, rabbi Moses, father Kircher, Villalpandus Waserus, Conringius, Hottinger, father Morin, Walton, Hardouin, Spanheim, &c.

The learned jesuit Souciet, in an express dissertation on the Samaritan Medals, rejects all Hebrew medals, whose inscriptions are in Chaldee characters, as spurious; and allows of none to be genuine but the Samaritan.—Of these there are four kinds.

The first bear expressly the name of Simon, and the subject for which they were struck, viz. the deliverance of Jerusalem. The second kind have not the name Simon, but only the deliverance of Sion, or Jerusalem. The third kind have neither Simon, nor the deliverance of Sion, but only the epocha's, first year, second year, &c. The fourth class have neither any inscriptions, nor any thing whence one may judge of the time when they were struck.

The

The three first kinds were certainly struck after the return from the Babylonish captivity, and in the time of Simon Maccabeus, after Jerusalem had been freed from the yoke of the Greeks. But, though struck after the captivity, father Souciet observes, their character shews itself to be that of the ancient Hebrew, which was used before the captivity, and the use whereof was lost by the people, during their sojourn in Babylon and Chaldea; but restored, after their return, on the same footing as before. He adds, that the inscriptions are pure Hebrew, such as it was spoke before the captivity; that the character, therefore, is the true ancient Hebrew character: that it was customary to write each language in its proper character: that, if they had departed from this rule, they had doubtless used the new character they brought with them from Babylon: that there could be no other reason, but that of settling all things on the same foundation they were on before the destruction of Jerusalem, that could have induced them to use this character on their coins. And, lastly, that these medals were not struck by the Samaritans, but by the Jews, and in Jerusalem.

F. Souciet is very full on all these points, and, to the proofs drawn from medals, adds two others foreign thereto: the first drawn from the resemblance of the Greek letters, introduced by Cadmus the Phœnician, with this Hebrew character; which was the same with that of the Phœnicians, as the language of those people was the same with that of the Hebrews. —The second drawn from several various readings in the scriptures, which cannot be well accounted for otherwise, than by supposing, that the books wrote before the captivity were in the same character with these medals, and which shew, that it is the conformity which certain letters have in that character, that has deceived the copyists.

From the whole, he concludes, that this character of the medals is the true antient Hebrew character; and, that to judge of the various readings of the Hebrew text, and the differences of the ancient Greek and Latin translations, either from themselves, or from the Hebrew text, recourse must be had to this character.

SA'MLET, an English name for a fish of the truttaceous kind, caught in Herefordshire, and some other parts of England, and called, by Willughby, salmulus. *Willughby's Hist. Pisc.*

SAMP, in our American colonies, a name given to a sort of bread made of the maiz, or Indian corn.

They first water the corn for about half an hour, and then beat it in a mortar, or grind it in a hand mill; they then sift out the flour, and winnow the husks from it; they then mix this into a thin paste with water, and bake it in flat loaves, which they call Samp loaves, or Samp bread.

Besides this they have another dish prepared of this corn, which they esteem a great delicacy, and call by the name of Samp, without the addition of loaf or bread. To make this, they only bruise or grind the corn to the size of rice, and then, winnowing away the husks, they boil it gently till it is thoroughly tender, and then add to it milk and butter, and sugar: this is not only a very wholesome, but a very pleasant dish. It was the first diet of our planters when newly settled there, and is still in use, as an innocent food in sickness as well as health.

The Indians, who feed on this sort of food, are found never to be subject to the stone, and to escape several other painful diseases.

The English have found a way of making a very good sort of beer of the grain of this Indian corn: they do this either by using the bread made of it, or else by malting it as we do our own corn. When they make the beer of the maiz breed, they break or cut it into lumps as big as a man's fist; they mash these in the same manner that we do malt, and boil up the wort in the same manner, either with or without hops. *Phil. Transf.* N°. 142.

SA'NCTUARY, among the Jews, was the holiest and most retired part of the temple of Jerusalem; wherein was preserved the ark of the covenant, and into which nobody was allowed to enter but the high-priest, and that only once a year, to intercede for the people.

The Sanctuary, called also sanctum sanctorum, or holy of holies, is supposed to be a type or figure of heaven, and of Jesus Christ the true high-priest, who is ascended thither to make intercession for us.

Some will have it, that the whole temple was called the Sanctuary; and that the sanctum sanctorum, where the ark was kept, was only a little chapel or oratory therein.

To try or examine a thing by the weight of the Sanctuary, is to examine it by a just and equal scale; in regard, among the Jews, it was the custom for the priests to keep stone weights, to serve as standards for regulating all weights by; though these did not differ from the royal, or profane weights.

SANCTUARY, *or asylum*, also signified, a place of refuge or protection.

Some pretend, the first asylum in Greece was that established by order of the oracle of Jupiter Dodonæus, which commanded the Athenians to grant their lives to all those who fled for Refuge into the Areopagus, to the altars of the Goddesses. But others say, the first asylum was built at Athens, by the Heraclidæ, and was a refuge for those who fled from the oppression of their fathers. The asyla of altars and temples were very ancient in the time of Pausanias; who writes, that Neoptolemus, the son of Achilles, was slain near the altar of Apollo at Delphos, as a just punishment for his killing Priam, king of Troy, who had fled to the altar of Jupiter Herceus for refuge. The temple of Diana at Ephesus was the most famous asylum. The privileges of the asyla were inviolable; whence Tacitus complains, that the Grecian temples were filled with the worst of slaves, with insolvent debtors, and criminals, who fled from justice; and that no authority was sufficient to drive them from thence. Yet we meet with instances of obliging such persons to quit their Sanctuary, by starving them, or by setting fire to their place of refuge. All temples were not Sanctuaries, but such only as received that privilege from the manner of their consecration; and, of those which enjoyed this privilege, some were free for all men, others appropriated to certain persons or crimes. Nor was this honour paid to the Gods only, but also to the statues, or monuments, of princes, and other great persons.

When Romulus built Rome, he left a place, covered with wood, between the capitol and the Tarpeian rock, as an asylum to all persons, who should fly thither, whether freemen, or slaves. This asylum at Rome remained sacred, and was not violated, till the reign of Tiberius, who, seeing its abuses, abolished it. At last the asyla were so little regarded, that they served only as a protection for small offenders; for the magistrates made no scruple of forcing great criminals from the very altars.

The Jews had their asyla; among these, the most remarkable were the cities of refuge; in order to provide for the security of those who, by chance, and without any design, happened to kill a man. They were six in number, three on each side Jordan. They were commanded likewise, when they should enlarge their borders, to add three more: but, as this command was never fulfilled, the Rabbins say, the Messiah, when he comes, will accomplish it. Besides the cities of refuge, the temple, and especially the altar of burnt-offerings, enjoyed the privilege of an asylum.

This privilege began to be enjoyed by the Christians about the time of Constantine; but whether that prince made any laws concerning it, is doubted by learned men; for none appear that are older than the time of Theodosius. At first, only the altar, and inward fabric of the church, was a place of refuge; but afterwards any outer buildings, or precincts of the church, had the same privilege granted them; such as the houses or lodgings of the bishop, and clergy, gardens, baths, courts, and cloysters: and, in after-ages, this exemption was extended to the graves and sepulchres of the dead, to crosses, schools, monasteries, and hospitals. This privilege, originally, was not intended to patronise wickedness, or screen the guilty from justice; but as a refuge for the innocent, the injured, and the oppressed; or, in doubtful causes, to give men protection, till they might obtain an equitable and fair hearing: in all such cases, they were allowed thirty days protection. But, that no one might expect this indemnity, who had not a just and legal title to it, several crimes and cases were excepted by law, for which the church could grant no protection; as, first, protection was denied to public debtors, who had either embezzled, or kept back by fraud, the public revenues of the state; secondly, the Jews, who pretended to turn Christians, only to avoid paying their debts, or suffering legal punishment for their crimes; in other cases, they had the common benefit of the Sanctuary with other men: the third sort of persons, to whom this privilege was denied, were heretics and apostates; the fourth, slaves, who fled from their masters; and the fifth, robbers, murderers, conspirators, ravishers, adulterers, and other criminals of the like nature. This shews, that the original intention of Sanctuaries in the Christian church was only to protect the innocent and injured, and, in dubious cases, to grant the supposed offender a little respite. The conditions, upon which protection was granted, were, first, not to fly with arms to the church; secondly, to raise no clamour or tumult in flying thither; and, thirdly, not to eat, or lodge, in the church, but to be entertained in some outward building.

Paulinus, in the Life of St. Ambrose, relates a remarkable instance of the violating of the asyla.

Modern Sanctuaries are a great abuse of these ancient asyla of the Christian church, in giving protection to almost all sorts of criminals, and so enervating the force of the civil laws. The canon law of Gratian, and the decretals of the popes, grant protection to all criminals, except house-breakers, highway-men, and such as commit enormous crimes in the church itself, upon presumption of its protection. Polydore Virgil censures the English for granting protection to all sorts of criminals, not excepting traitors and rebels: but at present we have no such practice; no sanctuary in England, to screen offenders from justice.

SAND, *arena*, in natural history, a genus of fossils, the characters of which are: that it is found in minute concretions forming together a kind of powder, the genuine particulars of which

which are all of a tendency to one determinate ſhape, and appear regular, though more or leſs complete concretions; not to be diſſolved or diſunited, by water, or formed into a coherent maſs by means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in, nor effervefcing with acids. *Hill's Hiſt. of. Foſſ.*

Theſe are ſubject to be variouſly blended and intermixed either with homogene, or heterogene particles, particularly with flakes of talc; and according to theſe, and their different colours, are to be ſubdivided into ſeveral kinds, as red, white, &c.

Dr. Liſter divides the Engliſh Sands into two claſſes; the firſt, ſharp or rag Sand, conſiſting of ſmall tranſparent pebbles, naturally found on the mountains, and not calcinable: theſe he farther divides into fine and coarſe, and ſubdivides each, according to the colours, into white, grey, reddiſh, brown, &c.

The ſecond, ſoft or ſmooth, which he ſubdivides into that with flat particles broken from lime-ſtones, that with ſilver-like particles, and that with gold-like particles.

As to Sand, its uſe is to make the clayey earth fertile, and fit to feed vegetables, &c. for earth alone, we find, is liable to coaleſce, and gather into an hard coherent maſs, as is apparent in clay: and earth thus embodied, and, as it were, glued together, is no-ways diſpoſed to nouriſh vegetables: but if with ſuch earth, Sand, &c. i. e. hard cryſtals, which are not diſſolvable in water, and ſtill retain their figure, be intermixed, they will keep the pores of the earth open, and the earth itſelf looſe and incompact, and by that means give room for the juices to aſcend, and for plants to be nouriſhed thereby,

Thus a vegetable, planted either in Sand alone, or in a fat glebe, or earth alone, receives no growth or increment at all, but is either ſtarved or ſuffocated; but mix the two, and the maſs becomes fertile. In effect, by means of Sand, the earth is rendered, in ſome manner, organical; pores and interſtices being hereby maintained, ſomething analogous to veſſels, by which the juices may be conveyed, prepared, digeſted, circulated, and at length excerned, and thrown off into the roots of plants.

Grounds that are ſandy and gravelly, eaſily admit both of heat and moiſture; but then they are liable to theſe inconveniencies, that they let them paſs too ſoon, and ſo contract no ligature, or elſe retain it too long, eſpecially where there is a clay bottom; and by that means it either parches or chills too much, and produces nothing but moſs, and cankerous infirmities; but if the ſand happens to have a ſurface of good mould, and a bottom of gravel, or looſe ſtone, though it do not hold the water, it may produce a forward ſweet graſs; and, though it may be ſubject to burn, yet it quickly recovers with the leaſt rain.

Sea Sand is accounted a very good compoſt for ſtiff ground; for it effects the two things following, viz. it makes way for the tree or ſeed to root in ſtiff ground, and makes a fume to feed it.

Sand indeed is apt to puſh the plants, that grow upon it, early in the ſpring, and make them germinate near a month ſooner than thoſe that grow upon clay, becauſe the ſalts in the Sand are at full liberty to be raiſed, and put into motion, upon the leaſt approach of the warmth of the ſun; but then, as they are haſty, they are ſoon exhaled and loſt.

It is remarkable that Sand, though it appear a very hard, denſe, and indiſſoluble body, yet is contained inviſibly in the brine, or ſalt water of our ſalt ſprings; and even on the ſhooting of the ſalt, after evaporation, there ſtill remain the particles of it in the clear pellucid Salt; and this, though wholly ſoluble in water, yet when a brine, made by ſuch a ſolution, is boiled, depoſits as much of the Sand as the common brine of the pits, or ſea water.

Dr. Plot, who was very curious to know the true hiſtory of this ſingular effect, procured experiments to be made in the following manner: eight folds of fine Holland, and as many of much finer cambric, were put together, and, a quantity of the brine of the Staffordſhire ſalt pits being ſtrained through this, there was nothing ſeparated from it but a ſmall quantity of black duſt, which ſeemed to have fallen in by accident, and which was not at all like Sand; yet, on evaporating this brine, it was found to contain no leſs than one fourth part as much Sand as ſalt; the quantity of brine, yielding a buſhel of ſalt, yielding alſo a peck of Sand.

Some have ſuppoſed from theſe, and the like obſervations, that the Sand was generated during the time of the boiling the liquor, but the more careful examiners think otherwiſe; it appearing to them, that the particles of this Sand may be ſeen in the brine, by the help of a microſcope, before the boiling, in form of rectangular oblong plates, ſome nearly ſquare; theſe were ſo ſmall, as readily to paſs the ſtrainer with the water; and appearing as numerous in it after, as before the ſtraining, ſhew that they are no more to be kept, by ſuch means, than the ſalt.

The pores of the fineſt ſtrainers, examined by the microſcope, appear twenty times bigger than theſe plates, or particles of the Sand, and therefore it is not to be wondered at, that they let them through. There requires, therefore, no more to the formation of the Sand, than the coaleſcing of ſeveral of theſe particles into one larger granule, and ſo on; and this is very likely to be done by means of the evaporation of a part of the fluid which kept them ſeparate, and of the motion given to them in boiling, which naturally and neceſſarily brought them into the ſpheres of their own mutual attractions, at a time when their attraction with the fluid they ſwam in, was alſo much diminiſhed with its quantity. This attraction ſeems even evidently to increaſe between the particles, as the water becomes evaporated, and, when finally the Salt is drawn from it, and it is examined, as it drops from the baſkets, in which the ſalt is put to drain, it is ſeen to contain more numerous particles of this ſandy matter than before; and theſe are found to coaleſce into yet larger concretions, by degrees, as the remainder of the fluid evaporates from them on the glaſs.

The particles of this ſtony matter, when once thus united, are no more to be ſeparated by water, nor is the matter any longer ſoluble in that fluid. The common ſpar found in form of ſtalactites and incruſtations on the roofs, walls, and floors of old caverns, ſhews that it was once diſſolved in water, and by that means brought to thoſe places, and made into thoſe forms; and it ſhould ſeem, that this Sand, as it is called, was only this ſort of ſpar, which is contained more or leſs in all water; and which, on the evaporating of that water and ſeparation of the ſalt, which might help in making the water a menſtruum proper for the retaining it, ſhoots out into its own natural concretions; for the figure of theſe thin plates is the true and natural thin parallellopiped or rhomboidal figure of the ſmaller concretions of that matter, and even of thoſe pieces into which it falls on breaking. *Phil. Tranſ.* N°. 145.

Sand ſeems to have been the firſt ſubſtance added to proper ſalts for the making of glaſs. Joſephus, Tacitus, Strabo, Pliny, Agricola, &c. all mention this, and tell us of the ſtores, from which the Sand for this uſe was brought, being inexhauſtible. Latter ages have found that ſtones which have cryſtal for their baſis make a finer glaſs than Sand; of this kind are flints, &c. but theſe are all ſo expenſive in their preparation, that Sand is ſtill uſed in much greater abundance than any other ingredient. All the preparation it requires, is, that it be well waſhed before it is uſed; which much of what is uſed is found ready to their hands, being brought from the ſhores and beds of rivers.

Our glaſs-houſes, in London, uſe for their white glaſs the common white Sand uſed in writing, and have it from Maidſtone in Kent in vaſt quantities. For their green glaſs they uſe a common coarſe and greeniſh looking Sand, of which there are vaſt ſtrata at Woolwich. *Merret's Notes on Neri.*

Common Sand is a very good addition by way of manure to all ſorts of clay lands; it warms them, and makes them more open and looſe. The beſt Sand for the farmers uſe is that which is waſhed by rains from roads, or hills, or that which is taken from the beds of rivers; the common Sand that is dug in pits never anſwers nearly ſo well. Sand mixed with dung is much better than laid on alone: and a very fine manure is made by covering the bottom of ſheep-folds with ſeveral loads of Sand every week, which are to be taken away, and laid on cold ſtiff lands, impregnated as they are with the dung and the urine of the ſheep.

Beſides clay land there is another ſort of ground very improveable by Sand; this is that ſort of black foggy land on which buſhes and ſedge grow naturally, and which they cut into turf, in ſome places. Six hundred load of Sand being laid upon an acre of this land, according to the Cheſhire meaſure, which is near double the ſtatute acre, meliorate it ſo much, that without plowing, it will yield good crops of oats or tares, though before it would have produced ſcarce any thing. If after this crop is taken off, the land be well dunged, and laid down for graſs, it will yield a large crop of ſweet hay.

Once ſanding this land will improve it for a vaſt number of years, and it will yield two crops of hay in the year, if there be weather to make it in. Some land in Cheſhire has been, by this means, rendered of twelve times its former value to the owner. The bogs of Ireland, when drained, have been rendered very fruitful land, by mixing Sand in this manner among the earth, of which they conſiſt. Add to this, that in all theſe boggy lands, the burning them, or firing their own turf upon them, is alſo a great advantage. The common peat, or turf aſhes, mixed with the Sand for theſe purpoſes, add greatly to its virtue.

Sea Sand, which is thrown up in creeks and other places, is by much the richeſt of all Sand for manuring the earth; partly its ſaltneſs, and partly the fat and unctuous filth that is mixed among it, give it this great virtue. In the weſtern parts of England, that lie upon the ſea coaſts, they make very great advantages of it. The fragments of ſea ſhells alſo, which are always in great abundance in this Sand, add to its virtues; and it is always the more eſteemed by the farmers, the more of theſe fragments there are among it.

The ſea Sand uſed as manure in different parts of the kingdom is of three kinds: that about Plymouth, and on other of the ſouthern coaſts, is of a blue grey colour like aſhes, which is probably owing to the ſhells of muſcles, and other fiſh of that or the like colour, being broken and mixed among it in great quantity.

quantity. Westward, near the land's end, the sea Sand is very white, and about the isles of Scilly it is very glistering, with small particles of talc; on the coasts of the north sea the Sand is yellowish, brown, or reddish, and contains so great a quantity of fragments of cockle shells, that it seems to be chiefly composed of them. That sea Sand is accounted best, which is of a reddish colour: the next in value to this is the bluish, and the white is the worst of all.

Sea Sand is best when taken up from under the water, or from Sand banks, which are covered by every tide.

The small-grained Sand is most sudden in its operation, and is therefore best for the tenant who is only to take three or four crops; but the coarse or large-grained Sand is much better for the landlord, as the good it does last many years.

Where the Sand is dredged out of the Sea, it is usually twice as dear as where it is taken from the Sand banks.

When the land has been well manured with the large Sand, they take four crops of corn from it, and then lay it down for pasture for six or seven years before they plow it again. The grass is so good, that they commonly mow it for hay the first year; it always abounds very much with the white-flowered clover. If the grass grows but short, it is the farmer's interest to feed his cattle upon it, and it will turn to as good account this way, being very sweet and rich, and making the cattle fat, and the cows yield a very large quantity of milk. *Mortimer's Husbandry.*

Indian SAND. The substance, commonly called Indian Sand, is famous for answering to the magnet. It is brought into several parts of Europe, and is said to be gathered on the sea shore in Persia. After it is gathered, it is boiled in water to wash away the sea Salt and other impurities it may contain. After this operation, it is dried and sent abroad in form of a black powder, consisting of grains of different sizes. Some of these grains are very rough in every part of their surface, and others have one side only rough, the others perfectly smooth and glossy. Their figure is very irregular, and resembles that of the grains of common Sand only; the grains of this Indian Sand are usually smaller than those of our common Sands.

These little lumps have neither taste nor smell, and are so friable, that they are easily reduced to an impalpable powder by rubbing. Some of the particles are strongly attracted by the loadstone, and others are so inactive as to be scarce at all affected by it. Those particles, which are of the deepest dusky black, are most of all affected by the loadstone; those which are not affected by it, seem rather of the colour of lead, of a bluish black and shining; these are in the greatest quantity, and the others are selected from among these by the loadstone. *Philos. Trans.* N°. 432.

SAND *flood.*— Violent winds break through the turf that covers these hills, and then the Sand, lying loose and naked, is soon carried down upon the plains, where it covers and buries the grass, and in a very little time eats through the light turf, and mixing itself with the Sand underneath, becomes one bed of this dry matter never to be covered with turf again. A large body of Sand being thus got together, nothing stops it progress; but it, at every storm, rolls over more and more ground, so that in a few years it extends itself a vast way, especially where the ground, over which it passes, is of the same sandy nature, and only covered with a thin turf.

In some parts of Suffolk the ground encourages this change so greatly, that a bed of Sand broke loose from a neighbouring hill, and covering only a few acres, perhaps eight or ten, will, before it has travelled four miles forward, which it does in a small course of years, deluge a thousand acres. It travels down hill faster than any way else, but will not be stopped by ascent, but will move up the steepest hill, only that it requires more time. The making of fences, in the common way, to keep it out, is vain. It runs through the hedges, and flies over the tops of the banks; and, when it reaches a village, in its course, will bury the cottages, unless preserved at more charge than they are worth. It will in a very little time beat up to the eves of a house, of the low kind, that are usually built in a country village, and has often weight enough to break down walls in its passage.

The best way of stopping its progress is by hedges of furze, planted one over another, as they become levelled; these, if well kept up, will, by degrees, stop or divert the progress; and some who have tried this, with resolution, after they have had the Sand raised twenty feet high, have found it stop its increase, and then, having manured this adventitious soil with dung, found it as good ground as that which made the surface before.

About Thetford, the villages were wholly destroyed by this about ninety years ago, and the branch of the river Ouse, called then Thetford river, so blocked up by it, that very small vessels only could go up it, where very large ones used before. The river has been of great service in stopping its progress into Norfolk, where otherwise its course would have carried it, and its vast spreading sideways, in proportion to its going forward, would have made it bury vast quantities of land in a few years.

The most probable conjecture, as to the cause of this strange sort of deluge in these parts of England, is, that this portion of the county of Suffolk lies east-north-east of a part of the great level of the fens, and is by this exposed to very impetuous winds, which acquire more than ordinary force, by their passing thro' so large a tract of country uninterrupted; the storms seem to be one great cause of the mischief, and the sandy nature of the soil the other. There are old stories, in the country, of suits at law commenced among the farmers, for grounds blown out of the owners possession; but the people who gain this sort of wandering land are the greatest sufferers. A little Sand sprinkled by the winds over a tract of land, where there is a bed of Sand under the turf, soon eats through that obstacle; and what was at first only a thin coat of Sand, becomes then a deep plain of it, capable of being blown away to the depth of eight, ten, twenty, or more feet, and is carried over every thing in its progress before the winds, when once taken up by them. *Philos. Trans.* N°. 37.

SAND-*lands*, a term used by our farmers to express such grounds as consist wholly of a pure sheer Sand.

This is of different colours, as white, blackish, reddish, or yellowish, and is very different in its nature, and in the size of its particles, some being harsher and some milder, and some very light, seeming only to be mere dust. The grey, black, and ash-coloured Sand-land are the worst of all, and generally are found on heaths and commons. Gravelly lands approach much to the nature of these, and those which consist of the largest stones, and are mixed with the harshest Sands, are of all the most barren.

The properest plants for arable land, of this kind, are white oats, rye, black wheat, and turneps. The natural produce, in weeds, is quick grass, sorrel, broom, furze, fern, and heath.

The best manure for them is either marl, or such clay as will break with the frosts. Cow dung is also a good manure for these lands, and many use with success chalk, mud, and the half rotten straw from dunghills.

When the farmer has a mind to raise corn on these lands, he must order them the same as they do the clays; but where they are over-run with broom, furzes, and such sort of weeds, marl is to be laid on in great quantities. This is the practice in Staffordshire, and by it they rid themselves of these troublesome weeds, and procure good crops of corn, though at some expence.

The first sowing of this land is with black wheat, and for this they make three fallowings in winter, and stir them in the May following; at this time they sow them, allowing one bushel of seed to an acre, which generally yields them sixty again. Then once plowing these lands, after this crop is off, they are fit to sow rye on.

In Oxfordshire, they seldom give these lands more than two fallowings for wheat, except they are very much over-run with weeds; and they esteem the white and Lammas wheat the most agreeable for this sort of land, and then after a fallow rathripe barley. They afterwards generally fallow them every other year, and reckon them unfit for beans and peas, though they sometimes sow them with winter vetches. If they sow peas on them, they esteem the rathripe kinds the best.

In Herefordshire, they are much subject to moss growing upon their sandy lands, and they make a great improvement by burning it on the ground, and mixing the ashes with lime, which they plow in.

They generally sow them with rye after this manure, and that yields a very great increase upon them, and brings on a very good kind of grass, if they are laid down after a crop or two. *Mortimer's Husbandry.*

SA'NDIVER (*Dict.*)—It is reported, by many authors of great credit, that this salt, in its genuine form, and no way differing from such as is separated from glass, is thrown out in great abundance in the eruptions of the burning mountains, and lies about in lumps of a spungy texture and great size, or in smaller solid ones among the sciarri and ashes thrown out at those times. The more firm and solid pieces are the most pure, and are generally of a fine white; the others not unfrequently are tinged bluish or yellow, and have sometimes some of the melted matter of the sciarri blended among the mass, and filling up some of the cavities. In the catalogue of the specimens of substances thrown out of Mount Ætna in one of its eruptions, and sent as a present to the Royal Society, we find mention of several pieces of Sandiver, but without any particular description. *Philos. Trans.* N°. 53.

SANGUINA'RIA, *puccoon*, in botany, the name of a genus of plants whose characters are:

The flower is inclosed in a sheath, composed of two oval concave leaves, which fall off: the flower hath eight oblong petals, which are alternately narrow: these spread open, and in the center is situated the pointal, attended by several short stamina: the pointal afterwards becomes an oblong swelling pod, opening both ways, and including many round-pointed seeds.

It is a native of most of the northern parts of America, where it grows plentifully in the woods; and in the spring, before the leaves of the tree come out, the surface of the ground in many places is covered with the flowers, which have some resemblance to our wood anemone; but they have short naked pedicles, each supporting one flower at the top: some of these flowers will have ten or twelve petals; so that they appear to have a double range of leaves, which has occasioned their being termed double flowers: but this is only accidental, the ſame roots, in different years, producing different flowers : the roots of this plant are tuberous, and the whole plant has a yellow juice, with which the Indians uſe to paint themſelves.

SANGUI'NEOUS *Fevers*, a term uſed by the medical writers to expreſs a kind of fever, in which there is always a plethora or fulneſs of blood, which nature is attempting to leſſen by means of this accelerated motion of it, either by forming ſome hæmorrhage, or by throwing a part of it off in form of ſweat. It is very obvious to reaſon, therefore, that bleeding is the firſt thing neceſſary in theſe fevers.

The continent fevers, ſuch as the ephemera and ſynocha, are of this kind. *Junker's Conſp. Med.*

SANHE'DRIM, or SANHEDRIN (*Dict.*)—Many of the learned agree, that the Sanhedrim was inſtituted by Moſes, Numbers ch. xi. and conſiſted at firſt of ſeventy perſons, all inſpired of the Holy Ghoſt, who judged finally of all cauſes and affairs; and that it ſubſiſted, without intermiſſion, from Moſes to Eſdras. — Others will have it, that the council of ſeventy elders, eſtabliſhed by Moſes, Numb. ch. xi, was temporary, and did not hold after his death; adding, that we find no ſign of any ſuch perpetual and infallible tribunal throughout the whole Old Teſtament.

The Jews, however, contend ſtrenuouſly for the antiquity of their great Sanhedri: M. Simon backs and defends their proofs, and M. le Clerc attacks them.— Be the origin and eſtabliſhment of the Sanhedrim how it will, it is certain it was ſubſiſting in the time of our Saviour; that it was held at Jeruſalem; and that the deciſion of all the moſt important affairs belonged to it.—The preſident of this aſſembly was called Naſi.

There were ſeveral inferior Sanhedrims in Paleſtine, all depending on the great Sanhedrim at Jeruſalem. The inferior Sanhedrim conſiſted each of twenty-three perſons; and there was one in each city and town. Some ſay, that, to have a right to hold a Sanhedrim, it was requiſite there were one hundred and twenty inhabitants in the place. Where the inhabitants came ſhort of the number of one hundred and twenty, they only eſtabliſhed three judges.

Into the great as well as the inferior Sanhedrim were admitted prieſts, levites, and laymen, of all the tribes, provided they were of noble extraction, rich, wiſe, without any blemiſh of body, and expert in magic; which laſt was eſteemed a neceſſary qualification, to enable them to obviate and deſtroy it: very old people and eunuchs were excluded.

In each Sanhedrim there were two ſcribes; the one to write down the ſuffrages of thoſe who were for condemnation; the other to take down the ſuffrages of thoſe who were for abſolution. Selden has a learned work on the ſubject of the Jewiſh Sanhedrim, de Synedriis, printed at London in 1635, in three volumes, quarto.

SANI'CULA, *ſanicle*, or *ſelf-heal*, in botany, the name of a genus of plants, whoſe characters are:

It is an umbelliferous plant, whoſe flower conſiſts of five leaves placed orbicularly, but are generally bent back to the center of the flower, reſting on the empalement, which becomes a fruit compoſed of two ſeeds, that are gibbous and prickly on one ſide, but plain on the other: ſome of the flowers are always barren.

This plant is found wild in woods and ſhady places, in moſt parts of England; but being a medicinal plant, may be propagated in gardens for uſe: it may be increaſed by parting of the roots, any time from September to March; but it is beſt to do it in autumn, that the plants may be well rooted before the dry weather in ſpring comes on: they ſhould have a moiſt ſoil and a ſhady ſituation, in which they will thrive exceedingly.

SANI'DIUM, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way diſtinguiſhable by its external figure, being made up of ſeveral plain flat plates.

SANS *Pareille*, in conchyliology, the name of a peculiar ſpecies of buccinum, which has its mouth opening a contrary way to that of all other buccina. This is a ſingle ſpecies among the recent buccina, but we find more than one with this peculiarity among the foſſil ſhells, and that in great abundance in many places in England.

SANTOLI'NA, *lavender-cotton*, in botany, the name of a genus of plants, whoſe characters are:

It hath a globoſe floſculous flower; conſiſting of many florets, divided into ſeveral ſegments, ſitting on the embryo, contained in the intermediate little leaves, hollowed like a gutter, and a ſquamous hemiſpherical empalement: the embryo afterwards becomes a ſeed, not at all furniſhed with down: to theſe notes muſt be added larger flowers than thoſe of wormwood and ſouthernwood, alſo the whole face of the plant.

Theſe plants may be propagated by planting ſlips or cuttings of any of the kinds during the ſpring, which ſhould be put into a border of light freſh earth, and watered and ſhaded in hot dry weather, until they have taken root; after which they will require no farther care, but to keep them clear from weeds till autumn, when they ſhould be carefully taken up, and tranſplanted where they are deſigned to remain: but, if the ground is not ready by that time to receive them, it will be proper to let them remain in the border until ſpring; for, if they are tranſplanted late in the autumn, they are liable to be deſtroyed by a little cold in winter.

Theſe plants are very hardy, and, if planted in a lean, gravelly, or ſandy dry ſoil, will continue many years, and reſiſt the cold very well: but, if they are in a wet or rich ſoil, they are often deſtroyed in winter. *Miller's Gard. Dict.*

SA'NTSI, in botany, a name given by the Chineſe to a plant famous among them for its medicinal virtues.

It is deſcribed by the writers, who have been on the ſpot, in ſo remarkable a manner, that it cannot eaſily be miſtaken, provided their deſcriptions are juſt. They tell us that it grows wild on the mountains in ſome of the provinces of China, and that each root of it uſually ſends up eight ſtalks, the middle one greatly higher than the reſt.

They have no branches, and have each only three leaves at the top, and the middle ſtalk bears cluſters of flowers. The root they ſay is four inches thick, and puſhes out ſeveral ſide branches, of the thickneſs of a finger. The bark of theſe roots is rough and brown, and their internal parts ſoft and yellow.

The ſmall roots only are uſed in medicine, the great ones being ſeldom found. The plant flowers in the month of July, and the ſpring ſeaſon is accounted the beſt for taking up the roots.

The way of multiplying the plant is to cut the great root into ſlices tranſverſly, and plant theſe an inch deep in a good ſoil; they will ſoon ſhoot up the natural number of branches, and in three years the plant will grow to its utmoſt perfection.

The great uſe of the plant is in hæmorrhages, in which caſe it is ſaid to be almoſt infallible. *Obſerv. ſur les Cout. de l'Aſie.*

SAP (*Dict.*)—The notion of the Sap's circulation was entertained by ſeveral authors much about the ſame time, without any communication from one another; particularly M. Major, a phyſician of Hamburgh, M. Perrault, Mariotte, and Malpighi. It has met, however with ſome conſiderable oppoſers, particularly the excellent M. Dodart, who could never be reconciled to it.

One of the great arguments for it is, that the ſame experiments of ligature and inciſion, which evince a circulation of the blood in animals, ſucceed in the like manner in plants, particularly in ſuch as abound with a milky Sap, as the great tithymale, milk-thiſtle, &c. if the ligature be faſtened tight round them, the part above is found to ſwell very conſiderably, and that below it, a little: whence it appears, that there is a juice aſcending from the branches; and that the latter is thicker than the former, which quadrates exactly with the common ſyſtem; the juice being ſuppoſed to ariſe in capillary veſſels, in form of a ſubtile vapour, which, condenſed in the extremes of the plant, by the neighbourhood of the cold air, turns back in form of a liquor, through the more patent pipes of the inner bark.

M. Dodart, inſtead of the ſame juices going and returning, contends for two ſeveral juices; the one imbibed from the ſoil digeſted in the root, and from thence tranſmitted to the extremes of the branches, for the nouriſhing of the plant; the other received from the moiſture of the air entering in at the extremities of the branches: ſo that the aſcending and deſcending juices are not the ſame.

One of his chief arguments is, that if two trees of the ſame kind be tranſplanted in one day, after firſt cutting off their roots and branches, and if, after they have taken root again, ſome of the new ſhoots put forth each year be cut off one of them, it will not thrive half ſo well, notwithſtanding its root and trunk being intire as the other.

This he conceives to be a proof of the plants deriving nouriſhment by the branches, and concludes it to be of an aerial nature, becauſe formed of the moiſture of the air, dew, &c. whereas that imbibed from ſoil is terreſtrial, &c. *Hiſt. de l'Acad. Roy. Ann.* 1709.

The humour or Sap of a plant, then, is a juice furniſhed by the earth, and changed into the plant, conſiſting of ſome foſſil parts, other parts derived from the air and rain, and others from putrified animals, plants, &c. Conſequently, in vegetables, are contained all kinds of ſalts, oil, water, earth, &c. and, probably, all kinds of metals too, inaſmuch as the aſhes of vegetables always yield ſomewhat which the loadſtone attracts.

This juice enters the plant in form of a fine and ſubtile water; which the nearer it is to the root, the more it retains of its proper nature; and, the farther from the root, the more action it has ſuſtained, and the nearer it approaches to the nature of the vegetable.

Conſequently, when the juice enters the root, the bark whereof is furniſhed with excretory veſſels, fitted to diſcharge the excrementatious part, it is earthy, watery, poor, acid, and ſcarce oleaginous at all.

In the trunk and branches it is further prepared, though it ſtill continues acid; as we ſee by tapping or perforating of a tree in the month of February, when it diſtils a watery juice apparently acid.

The juice being here carried to the germs or buds is more concocted; and here, having unfolded the leaves, theſe come to ſerve as lungs for the circulation and further preparation of the juice.

For

For these tender leaves, being exposed to the alternate action of heat and cold, moist nights, and hot scorching days, are alternately expanded and contracted, and the more on account of their reticular texture.

By such means is the juice still further altered and digested, as it is further in the petala or leaves of the flowers which transmit the juice, now brought to a further subtility, to the stamina: these communicate it to the farina or dust in the apices, which is, as it were, the male seed of the plant, where having undergone a further maturation, it is shed into the pistil, which performs the office of an uterus or womb; and thus, having acquired its last perfection, it gives rise to a new fruit or plant.

The root or part whereby vegetables are connected to their matrix, and by which they receive their nutritious juice, consists of an infinite number of vasa absorbentia, which, being dispersed through the interstices of the earth, attract or imbibe the juices of the same: consequently, every thing in the earth that is dissoluble in water, is liable to be imbibed; as air, salt, oil, fumes of minerals, metal, &c. and of these do plants really consist.

These juices are drawn from the earth very crude; but by the structure and fabric of the plant, and the various vessels they are strained through, become changed, further elaborated, secreted, and assimilated to the substance of the plant.

The motion of the nutritious juices of vegetables is produced, much like that of the blood in animals, by the action of the air; in effect, there is something equivalent to respiration throughout the whole plant.

The discovery of this is owing to the admirable Malpighi, who first observed, that vegetables consist of two series or orders of vessels.

First, such as receive and convey the alimental juices, answering to the lacteals, veins, &c. of animals.

Secondly, tracheæ or air vessels, which are long hollow pipes, wherein air is continually received and expelled, i. e. inspired and expired; within which tracheæ he shews all the former series of vessels are contained.

Hence, it follows, that the heat of a year, nay, of a day, of a single hour, or minute, must have an effect on the air included in these tracheæ, i. e. must rarefy it, and consequently dilate the tracheæ; whence arises a perpetual spring or source of action, to promote the circulation in plants.

For, by the expansion of the tracheæ, the vessels containing the juices are pressed, and by that means the juice contained is continually propelled, and so accelerated; by which propulsion, the juice is continually comminuted, and rendered more and more subtile, and so enabled to enter vessels still finer and finer, the thickest part of it being at the same time secreted, and deposited into the lateral cells or loculi of the bark, to defend the plant from cold, and other external injuries.

The juice having thus gone its stage, from the root to the remote branches, and even the flower; and having in every part of its progress deposited something both for aliment and defence; what is redundant passes out into the bark, the vessels whereof are inosculated with those wherein the Sap mounted; and through these it re-descends to the root, and thence to the earth again: and thus a circulation is effected.

Thus is every vegetable acted on by heat and cold, during the day-time especially, while the sun's force is considerable, the Sap-vessels squeezed and pressed, and the Sap protruded and raised, and at length evacuated, and the vessels exhausted; and, in the night again, the same tracheæ being contracted by the cold of the air, the other vessels are eased and relaxed, and so disposed to receive fresh food for the next day's digestion and excretion.

What course the juice takes, after it is imbibed by the roots, is not very clear; the vessels that take it up, to convey it to the plant, are too fine to be traced; and hence it has been controverted, whether it is by the bark, or the pith, or the woody part, that the plant is fed.

The more common opinion is for the bark: the juice, raised by the capillaries of the wood, is here supposed to descend by the larger fibres, placed in the inmost part thereof, immediately over the wood; in which descent, the Sap, now sufficiently prepared, adds a part of its substance to the contiguous wood, and thus increases by apposition: and hence it may be, that hollow, carious, or rotten trees, which have neither pitch nor wood except just enough to sustain the bark, do grow and bear.

Some contend for the wood, which they observe to consist of slender capillary tubes running parallel to each other from the root up to the trunk, being proper to receive in a fine vapour; in the ascent whereof the fibres become opened, and their substance increased: and thus the trunks of trees are said to increase in their circumference.

As for the pith; as the woody substance of the trunk becomes more woody, the pith is compressed and streightened to such a degree that in some trees it quite disappears: whence it seems, that its office in vegetation is not very important, since its use is not perpetual. By its spongious substance, it should seem fitted to receive any superfluous moisture transuding through the pores of the woody fibres: and, if by the excess of such moisture, or the like cause, it corrupt and rot, as it frequently happens in elms, the tree does not grow the worse for it; which is a convincing proof it is of no great use.

The learned Dr. Boerhaave distributes the juices of plants into six classes.

First, the first class comprehends the crude nutritious juice, or the juices of the root and stem of plants, which are little more than the mere matter of the element, as drawn by the root from the body it adheres to, whether it be earth, water, or the like.

This juice is found in every part of the plant, and therefore may be held an universal juice; yet he considers it as the juice of the root and stem, because it is chiefly found in them.

This he takes to be a subacid watery lymph, without any specific taste or smell, as not being yet arrived to the maturity of oiliness.

To this class belong those juices which distil in great abundance from wounds or incisions made in the woody parts of plants; such, for instance, is that tart liquor ousing from the root of the walnut-tree, when cut off in the month of May.

Such also is that limpid, subacid humour, flowing out very plentifully at an incision in the birch-tree in the month of March, to the quantity of several gallons in a few days.

Such also is the juice issuing out of the vine wounded in the spring-time, which always tastes tartish, and ferments like the grapes themselves.

This juice may be esteemed as yet fossil, being generated of and in the earth; for the juice of the earth, being received into the canals of this plant, retains its nature during two or three circulations; nor does immediately commence a vegetable juice.

This class of juices therefore he accounts as the chyle of the plant, being chiefly found in the first order of vessels, viz. in the roots and the body of the plant, which answers to the stomach and intestines of animals.

Secondly, the second class of the juices is that of the leaves, which are the real lungs of plants, and accordingly make a further change of the juice, which they receive from the roots and stem by force of the air. The juice of leaves is different therefore from the first juice, as being more sulphureous, and farther elaborated; not that it derives any sulphur from the sun, but that, its watery part exhaling, it becomes more oily, and less volatile.

The juice of leaves he distinguishes into three kinds:

The first is the nutritious juice of the leaves; which is that already described, only further elaborated in the minute vesiculæ of the leaves, and consequently less watery, and more oily and saccharine.

The second is wax, which, exuding out of the leaves, adheres to the surface, and is scraped off by bees with their rough thighs, to build their combs withal. This is chiefly afforded by lavender and rosemary: upon the latter of which, the wax may be plainly perceived sticking to the leaves of it.

The third is manna: not that with which the Israelites were fed in the desart, but a drug sold among us: it is an essential saccharine salt, exuding chiefly by night, and, in the summer-season, from the leaves of a sort of ash growing in Calabria and Sicily, and adhering thereto in the form of a crust, to be gathered the next morning before the sun is up.

The like substance is found to exude from the leaves of the linden-tree and poplar, in the heats of May and June; at which time they have an honey-taste, and are even seen with a fatty juice on them, which, at the approach of the cold evening, gathers into grains.

Thirdly, the third class of juices are those of flowers, or the genital parts of plants; in these are:

First, a pure, elaborated, volatile oil or spirit, wherein the particular smell of the plant or flower resides, and which, by reason of its extreme volatility, exhales spontaneously; insomuch that, if the flower be laid for some time in a warm place, the odorous juice or spirit will be all fled.

The second is the juice expressed from the flower, which in reality is the same with that of the root and leaves, only farther prepared; it is thicker than the former, and has scarce any smell at all: thus, if you bruise an hyacinth, or other fragrant flower, and express the juice, it will be found altogether inodorous.

The third is the sweet juice called honey, which exudes from all flowers; aloes, colocynthis, and other bitter flowers, not excepted.

In all male flowers, that have utricles at the bottom of the petala, which Dr. Linnæus stiles the nectarium, is found a viscid, ruddy, sweet juice in some plenty; and accordingly we see the children gather cowslips, fox-gloves, honeysuckles, &c. and suck the honey from them: the bees too visit these flowers, and, putting in their proboscides or trunks, suck out the honey, and load their stomachs therewith, to be afterwards discharged and laid up in their combs: so that honey is a vegetable juice.

Fourthly, the fourth class of juices are those of the fruit and seed; the preparative whereof is nature's final work: which performed, the plants seem to die for a time, as all animals are seen to languish after the emission of their semen.

The juice of the fruit is like that of the root, only farther elaborated.

The juice of the seed is an essential oil or balm, elaborated and exalted to its last perfection. This juice or oil is not found in the very point or embryo in the center of the placenta; all we meet with in that part, is a few fine watery particles secreted from

from the placenta: but it is in the placentula or cotyledons themselves, which consist of innumerable little folliculi or cells, wherein this only juice is contained, serving to defend the embryo, and preserve it from being corrupted by water, which, it is well known, will hardly pass through oil.

Thus, if you take, for instance, fennel-seed, cut it through the middle, and apply it to the microscope, you will easily perceive a clear shining oil in the cells of each lobe, investing the tender embryo. Without this oil, it were impossible a seed should live a month, and, much less, a year or two, intire and uncorrupted in the ground.

This oil is found in the seeds of all plants; in some, for instance, in almonds, cocoa-nuts, &c. in very great quantities; in others less, as pepper, arum, &c. where one would scarce imagine any oil at all: and these seeds lose their vegetative quality very soon.

Fifthly, the fifth class of juices are those of the bark; which is an artful congeries or bundle of perspirative ducts, and absorbent vessels.

Of these juices there are divers species; for the several humours raised and distributed through the leaves, flowers, and other parts of the plants, have all circulated through the bark, and accordingly are frequently found to distil from wounds made therein. In some cases, even the whole plant is no more than bark, the pulp having been eaten out; as in willows, poplars, &c. which will live a long time in that state.

The bark serves divers purposes; for it not only transmits the nutritious juices of the plants, but also contains divers fat oily humours, to defend the fleshy parts from the injuries of the weather.

Sixthly, as animals are furnished with a panniculus adiposus, usually replete with fat, which invests and covers all the fleshy parts, and screens them from external cold; so are plants incompassed with a bark replete with fat juices, by the means whereof the cold is kept out, and in winter-time the spiculæ of ice prevented from fixing and freezing the juices in their vessels; whence it is that some sorts of trees remain ever-green the year round, by reason their barks have more oil than can be spent and exhaled by the sun; and their leaves are covered with a thick oily film over their surface, which prevents their perspiring so much as other plants, and also defends them from the cold, &c.

All the juices of barks are reducible to eight, viz.

First, the crude, acid, watery juice, called the chyle of the plant.

Secondly, an oily juice, which, bursting the bark in the beginning of the summer, exudes out of several plants; as cypress, pine, fir, savin, juniper, and other ever-greens; and such alone: this oil dissolves by the smallest degree of warmth, and is easily inflamed, and is that which defends the plant; which is the reason why most of these plants will not thrive in very hot climates.

For balm, or fatty liquor, more glutinous than oil, is nothing but the last-mentioned oily juice, which was more fluid during the spring-time; but which, by the greater heat of the sun, has evaporated all its most subtile parts, and is converted into a denser liquor. Thus the finer part of oil of olives being exhaled by the summer's warmth, there remains a thick balsam behind: thus also oil of turpentine, having lost its more liquid parts by heat, becomes of the thick consistence of a balm.

Thirdly, a pitchy juice, which is the body of the oil itself, inspissates, and turns black, when put into a great warmth: this is the most observed in the pine and fir.

Fourthly, resin, which is an oil so far inspissated, as to become friable in the cold, and may be procured from any oil, by boiling it much and long. Thus, if turpentine be set over a gentle fire, it first dissolves, and becomes an oil, then a balsam, then pitch, and then a resin; in which state it is friable in the cold, fusible by fire, and withal inflammable and combustible; dissoluble in spirit of wine, but not in water, which makes the character of resin.

Hence the oil is most abundant in the barks in the winter-time, the balsams in summer, and the resin in autumn.

Fifthly, colophony, which is a Resin still farther exhausted of its volatile part, being pellucid, friable, and approaching to the nature of glass.

Sixthly, gum, which is an humour exuding out of the bark, and, by the warmth of the sun, concocted, inspissated, and rendered tenacious, but still dissoluble in water, and at the same time inflammable, and scarce capable of being pulverised. This oily mucilage serves as a pigment to cover over, and defend the buds of trees, from the injuries of wet and frost in winter; but will melt with a moist warmth, and easily run from them, when the gentle warmth of the spring approaches: nor is ever so far hardened into a crust, as to do any injury to the inclosed shoot. This oily substance always contains in it an acid spirit; which is a preservative against putrefaction.

Seventhly, a gummous resin; which is an humour secreted in the bark, and dried by the heat of the sun; and thus constituting a body that is partly gummous, and, as such, tenacious, and soluble in water; and partly resinous, and therefore friable, and soluble in oil, or spirit of wine, but not in water.

Botanists are now generally agreed, that all plants are furnished with organs and parts necessary both for chylification and sanguification; that they have veins, arteries, heart, lungs, adipose cellules, &c. If so, it is obvious, that there must be some difference between the juices, which have not undergone the action of those parts, and such as have already circulated a number of times.

The several juices, hitherto recounted, are the first or nutritious juice, called also the chyle of the plant, under such alterations, and new modifications, as it undergoes in being received, and kept some time, in parts of a peculiar structure; as leaves, flowers, seed, &c. This last juice, called the blood, is the same nutritious juice farther altered, by being divers times passed through each of those parts, and remixed, and at length converted into a new juice, with properties different from any of them all.

To prove the circulation of the Sap, instances are brought from experiments made by Mr. Fairchild; as, his budding or inoculating of a passion-tree, whose leaves are spotted with yellow, into one of that sort of passion-tree whose leaves are plain: for though, the buds did not take, yet, after it had been budded a fortnight, the yellow spots began to shew themselves about three feet above the inoculation; and, in a little time after that, the yellow spots appeared on a shoot, which came out of the ground from another part of the plant; which has been accounted a plain proof of the Sap's circulation.

Another instance is, a second experiment of the same person, who grafted the ever-green oak, or ilex, upon the common oak. The leaves of the common oak, which was the stock, decayed, and fell off, at the usual season of the year; but the ever-green oak, which was the cyon grafted upon it, held its leaves, and continued shooting in the winter. From whence it is concluded, that, when trees drop their leaves, the Sap keeps full in motion, and is not gone into the root, as some persons think.

There are also other experiments of the same person, which were shewn before the Royal Society; as the New-England cedar, or rather juniper, grafted on the Virginian: and what is taken to prove the circulation in it, is, the branch which was grafted was left several inches below the grafting; which continued growing as well as the upper-part above the grafting.

And also another, which is the viburnum, with the top planted in the ground, which was become roots; and the roots turned up, which were become branches: which plant was in as good a state of growing, as it was in its natural state.

A third experiment of his was on a pear-tree, which he inarched upon two pear-stocks, in March 1721-2, having the roots out of the ground; and was in a good flourishing state, with a branch in blossom, that receives no other nourishment but by the juices that return down the other two branches; which, though it had been done above two years, yet it continued shooting suckers out of the root; which is esteemed as a proof, that the branches are as useful to support the roots, as the roots the branches: and thence he infers, that it is not strange, that so many trees miscarry in planting, when there are no branches left to the head to maintain the circulation to the roots.

A fourth experiment he made on the cedar of Lebanon, grafted on the larix, which dropped its leaves in the winter, yet maintained the cedar in a flourishing condition, as if it had been on a tree which held its leaves all the winter; and the circulation of juices supported the graft below the grafting, and kept it in as good health as above the grafting.

In opposition to the notion of the circulation of the Sap in trees like to that in animal bodies, the rev. Dr. Hales, in his excellent treatise on Vegetable Statics, presents us with various experiments, and says:

When the Sap has first passed through that thick and fine strainer, the bark of the root, we then find it in greatest quantities in the most lax part, between the bark and wood, and that the same through the whole tree.

And if, early in the spring, the oak, and several other trees, were to be examined near the top and bottom, when the Sap first begins to move, so as to make the bark run, and easily peel off, he believes it would be found, that the low bark is first moistened; whereas the bark of the top branches ought first to be moistened, if the Sap descends by the bark. As to the vine, he says, he is pretty well assured, that the lower bark is first moistened.

He adds, that it is to be seen in many of the examples of the experiments he has given in that book, what quantities of moisture trees daily imbibe and perspire: now the celerity of the Sap must be very great, if that quantity of moisture must most of it ascend to the top of the tree, then descend, and ascend again, before it is carried off by perspiration.

The defect of a circulation in vegetables seems, in some measure, to be supplied by the much greater quantity of liquor, which the vegetable takes in, than the animal, whereby its motion is accelerated: for, by the first example he gives, we find the sunflower, bulk for bulk, imbibes and perspires seventeen times more fresh liquor than a man every twenty-four hours.

Besides, nature's great aim in vegetables being only, that the vegetable life be carried on and maintained, there was no occasion to give its Sap the rapid motion which was necessary for the blood of animals.

In animals, it is the heart which sets the blood in motion, and makes it continually circulate: but in vegetables we can discover

cover no other cause of the Sap's motion, but the strong attraction of the capillary Sap-vessels, assisted by the brisk undulation and vibration caused by the sun's warmth; whereby the Sap is carried up to the top of the tallest trees, and is there perspired off through the leaves: but, when the surface of the tree is greatly diminished by the loss of its leaves, then also the perspiration and motion of the Sap are proportionably diminished; as is plain from many of his experiments.

So that the ascending velocity of the Sap is principally accelerated by the plentiful perspiration of the leaves, thereby making room for the fine capillary vessels to exert their vastly attracting power; which perspiration is effected by the brisk rarefying vibrations of warmth; a power that does not seem to be any-ways well adapted to make the Sap descend from the tops of vegetables, by different vessels, to the root.

If the Sap circulated, it must needs have been seen descending from the upper part of large gashes, cut in branches set in water, and with columns of water pressing on their bottoms in long glass tubes, in his forty-third and forty-fourth experiments. In both which cases it is certain, that great quantities of water passed through the stem; so that it must needs have been seen descending, if the return of the Sap downwards were by trusion or pulsion, whereby the blood in animals is returned through the veins to the heart; and that pulsion, if there were any, must necessarily be exerted with prodigious force, to be able to drive the Sap through the finer capillaries.

So that, if there be a return of the Sap downwards, it must be by attraction, and that a very powerful one, as may be seen by many of these experiments, and particularly by experiment the eleventh. But it is hard to conceive what and where that power is, which can be equivalent to that provision nature has made for the ascent of the Sap, in consequence of the great perspiration of the leaves.

The instances of the jasmine-tree, and of the passion-tree, have been looked upon as proofs of the circulation of the Sap; because their branches which were far below the inoculated bud, were gilded. But we have many visible proofs in the vine, and other bleeding trees, of the Sap's receding back, and pushing forwards alternately, at different times of the day and night; and there is great reason to think, that the Sap of all other trees has such an alternate receding and progressive motion, occasioned by the alternacies of day and night, warm and cold, moist and dry.

For the Sap in all vegetables does probably recede, in some measure, from the tops of branches, as the sun leaves them; because, its rarefying power then ceasing, the greatly rarefied Sap and air mixed with it will condense, and take up less room than they did, and the dew and rain will then be strongly imbibed by the leaves, as is probable from experiment 42d, and several others; whereby the body and branches of the vegetable, which have been much exhausted by the great evaporation of the day, may, at night, imbibe Sap and dew from the leaves.

For, by several experiments in the first chapter of the book of Vegetable Statics, plants were found to increase considerably in weight in dewy and moist nights.

And by other experiments on the vine, in the third chapter, it was found, that the trunk and branches of vines were always in an imbibing state, caused by the great perspiration of the leaves, except in the bleeding season; but, when at night the perspiring power ceases, then the contrary imbibing power will prevail, and draw the Sap and dew from the leaves, as well as moisture from the roots.

And we have a further proof of this in experiment 12th, where, by fixing mercurial gauges to the stems of several trees which do not bleed, it is found that they are always in a strongly imbibing state, by drawing up the mercury several inches; whence it is easy to conceive, how some of the particles of the gilded bud in the inoculated jasmine may be absorbed by it, and thereby communicate their gilding miasma to the Sap of other branches; especially when, some months after the inoculation, the stock of the inoculated jasmine is cut off a little above the bud, whereby the stock, which was the counter-acting part to the stem, being taken away, the stem attracts more vigorously from the bud.

Another argument for the circulation of the Sap is, that some sorts of grafts will infect and canker the stocks they are grafted on; but by experiments twelfth and thirty-seventh, where mercurial gauges were fixed to fresh-cut stems of trees, it is evident, that those stems were in a strongly imbibing state; and, consequently, the cankered stock might very likely draw Sap from the graft, as well as the graft alternately from the stock; just in the same manner as leaves and branches do from each other in the vicissitudes of day and night.

And this imbibing power of the stock is so great, where only some of the branches of the stock will, by their strong attraction, starve those grafts; for which reason, it is usual to cut off the greatest part of the branches of the stock, leaving only a few small ones to draw up the Sap.

The instance of the ilex grafted upon the English oak seems to afford a very considerable argument against a circulation, for, if there were a free uniform circulation of the Sap through the oak and ilex, why should the leaves of the oak fall in winter, and not those of the ilex?

Another argument against an uniform circulation of the Sap in trees, as in animals, may be drawn from Dr. Hales's thirty-seventh experiment; viz. where it was found, by three mercurial gauges, fixed to the same vine, that, while some of its branches changed their state of protruding Sap into a state of imbibing, others continued protruding Sap, one nine, and the other thirteen days longer.

That the Sap does not descend between the bark and the wood, as the favourers of a circulation suppose, seems evident from hence, viz. that, if the bark be taken off for three or four inches breadth quite round, the bleeding of the tree above that bared place will much abate; which ought to have the contrary effect, by intercepting the course of the refluent Sap, if the Sap descended by the bark.

But the reason of the abatement of the bleeding, in this case, may be well accounted for, from the manifest proof we have in these experiments, that the Sap is strongly attracted upwards by the vigorous operation of the perspiring leaves and attracting capillaries; but, when the bark is cut off for some breadth below the bleeding place, then the Sap which is between the bark and the wood below that disbarked place is deprived of the strong attracting power of the leaves, &c. and consequently the bleeding wound cannot be supplied so fast with Sap, as it was before the bark was taken off.

But the most considerable objection against this progressive motion of the Sap, without a circulation, arises from hence, viz. that it is too precipitate a course for a due digestion of the Sap, in order to nutrition: whereas in animals nature has provided that many parts of the blood shall run a long course before they are either applied to nutrition, or discharged from the animal.

But when we consider that the great work of nutrition in vegetables, as well as animals (I mean after the nutriment is got into the veins and arteries of animals) is chiefly carried on in the fine capillary vessels, where nature selects and combines, as shall best suit her different purposes, the several mutually attracting nutritious particles, which were hitherto kept disjoined by the motion of their fluid vehicle; we shall find, that nature has made an abundant provision for this work in the structure of vegetables: all whose composition is made up of nothing else but innumerable fine capillary vessels, and glandulous portions or vesicles.

Upon the whole, he thinks we have, from these experiments and observations, sufficient ground to believe, that there is no circulation of the Sap in vegetables; notwithstanding many ingenious persons have been induced to think there was, from several curious observations and experiments, which evidently prove, that the Sap does, in some measure, recede from the top, towards the lower part of plants; whence they were, with good probability of reason, induced to think, that the Sap circulated.

SAPI'NDUS, *the soap-berry*, in botany, the name of a genus of trees, whose characters are:

It hath a flower, which, for the most part, is composed of four leaves, expanding in form of a rose: from whose four-leaved empalement arises the pointal, which afterwards becomes a spherical fruit, having a thick oily cover, inclosing a nut of the same form.

This tree is very common in Jamaica, Barbadoes, and most other places in the West-Indies, where it rises to the height of thirty-feet, or more; but in Europe it is preserved by those persons who are curious in cultivating exotic plants, for the singular structure of the leaves, which are very long and narrow, having borders on each side, which, at about every two inches, have pinnæ, or wings, opposite to each other, and terminated by an odd one. The flowers are produced at the ends of the branches, which are small and white, growing in clusters. These are succeeded by spherical brown berries, about the size of cherries, which have very little pulp; but a brown skin covering the nut, which is round, black, and hard. These nuts were formerly brought into England to make buttons; for which purpose they were very proper, because they never crack. The skin which surrounds the nut will lather like soap, and is used in America to wash linen, though many people say it will burn it, when it is often used. *Miller's Gard. Dict.*

SA'PPHIRE-*colour*.—To give this elegant and beautiful blue to glass, the workers in the glass-houses use the following method: take an hundred weight of rochetta frit, and add to it a pound of prepared zaffer, and to this one ounce of manganese; mix all well together, and put them into the furnace to melt and purify, and, when it is become perfectly pure and fine, work it into vessels, &c. This small quantity of manganese, with the zaffer, gives a most beautiful violet blue.

SAPPHIRE-*paste*. The method of making the counterfeit Sapphires in paste is this: take of crystal prepared two ounces, minium, or common red lead, six ounces, zaffer prepared five grains, manganese prepared seven grains; mix all the powders perfectly together, and put them into a crucible; cover it with a strong lute, and put the whole into a potter's kiln, to stand in the hottest place for twenty-four hours; it will be of a most beautiful deep Sapphire-colour. Blue pastes of two other degrees of blue are also made in the following manner: for a sky blue take crystal prepared two ounces, red lead six ounces, prepared zaffer twenty-one grains; mix all well together, and bake them as before. For a deep violet

let blue take cryſtal two ounces, and lead four ounces, and four grains of painters blue ſmalt; mix all, and bake together in the kiln. Theſe both make good blues, but much inferior to the firſt proceſs. *Neri's Art of Glaſs.*

SAPPHIRI'NA *Aqua*, or blue eye water, is thus made: pour a pint of ſtrong and freſh lime water into a copper veſſel; add to it a drachm of crude ſal armoniac, and throw in ſome filings, or ſmall pieces of copper; it ſoon acquires a beautiful blue colour, and is not only uſed as an eye water, but alſo to deterge old ulcers; and ſometimes is mixed with other things in injections for gonorrhœas.

SAPPHI'RO-RUBI'NUS, in natural hiſtory, a name given by ſome modern writers on gems to a ſtone, partly a ſapphire, and partly a ruby, or, more properly ſpeaking, a ſapphire tinged in ſome part with the ruby colour, while the reſt remains blue. The Indians call this nilacundi.

SARCI'TES, *the fleſh-ſtone*, a name given by ſome authors to the cornelian, from its being of the colour of fleſh, as it is very exactly in ſome pieces.

SARCITES, *or* SAURITES, is alſo a ſtone ſuppoſed to be found in the belly of a lizard; it ſeems to have been a ſpecies of pale cornelian. Pliny mentions it, but gives no deſcription of it.

SARCITES, *the fleſh-ſtone*, in natural hiſtory, is alſo a name given by ſome authors to a ſpecies of ſtone, whoſe fibres were ſuppoſed to repreſent thoſe of beef. It was of a black colour and firm texture.

SA'RCLING-*time*, is the time or ſeaſon when huſbandmen weed their corn.

SA'RCOMA *of the eyes*, a fleſhy excreſcence or tubercle formed on the inner ſurface of the eye-lids. Theſe tubercles, in their beginnings, are uſually ſmall; but they, by degrees, advance often to a very conſiderable bulk. Some of theſe are of ſmooth ſurfaces, others rough and unequal, like a raſberry, or mulberry.

They are always to be cured by extirpation, getting them out by a hook, a pair of pliers, or a needle and thread, and then cutting them out to the roots with ſciſſars; the wound ſhould be ſuffered to bleed a while, and afterwards waſhed with a collyrium made of aloes, tutty, and ſugar of lead mixed in roſe-water, till it is perfectly healed. Some uſe the cauſtic to theſe humours, but the ſciſſars are more ſafe and leſs painful. *Heiſter's Surgery.*

SA'RDA, *the cornelian*, in natural hiſtory, the name of a genus of the ſemi-pellucid gems: the characters of which are that they are ſemi-pellucid ſtones, compoſed of cryſtal with a ſmall admixture of earth, of a plain uniform ſtructure, not tubulated, nor cruſtated, and uſually of one ſimple colour. See CORNELIAN in the Dictionary.

SARDA'NUS, in zoology, the name of a fiſh of the harengiform kind, caught in the Mediterranean, and common in the markets of Rome and Venice. Its body is broader than that of the pilchard, and its back green, and the line which runs along the belly is much leſs rough than in that fiſh. It is indeed eaſy to be diſtinguiſhed from the pilchard, but not ſo eaſy to ſhew in what it differs from the common herring more than in ſize. It ſeems very probable, that it is no diſtinct ſpecies of fiſh; but that the herring, like the pilchard, is always ſmaller in the Mediterranean than in the ocean. *Willughby's Hiſt. Piſc.*

SAR'DAR, in the Turkiſh military orders, the title of an officer choſen from among the caias of the Janizaries on ſome particular occaſion, ſuch as to head a detachment ſent to war, or on any other occaſion. The word is of Perſian origin, and is derived from *ſar*, which in that language ſignifies a head or chief.

This officer is a colonel of a detached body; he is attended in his expedition by his deputy, and two ſecretaries, and his office expires at his return from the buſineſs he was diſpatched on. *Pocock's Ægypt.*

SARDO'NYX, in natural hiſtory, the name of a genus of the ſemi-pellucid gems, which are conſiderably tranſparent, of the true onyx ſtructure, either zoned or tabulated, and are compoſed of the true matter of the onyx, variegated with zones of that of the red or yellow cornelian.

Of this genus there are four known ſpecies: 1. The thin-zoned red Sardonyx, or whitiſh onyx, with thin, ſnow-white, and red zones; this is one of the moſt beautiful of the ſemi-pellucid gems: the ground of this is a cryſtalline matter, ſomewhat whitiſh, otherwiſe very little differing from pure cryſtal, either in colour or tranſparence; and the zones are always extremely fine and ſlender, and laid with a beautiful regularity over one another; they are of the true matter of the cornelian, and ſome are of the plain red cornelian, others of the white, and others often of a pale fleſh colour, made by an admixture of the two former. It is only found in the Eaſt-Indies, and is greatly valued among our lapidaries. *Hill's Hiſt of Foſſ.*

SARO'NIA, Σαρώνια, among the Greeks, a feſtival kept in honour of Diana, ſurnamed Saronia, from Saro, the third King of Trœzene, by whom a temple was erected, and this feſtival inſtituted to her. *Potter, Archæol. Græc.*

SA'ROS, σαρὸς, in chronology, a period of 223 lunar months. The etymology of the word is ſaid to be Chaldean, ſignifying reſtitution, or return of eclipſes; that is, conjunctions of the ſun and moon in nearly the ſame place of the ecliptic.

SA'ROSEL, in the glaſs trade, the name of the room into which the mouth of the leer opens, and in which the glaſs veſſels are placed, when taken out of the leer.

The men who attend to do this are called the ſaroſemen. *Neri's Art of Glaſs.*

SA'RPLAR *of wool*, a quantity of wool otherwiſe called a pocket, or half ſack; a ſack containing eighty tod, a tod two ſtone, and a ſtone 14 pounds. In Scotland it is termed ſarpliath, and contains eighty ſtone.

SARRACE'NA, *the ſide-ſaddle flower*, in botany, the name of a genus of plants, whoſe characters are:

It hath a flower conſiſting of ſeveral leaves which are placed circularly, and expand in form of a roſe, and reſting in a many-leaved empalement: from the middle ariſes the pointal, which is membranaceous, and ſhaped like an hood, and afterwards becomes a roundiſh fruit divided into five cells, which contain oblong ſeeds.

Theſe ſtrange plants are natives of New-England, Virginia, and ſeveral places in North-America, where they grow on bogs, and ſuch places where the waters uſually ſtand in winter.

The name was given to this plant by Dr. Tournefort, in honour of Dr. Sarrazin, a curious botaniſt, who ſent the plant from Canada to Dr. Tournefort at Paris.

As theſe plants grow on bogs, it is very difficult to cultivate them in England: for, although the winters are much more ſevere in the places of their natural growth than they generally are in England, yet, their ſummers being much warmer, they thrive much better, and produce their flowers and fruit annually, whereas it is with great difficulty they are kept alive for a year or two in England.

SARRI'TION, *ſarritio*, among Roman authors, the term uſed to expreſs what we call hoeing in huſbandry, or ſomething analogous to it, that is, a way of ſtirring up the earth about young plants, and deſtroying the weeds that would grow among them. When the plants had been ſome time come up, they ſtirred the land with wooden rakes or harrows, and then went over the fields, and pulled up the weeds by hand.

SA'SSAFRAS (*Dict.*)— The culture of this tree is a hard taſk, it being a very difficult tree to keep long alive, though it will do very well for ſome time. It will not live in green-houſes, and hard winters kill it in the open air.

The beſt way to manage it is to remove it in April into a warm and well defended place, where it will be ſafe from the cold winds, and from too much open ſun. It muſt not, however, be under the droppings of other trees. In winter ſome mulch muſt be laid on the ground round the ſtem, and in the ſummer ſeaſon all the weeds muſt be cleared away about it.

It is brought from Virginia and Carolina, in both which places it is common. Ximenes, an author of conſiderable credit in the world, has ventured to tell us, that the chips of the Saſſafras tree put into ſea-water will, in a few days, render it freſh and potable. He was probably impoſed on by ſome perſon, in whom he placed too much confidence in this article, for experiments ſhew it to be falſe; ever ſo large a quantity of this wood, kept for ever ſo long a time in ſea-water, having no ſuch effect. *Redi's Eſperienza.*

The oil of Saſſafras forms into cryſtals like the oil of thyme, obſerved by Mr. Neuman, and which he ſuppoſed like to camphor.

SASSARO'LLO, in zoology, the name of a peculiar ſpecies of pigeon, called by ſome columba rupicola, or the rock pigeon.

It is of the ſhape of a common pigeon, but ſmaller, and has red legs, and a grey variegated back. It ſeems the ſame with the livia of other authors. *Aldrovand de Avib.*

SA'TTIN *, or SATIN, a kind of ſilken ſtuff, very ſmooth and ſhining, the warp whereof is very fine, and ſtands out; the woof coarſer, and hid underneath: on which depends that gloſs, and beauty, which gives it its price.

* The word comes from the French *ſatin*, which Menage derives further from the Latin *ſeta*, a briſtle, or hair; others from the Hebrew *ſadin*; or from the old French *ſade* and *ſadinet*, handſome, genteel.

There are ſome Sattins quite plain, others wrought, ſome flowered with gold or ſilk, others ſtriped, &c.—All the varieties in the fabric of Sattins are made by uſing new warps, or woofs. The fineſt Sattins are thoſe of Florence and Genoa; yet, the French will not allow thoſe of Lyons any thing inferior thereto.— The Sattins of Bruges have their warp of ſilk, and their woof of thread.

India Sattins, or Sattins of China, are ſilken ſtuffs, much like thoſe manufactured in Europe.— Of theſe, ſome are plain, either white, or of other colours; others worked, either with gold, or ſilk, flowered, damaſked, ſtriped, &c. They are moſtly valued becauſe of their cleaning, and bleaching eaſily, without loſing any thing of their luſtre. In other reſpects they are inferior to thoſe of Europe.

F. le Comte obſerves, that the Chineſe prepare their Sattins in oil, to give them the greater luſtre; but this makes the duſt liable to hang to them.

SATTINET *, or SATTINADE, a very slight, thin sort of sattin, chiefly used by the ladies for summer night-gowns, &c. and ordinarily striped.

* The word is a diminutive of *sattin*.

SATURATION, in chemistry, is the impregnation of an acid with an alkali, or of an alkali with an acid, till either will receive no more, and the mixture becomes neutral.

SATUREIA, *savory*, in botany, the name of a genus of plants, whose characters are:

It is a plant of the verticillate kind, with a labiated flower, whose upper lip, or crest, is divided into two parts; but the lower lip, or beard, is divided into three parts, the middle part being crenated: these flowers are produced from the wings of the leaves, in a loose order, and not in whorles or spikes, as are most of this tribe of plants.

The winter savory is an abiding plant, and may be propagated by slips or cuttings, which, if planted in a bed of light fresh earth in the spring, and carefully watered, will take root in a short time, and may then be transplanted where they are to remain. There seem to be two species of this, differing in their manner of growth, and also in the size of their flowers.

This plant should have a dry soil, in which it will endure the cold very well, as may be seen by its growing in some places upon the tops of walls, where it defies the severest cold of our climate.

SATURN (*Dict.*)—The ring of Saturn sometimes disappears, concerning which, we have a paper in the *Philos. Transact.* N°. 471.

This Phænomenon is rare. It ought to happen every fifteen years; but from the situation of the earth, with respect to the sun and to Saturn, it happens not above once in 30 or 45 years.

SATURNALIA (*Dict.*)—The Saturnalia held three days; beginning on the 16th, others say, the 17th, and others the 18th day of December.

During the solemnity the slaves were reputed masters; they were allowed to say any thing; and, in fine, were served at table by the masters themselves.—Every thing run into debauchery and dissoluteness, and nothing was heard or seen in the city of Rome, but the din, riot, and disorder of a people wholly abandoned to joy and pleasure.

M. Dacier observes, that the Saturnalia were not only celebrated in honour of Saturn, but also to keep up the remembrance of the golden age, when all the world was on a level. It was a piece of religion not to begin any war, or execute any criminal, during this feast.

The Saturnalia were not only observed at Rome, but also in Greece; and were, in reality, much older than Rome itself.—Some ascribe their institution to the Pelasgi, who were cast upon the island of Delos; others to Hercules, and others to Janus.—Goropius Becanus makes Noah the author of them. Orig. lib. 4. That patriarch, he tells us, in the ark, instituted a feast to be held in the tenth month, in memory of this; that, in that month, the tops of the mountains began to appear above the water; and this he makes the origin of the Saturnalia: but it is very probable the year then begun in autumn, and, of consequence, December could not be the tenth month. Vossius goes still higher, and will have it, that the Saturn, in honour of whom this feast was instituted, was Adam.

SATURNUS *glorificatus*, the name of a composition used in making artificial gems.—The preparation is as follows:

Take of good litharge, or rather good ceruse, what quantity you please, grind it into a subtile powder, put it in a large glass cucurbit; pour on it good distilled vinegar, till it rise about three inches above the ceruse.

Then put this vessel on a soft ash fire, or sand heat, and, when the vinegar is well coloured and impregnated with the salt, decant it off into another vessel; continue to put new vinegar on your matter, which stir well with a stick, to facilitate the solution of the salt; and do it so often, till your vinegar shall have extracted all the tincture from the ceruse.

Then take all your coloured vinegar, rectify it four times on tartar calcined to whiteness, then filtre it carefully, and put it in a glass cucurbit on a sand heat or ash fire, where gently evaporate it till a pellicle appears on the surface. Then put the vessel into a cold place, having taken care to cover it, for fear of any foulness tumbling into it, and in a little time you will find pure crystals, which you must take out of your vessel; then put your vessel on the same fire to evaporate the remaining vinegar, till a pellicle appears; then set it in a cool place to crystallise as before.

When you have taken out all the crystals, dry them well, and reduce them to a subtile powder; and keep them in a vessel well stopped. Thus you have Saturnus glorificatus.

SAW (*Dict.*)—The Saw is one of the most useful machines, in the mechanic arts, ever invented: the fable, which is perhaps founded on some surer tradition, attributes the invention thereof to Icarus; who, vying with his father Dædalus, enriched the rising arts with several discoveries.—It is added, he took the first hint from the spine or backbone of a flat fish, such as the soal. The Saw is made of steel, with teeth, but those differently filed and turned, according to the use it is designed for.—There are also a kind of Saws without teeth, used in the sawing of marbles and other stones.

The best Saws are of tempered steel, ground bright and smooth; those of iron are only hammer-hardened: hence, the first, besides their being stiffer, are likewise found smoother than the last.—They are known to be well hammered by the stiff bending of the blade; and well or evenly ground, by bending equally into a bow.

The edge, wherein the teeth are, is always thicker than the back, in regard the back is to follow the edge.—The teeth are cut and sharpened by a triangular file; first fixing the blade of the Saw in a whetting-block.

When filed, the teeth are to be set, that is, to be turned askew, or out of the right line, to make the wider kerf or fissure, that the back may follow the better. This is done by putting an instrument, called a Saw-wrist, between every other two teeth, and giving it a little wrench, which turns one of the teeth a little towards you, and the other a little from you.—The teeth are always set ranker for coarse cheap stuff, than for hard and fine; in regard, the ranker the tooth is set, the more stuff is lost in the kerf; and, if the stuff be hard, the greater the labour of sawing it.

The workmen, who make the greatest use of the Saw, are, the sawyers, carpenters, joiners, ebonists, stone-cutters, carvers, sculptors, &c. The lapidaries too have their Saw, as well as the workers in mosaic; but these bear little resemblance to the common Saws.

SAWING (*Dict.*)—There are wind-mills and water-mills, which do the office of Sawing wood, with infinitely more expedition and ease than is performed by the hand.

They consist of several parallel saws, which are made to rise and fall perpendicularly, by means of one of the grand principles of motion.—A very few hands are here needed, viz. only to push forward the pieces of timber, which are laid on rollers, or suspended by ropes, in proportion as the Sawing advances. These mills are frequently found abroad, and were lately begun to be introduced in England; but the parliament, in consideration of this, that they would spoil the sawyers trade, and ruin great numbers of families, thought fit to suppress them.

SCABIOUS (*Dict.*)—All the shrubby sorts of Scabious may be propagated by cuttings, which may be taken off during any of the summer-months, and should be planted in a shady border, and duly watered in dry weather, which will promote their taking root; and then they may be potted, and placed in a shady situation, till they have taken new root, after which time they may be placed amongst other hardy exotic plants, in a sheltered situation, where they may remain until the end of October, when they must be moved into shelter. In some favourable seasons these plants will produce good seeds in England, so that the plants may be raised from these, by sowing them in an open border of light earth about the middle of March; and, if the spring should prove very dry, it will be necessary to water the ground now-and-then, which will forward the vegetation of the seed; so that the plants will appear in about three weeks after the seeds are sown. When they come up, they must be kept clear from weeds, and in dry weather duly watered; and, when they are strong enough to transplant, they should be planted in pots, and managed in the same manner as those plants which are propagated by cuttings.

All the sorts of Scabious continue a long time in flower, for which they are regarded; for there is no very great beauty in many of their flowers: but, as most of the hardy sorts produce flowers near three months successively, so they may be allowed a place in the borders of large gardens, because they require very little care to cultivate them. And as the shrubby kinds continue in flower most part of the year, so they make an agreeable variety amongst hardy exotic plants in the winter. *Miller's Gard. Dict.*

SCÆNANTH, or SCHÆNANTH, in the Materia Medica, the dried stalk of a plant brought to us from Arabia.

This plant is called, by the generality of botanists, juncus odoratus and aromaticus; but Linnæus gives it the name of ischæmum.

The stalk is usually eight or ten inches in length, sometimes considerably more; it is smooth and glossy on the surface, and about the thickness of a wheat-straw, but much more rigid and firm. It is very light, yet considerably hard, and is of a fragrant or aromatic smell, in which we may discover something of a mixed scent, between that of the rose and penny royal. Its taste is acrid and bitterish, but not unpleasant.

It should be chosen fresh, sound, and clean, not dusty or decayed, of a good smell and strong and acrid taste. *Hill's Hist. Mat. Med.*

SCALE *of music* (*Dict.*)—That musical intervals are founded on certain ratio's or proportions expressible in numbers, is an old discovery. It is well known, that all musical ratio's may be analysed into the prime numbers two, three, and five; and that all intervals may be found from the octave, fifth, and third major; which respectively correspond to those numbers. These are the musicians elements, from the various combinations of which all the agreeable variety of relations of sounds result. This system is so well founded on experience, that we may look upon it as the ſtandard of truth. Every interval that occurs in muſic is good or bad, as it approaches to, or deviates from, what it ought to be on theſe principles. The doctrine of ſome of the ancients ſeems different. Whoever looks into the numbers given us by Ptolemy, will not only find the primes 2, 3, and 5, but 7, 11, &c. introduced. Nay, he ſeems to think all fourths good, provided their component intervals may be expreſſed by ſuperparticular ratio's. But theſe are juſtly exploded conceits; and it ſeems not improbable, that the contradictions of different numerical hypotheſes, even in the age of Ariſtoxenus, and their inconſiſtency with experience, might lead him to reject their numbers altogether. It is pity he did: had he made a proper uſe of them, we ſhould have had a clearer inſight into the muſic of his times. However, what remains of the writings of this great muſician, joined to my own obſervation and experience, has enabled me, I hope, to throw ſome light upon the obſcure ſubject of the ancient ſpecies of muſic.

By the manner in which Euclid and others find the notes of their Scale, it muſt have been compoſed of tones major and limma's. Hence, the ſeven intervals of one octave would be thus expreſſed in numbers, $\frac{8}{9}$, $\frac{243}{256}$, $\frac{8}{9}$, $\frac{8}{9}$, $\frac{243}{256}$, $\frac{8}{9}$, $\frac{8}{9}$.

Some modern authors have from this inferred the imperfection of the Greek muſic. They alledge we here find the ditonus, or an interval equal to two tones major expreſſed by $\frac{64}{81}$, inſtead of the true third major expreſſed by $\frac{4}{5}$. As there can be no queſtion of the beauty and elegance of the latter, the former therefore muſt be out of tune, and out of tune by a whole comma, which is very ſhocking to the ear. In like manner the trihemitone of the ancients falls ſhort of the third minor by a comma; which is alſo the deficiency of their hemitone or limma, from the true ſemitone major, ſo eſſential to good melody. Theſe errors would make their Scale appear much out of tune to us. This I readily grant; and add, that it appeared out of tune to them; ſince they expreſly tell us, that the intervals leſs than the diateſſaron or fourth, as alſo the intervals between the fifth and octave, were diſſonant and diſagreeable to the ear. Their Scale, which has been called by ſome the ſcala maxima, was not intended to form the voice to ſing accurately, but was deſigned to repreſent the ſyſtem of their modes and tones, and to give the true fourth and fifths of every key a compoſer might chuſe. Now if, inſtead of tones major and limma's, we take the tones major and minor, with the ſemitone major, as the moderns contend we ſhould, we ſhall have a good Scale indeed, but a Scale adapted only to the concinnous conſtitution of one key; and, whenever we proceed from that into another, we find ſome fourth or fifth erroneous by a comma. This the ancients did not admit of. If, to diminiſh ſuch errors, we introduce a temperature, we ſhall have nothing in tune but the octave. We ſee then the Scale of the ancients was not deſtitute of reaſon; and that no good argument againſt the accuracy of their practice can from thence be formed.

It was uſual among the Greeks to conſider a deſcending as well as an aſcending Scale; the former proceeding from acute to grave, preciſely by the ſame intervals as the latter did from grave to acute. The firſt ſound in each was the proſlambanomenos. The not diſtinguiſhing theſe two Scales has led ſeveral learned moderns to ſuppoſe, that the Greeks, in ſome centuries, took the proſlambanomenos to be the loweſt note in their ſyſtem; and, in other centuries, to be the higheſt. But the truth of the matter is, that the proſlambanomenos was the loweſt, or higheſt note, according as they conſidered the aſcending, or deſcending Scale. The diſtinction of theſe is conducive to the variety and perfection of melody; but I never yet met with above one piece of muſic, where the compoſer appeared to have any intelligence of this kind. The compoſition is about 150, or more, years old, for four voices; and the words are, ‘ Vobis datum eſt noſcere myſterium regni Dei, cæ‘ teris autem in parabolis; ut videntes non videant, et audientes ‘ non intelligant’. By the choice of the words, the author ſeems to allude to his having performed ſomething not commonly underſtood.

I ſhall here give an octave only of the aſcending and deſcending Scales of the diatonic genus of the ancients, with the names of their ſeveral ſounds, as alſo the correſponding modern letters.

Aſcending.			Deſcending.	
A		Proſlambanomenos		*g*
	$\frac{8}{9}$		$\frac{9}{8}$	
B		Hypate Hypaton		*f*
	$\frac{243}{256}$		$\frac{256}{243}$	
C		Parhypate Hypaton		*e*
	$\frac{8}{9}$		$\frac{9}{8}$	
D		Lychanos Hypaton		*d*
	$\frac{8}{9}$		$\frac{9}{8}$	
E		Hypate Meſon		*c*
	$\frac{243}{256}$		$\frac{256}{243}$	
F		Parhypate Meſon		*b*
	$\frac{8}{9}$		$\frac{9}{8}$	
G		Lychanos Meſon		*a*
	$\frac{8}{9}$		$\frac{9}{8}$	
a		Meſe		*G*

Where the ſame Greek names ſerve for the ſounds in the aſcending and deſcending Scales.

In the octave here given, four ſounds, viz. the proſlambanomenos, hypate hypaton, hypate meſon, and meſe, were called ſtabiles, from their remaining fixed throughout all the genera and ſpecies.

The other four ſounds being the parhypate hypaton, lychanos hypaton, parhypate meſon, and the lychanos meſon, were called mobiles, becauſe they varied according to the different ſpecies and varieties of muſic.

I come now to determine the queſtion, What theſe different genera and ſpecies were? We know, that by genus and ſpecies was underſtood a diviſion of the diateſſaron, containing four ſounds, into three intervals. The Greeks conſtituted three genera, known by the names of enharmonic, chromatic, and diatonic. The chromatic was ſubdivided into three ſpecies, and the diatonic into two. The three chromatic ſpecies were the chromaticum molle, the ſeſquialterum, and the toniæum. The two diatonic ſpecies were the diatonicum molle, and the intenſum; ſo that they had ſix ſpecies in all. Some of theſe are in uſe among the moderns, but others are as yet unknown in theory or practice.

I now proceed to define all theſe ſpecies, by determining the intervals, of which they ſeverally conſiſted; beginning by the diatonicum intenſum, as the moſt eaſy and familiar.

The diatonicum intenſum was compoſed of two tones, and a ſemitone: but to ſpeak exactly, it conſiſts of a ſemitone major, a tone minor, and a tone major. This is in daily practice; and we find it accurately defined by Didymus, in Ptolemy's Harmonics publiſhed by Dr. Wallis.

The next ſpecies is the diatonicum molle, as yet undiſcovered, as far as appears to me, by any modern author. Its component intervals are, the ſemitone major, an interval compoſed of two ſemitones minor, and the complement of theſe two to the fourth, being an interval equal to a tone major, and an enharmonic dieſis.

The third ſpecies is the chromaticum toniæum. Its component intervals are, a ſemitone major, ſucceeded by another ſemitone major; and, laſtly, the complement of theſe two to the fourth, commonly called a ſuperfluous tone.

The fourth ſpecies is the chromaticum ſeſquialterum, which is conſtituted by the progreſſion of a ſemitone major, a ſemitone minor, and a third minor. This is mentioned by Ptolemy, as the chromatic of Didymus. Examples among the moderns are frequent.

The fifth ſpecies is the chromaticum molle. Its intervals are two ſubſequent ſemitones minor, and the complements of theſe two to the fourth; that is, an interval compounded of a third minor, and an enharmonic dieſis. This ſpecies I never met with among the moderns.

The ſixth and laſt ſpecies is the enharmonic. Salinas and others have determined this accurately. Its intervals are, the ſemitone minor, the enharmonica dieſis, and the third major. Examples of four of theſe ſpecies may be found in modern practice. But I do not know of any theoriſt who ever yet determined what the chromaticum toniæum of the ancients was: nor have any of them perceived the analogy between the chromaticum ſeſquialterum and our modern chromatic. The enharmonic, ſo much admired by the ancients, has been little in uſe among our muſicians as yet. As to the diatonicum intenſum, it is too obvious to be miſtaken.

Ariſtoxenus and others often mention the tone as divided into four parts, and the ſemitone into two; thereby making ten diviſions or dieſes in the fourth. And this is true, if we conſider theſe ſounds in one tenſion; that is, either aſcending or deſcending: but, accurately ſpeaking, when we conſider all the dieſes or diviſions of the fourth, both aſcending and deſcending, we ſhall find thirteen; five to each tone, and three to the ſemitone major. But then it is to be obſerved, that ſome of theſe diviſions will be leſs than the enharmonic dieſis: for, if we divide the ſemitone major into the ſemitone minor, and enharmonic dieſis, aſcending, for inſtance, E, ♯ E, F, and then divide in like manner deſcending, F, ♭ F, E, we ſhall have the ſemitone major divided into three parts thus, E ♭ F, ♯ E, F; where the interval between ♭ F and ♯ E is leſs than the enharmonic dieſis between E and ♭ F, and between ♯ E and F, as is eaſily proved.

Now, if we ſuppoſe theſe ſmall intervals equal, by increaſing the leaſt diviſion, and diminiſhing the true enharmonic dieſis, we ſhall then have a fourth divided into thirteen equal parts; and, conſequently, the octave divided into thirty one ſuch equal parts; which gives us the celebrated temperature of Huygens, the moſt perfect of all.

From this it appears, that the diviſion of the octave into thirty-one parts was neceſſarily implied in the doctrine of the ancients. The firſt of the moderns who mentioned ſuch a diviſion was Don Vincentino, in his book intitled L'Antica Muſica ridotta alla moderna Prattica, printed at Rome, 1555, folio. An inſtrument had been made according to his notion: which was condemned by Zarlino and Salinas, without ſufficient reaſon. But Mr. Huygens, having more accurately examined the matter, found it to be the beſt temperature that could be contrived. Though neither this great mathematician, nor Zarlino,

lino, Salinas, nor even Don Vincentino, feem to have had a diftinct notion of all thefe thirty-one intervals, nor of their names, nor of their neceffity to the perfection of mufic.

In Huygens's temperature the tones are all equal: but, in a true and accurate practice of finging, they are not fo. And I muft add, that the tone divided in every fpecies muft be the tone minor; for the divifion of the tone major is harfh and inelegant. So that, in the divifion of the fourth, it is to be obferved, that in every fpecies, the tone major muft either be an undivided interval, or make part of one. *Philof. Tranf.* N°. 481.

SCALES, in natural hiftory. What the naturalifts underftand by Scales, are certain flat and femipellucid bodies, common to the fifh, the ferpent, and the lizard kind; confifting of a fubftance fomewhat analogous to that of the horns and hoof of other animals, as is found by cutting and burning them, and by their fmell.

The Scales in fifhes are of fo many different kinds and fhapes, that they afford, in many cafes, very good characters for the diftinction of the fpecies. The differences of thefe parts of fifh arife from their number, fituation, figure, and proportion, and to fome other qualities peculiar to a few of them. Their differences, in regard to number, are thefe: there are none on feveral kinds of fifh, as on the petromyza, the dolphin, and the whales. Upon fome other fifhes they are but very few in number, as on the conger, the eel, the clariæ, &c. And they are on others found in vaftly great numbers, and placed in clufters one over another, as in the pearch, falmon, &c. Thefe Scales are not fuppofed to be fhed every year, nor during the whole life of the fifh, but to have an annual addition of a new Scale growing over, and extending every way beyond the edges of the former, in proportion to the fifh's growth; fomewhat in the manner as the wood of trees increafes annually, by the addition of a new circle next the bark. And, as the age of a tree may be known by the number of ringlets its trunk is made up of, fo in fifhes, the number of plates, compofing their Scales, denote to us their age. It is alfo probable, that as there is a time of the year when trees ceafe to grow, or have any farther addition to their bulk, the fame thing happens to the Scales of fifhes; and that afterwards, at another time of the year, a new addition, increafe, or growth begins.

Mr. Lewenhoek took fome Scales from an extremely large carp, forty-two inches and a half long, Rynland meafure, which were as broad as a dollar; thefe he macerated in water, to make them cut the eafier, and then cutting obliquely through one of them, beginning with the firft formed, or very little fhell in the center, he by his microfcope plainly diftinguifhed forty lamellæ, or Scales, glewed as it were to one another; whence he concluded the fifh to be forty years old.

It is generally imagined that an eel has no Scales; but, if the flime be wiped clean away, and the fkin then examined by a microfcope, it is found covered with extremely fmall Scales, ranged in a very orderly and pretty manner; and probably very few fifhes, except fuch as have fhells, are truly free from Scales.

The way of preparing Scales for the microfcope, is to take them off carefully with a pair of nippers, wafh them very clean, and then place them between the leaves of a book to make them dry flat; and, when thoroughly dry, they are to be put between two flips of talc. The fnake, viper, and eel afford alfo a very beautiful and very different feries of Scales from thofe of fifhes.

SCA'LLION, or ESCALLION, a fort of onion that never forms any bulb at the root, but is ufed green in fpring, before the other forts fown in July are large enough.

This is however very fcarce in London, the gardeners ufually felling in its place the fhoots of fuch decayed common onions, as have fprouted in the houfe. Thefe they plant in a bed early in the fpring, and they foon grow large enough for ufe, when they pull them out; and, taking off all the old outer coat of the roots, they lay them in bunches, and fell them at market for Scallions.

The true Scallion is eafily propagated by parting the roots in autumn, and planting them three or four together in a hole, at fix inches diftance. Thefe will grow in any foil or fituation, and will multiply very quickly, and in a very great abundance; and their being hardy enough to endure the fevereft weather, and fit for ufe fo early in fpring, makes them worthy a place in all kitchen gardens. *Miller's Gard. Dict.*

SCAL'LOP. — The anatomy of this fifh lets us greatly into the knowledge of the ftructure of the parts of other bivalve fifh.

The Scallop is compofed of two fhells, which, as in many others, are one concave, and the other plane or flat. The cardo, or hinge, is lightly bent from the concave fhell, and thence carried over a part of the plane fhell, and all the way between it is firmly connected to a cartilage. In the middle of the length of the cardo there is placed another fhort, black, and very ftrong cardo.

It is eafy to fee, from hence, to what is owing that remarkable ftrong power, which this creature has of fhutting and opening its fhell; and it is very poffible, that, by means of fo ftrong an apparatus of tendons or ligaments as it has in this part, it may be able to move the plane fhell in fo fwift and regular, as well as forcible and eafy a manner, that it may ufe it in moving from place to place, and poffibly it may make a fort of wing of it, to beat againft the water as the pinion of a bird does againft the air; and what the antients have fo frequently faid of its moving about in a very fwift manner, from place to place, may be true, though we have been wanting in later obfervations to fee it.

When the two fhells are opened, the following particulars offer themfelves to the view. Firft, the mouth; this is covered with a fort of membranous hood, as in the oifter; it does not ftand on the center of the head, but towards the right-hand, and the covering is only an elongation of the branchiæ, or gills of the fifh: thefe are of a membranous nature, and furround the whole body from the mouth to the anus, which ftands towards the left hand from the mouth, where they are connected again.

That branchia of the exterior part, to which the flat or plane fhell adheres, is fixed in its center to an immenfely ftrong mufcle, which grows from the fhell, and is fixed into the body of the fifh at right angles: this branchia is fixed to the upper limb of that mufcle, and the other branchia is, in like manner, connected to the lower limb of the fame ftrong mufcle. Thefe two exterior, or fpurious branchiæ, from this mufcle to a confiderable extent, are formed only of a thin and pellucid membrane, and, being carried to the middle of the valves on each fide, they are fixed down in fuch a manner, that they cannot be removed by any means, without injuring or deftroying them.

The ufe of thefe is to defend the body of the animal from the injuries of the water, and other fubftances let in with it, on the opening of the fhell. From the place of this adhefion there is propagated a ftrong and thick mufcle, of a truly wonderful ftructure; this is a fort of limb or verge to the animal. It is contracted inward when the animal is dead, but, while it is alive, it is expanded, at the creature's pleafure, a great way out beyond the edges of the fhell; and is jagged, and variegated with lines and ftreaks in an amazing and elegant manner.

The ufe of this part feems eafily gueffed, it being, when expanded out of the mouth of the fhell, a fort of net, for the catching whatever the creature chufes to feed upon. It is, at the pleafure of the animal, either laid flat on the furface of the mud or rock, or arched into a part of a circle: when, in any of thefe pofitions, any thing comes in its way which is proper food for the creature, it immediately gathers up like a net round about it, and, withdrawing itfelf into the fhell, takes in the prey with it. In this cafe, the ufe of its being cut, or fringed, is alfo plainly feen; for it can, by means of this ftructure, let out the water taken in with the prey through the jags, and yet retain the prey itfelf. *Philof. Tranf.* N°. 229.

The ufe of this admirable mufcle is not only the ferving as a net for the taking the food, and afterwards as a ftrainer for the feparating the water from it; but its mufcular force is fo great, that it alfo ferves as a weapon of death to the little animal it has feized, by compreffing it to pieces, if neceffary, at leaft by fqueefing it till no life remains. This is a very neceffary article in the preying of an animal which can neither follow or refift an animal in motion, but this is not all. When the prey is brought into the fhell, it might there remain, where firft laid down, without being of any ufe to the Scallop, who cannot turn about her mouth to come at it: in this cafe the fame wonderful mufcle, by its undulatory motion, ferves to convey the prey to a part of the fhell nearer the mouth of the animal; and when there, taking it up between the jags of the fringe, it holds it to the opening of the mouth; in this laft office ferving in the place of a hand. Thefe are the many and neceffary ufes of this part.

But to come to the branchiæ, or gills, properly fo called; the true branchiæ are four in number; they are of a yellowifh colour, and are fringed in a very elegant manner; thefe every way furround the great central mufcle, and ferve as a covering to the uterus of the animal, or its ovary; certainly, however, to the parts of generation, by what ever name they may be called.

The lower part of the body of the Scallop is yellow, and its upper part white, and near its mouth there is very plainly to be difcovered a procefs with a double aperture. It feems probable, from all obfervation, that the Scallop is an hermaphrodite animal, and contains the parts of generation of both fexes in each individual; and it appears that the female part of generation is, on occafion, pufhed out from one of thefe apertures, and the penis, or male part, from the other. The mouth of the Scallop is furnifhed with reddifh lips, refembling the branchiæ, or gills, in their ftructure, but very fhort and fmall; and near the hinge there are two large circular cavities, refembling the eyes of the turbot. Near the head there is a large mafs of blackifh matter towards the left hand, and under that, or rather behind it, is fituated the creature's heart. The pericardium is pellucid, and is of fo fine a ftructure, that the heart is eafily feen through it: it is of a reddifh colour, and its aorta, or large artery, is divided into a great number of branches, which are fent every way round to the gills.

It is fome doubt, however, whether this their membrane, before

fore deſcribed, ſerves alone in the capacity of a pericardium, or whether all this black matter, that lies about it in a ſort of rhombic form, does not alſo, in ſome degree, ſupply that office. The lower part of this gives place to the urinary bladder, and the ſtrait gut ariſes from the baſe of this black ſubſtance, and is thence carried ſtraight over the pericardium, whence it runs on to the branchiæ, and is at length affixed to the great central muſcle.

This central muſcle is of a rounded figure, very ſmooth, and white, and even in the greater part of its bulk, where it is connected to the ſhell; but on the left it is divided, and forms another white and lacerated muſcle, which runs along a part of the ſhell, and ſtrengthens the connection of the body of the fiſh with this part of the plane valve. *Philoſ. Tranſ.* N°. 229.

SCAL'PEL, *ſcalpellum*, in chirurgery, a kind of knife chiefly uſed in diſſections; but which may be occaſionally uſed in many other operations, as in amputations, and to cut off the fleſh and membranes that are between the two bones of an arm or leg, before the limb be ſawed off.

There are two kinds of Scalpels: the firſt cuts on both ſides, and is fixed in an ebony or ivory handle, which, being very flat and thin at the extremity, ſerves to part the membranous and fibrous parts in anatomical preparations.

The other has a back, that is, it only cuts on one ſide; it is crooked, and very commodious for ſtripping the fleſh off the bones in embalming, making ſkeletons, &c.

Scultetus, in his Arſenal, deſcribes ſeveral other kinds of Scalpels; as, a deceitful Scalpel, thus called, becauſe it deceives the patient by hiding its blade. It was much uſed by the ancients, in opening and dilating of ſinews; but as it is apt to deceive the ſurgeon himſelf, and is beſides very ſlow, it is better uſing a ſyringotomus.—A Scalpel, ſharp on both ſides for ſetons.—A little crooked Scalpel for ſeparating the coherence of the eyelids.—A ſharp, double-cutting Scalpel, with a bone-handle, for the cutting off an ægilops.—Scalpels like ſcolopomachærions, &c. Even the ſcolopomachærion itſelf is a kind of Scalpel.

SCA'LPRA *dentalia*, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts, which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath.

The manner of uſing them is to begin near the gums, ſupporting the blade with the left hand, and ſcraping all along the teeth, till the cruſt is taken off, taking care not to wound the gums, or diſplace the teeth. *Heiſter's Surgery.*

SCAPE-*goat*, in the Jewiſh antiquities, the goat ſet at liberty on the day of ſolemn expiation. For the ceremonies on this occaſion, ſee Levit. XVI. 5, 6, &c.

Some ſay that a piece of ſcarlet cloth, in form of a tongue, was tied on the forehead of the Scape-goat. *Hofm. Lex univ. in voc. Lingua.*

Many have been the diſputes among the interpreters, concerning the meaning of the word Scape-goat, or rather of azazel, for which Scape-goat is put in our verſion of the Bible. Spencer is of opinion that azazel is a proper name, ſignifying the devil or evil dæmon. See his reaſons in his book de Leg. Hebr. Ritual, Diſſert. VIII. Among other things he obſerves that the antient Jews uſed to ſubſtitute the name Samaël for azazel, and many of them have ventured to affirm, that at the feaſt of expiation they were obliged to offer a gift to Samaël to obtain his favour. Thus alſo the goat, ſent into the wilderneſs to Azazel, was underſtood to be a gift or oblation. Some Chriſtians have been of the ſame opinion. But Spencer thinks that the genuine reaſons of the ceremony were, 1. That the goat loaded with the ſins of the people, and ſent to Azazel, might be a ſymbolical repreſentation of the miſerable condition of ſinners. 2. God ſent the goat thus loaded to the evil dæmons, to ſhew that they were impure, thereby to deter the people from any converſation or familiarity with them. 3. That, the goat ſent to Azazel ſufficiently expiating all evils, the Iſraelites might the more willingly abſtain from the expiatory ſacrifices of the Gentiles.

Fracture of the SCA'PULA.—The Scapula is uſually fractured either near its acromion, or head, where it joins the clavicle, or in ſome more diſtant part. If the fracture happens in proceſs of the acromion, the reduction will be eaſily made, by lifting up the arm to relax the deltoide muſcle, and puſhing the arm evenly upwards, making the fractured parts meet together with the fingers: but, notwithſtanding their reduction is ſo eaſy, they eaſily ſlip away again from any ſlight cauſe, and ſo are difficultly agglutinated. They are not in particular very eaſily ſeparated by the weight and motion of the arm, and by the contraction of the deltoide muſcle; inſomuch that there is ſcarce ever an inſtance of a fractured acromion being ſo perfectly cured, as to admit afterwards of a free motion of the arm upwards: all means muſt, however, be uſed to endeavour to keep the replaced bones in their proper ſituation. A compreſs, wet with ſpirit of wine, is to be applied to the fracture; a ball is to be put under the arm-pit to ſupport it; the whole is to be bound up with the bandage commonly called ſpica, and the arm is to be ſuſpended in a ſaſh or ſling hung about the neck. But if the neck of the Scapula, which lies under the acromion or its acetabulum, ſhould be fractured, which is a caſe that indeed very ſeldom happens, and, when it does, is very difficult to diſcover; it is a hundred to one but, from the vicinity of the articulation of the tendons, muſcles, ligaments, nerves, and large veins and arteries, there will follow a ſtiffneſs and loſs of motion in the joint; great inflammation is alſo to be expected, and abſceſſes with the worſt ſymptoms, and ſometimes death itſelf.

SCA'NDAL, * ΣΚΆΝΔΑΛΟΝ, in the ſcripture language, denotes any thing that may draw us aſide, or ſollicit us to ſin.

> * The word is formed from the Greek σκάνδαλον, or the Latin ſcandalum, which, according to Papias, was originally uſed for a ſudden, extemporary quarrel, quæ ſubito inter aliquos ſcandit vel oritur.

In which ſenſe, the word is uſed promiſcuouſly with offence and ſtumbling-block.

Scandal is either active or paſſive.

Active Scandal is a real induction to ſin; paſſive Scandal is the impreſſion which an active Scandal makes on the perſon induced to ſin.

SCANDAL, in the popular language, is ſome action, or opinion, contrary to good manners, or to the general ſenſe of a people.

SCANDAL alſo denotes a diſadvantageous rumour, or report; or an action whereby any one is affronted in public.

SCA'NDIX, *ſhepherd's needle, or Venus-comb*, in botany, a genus of plants, whoſe characters are:

It has a roſe-ſhaped umbellated flower, conſiſting of ſeveral petals, which are ranged orbicularly, and reſt on the empalement, which becomes a fruit conſiſting of two parts, having two ſeeds, which reſemble, when joined.

They may be propagated by ſeeds which ſhould be ſown in autumn, ſoon after they are ripe, in the place where they are deſigned to remain, which ſhould be in a ſhady ſituation; and, when the plants are come up, they will require no farther care, but to keep them clear from weeds. In May the plants will flower, and in the beginning of July they will perfect their ſeeds, and ſoon after decay. But, if the ſeeds are permitted to ſcatter, the plants will come up without any manner of care, and become weeds in the garden.

SCA'PHISM * SCAPHISMUS, in antiquity, a kind of torture or puniſhment formerly in uſe among the Perſians. It conſiſted in locking the criminal cloſe up within the trunk of a tree bored to the dimenſions of his body, only with five holes for his head, arms, and legs to come through. In this ſtate he was expoſed to the ſun, and the parts thus appearing anointed with honey and milk, to invite the waſps and flies.

> * The word is Greek, σκαφισμὸς; formed of σκαφὸς, digging, of σκάπτω, I dig, hollow.

To increaſe the torment, they forced the criminal to eat abundantly, till his excrements, cloſe pent up in the wood, rotted his body. Some authors obſerve, that perſons ordinarily lived forty days in this condition.

This invention is aſcribed to Pariſatis queen of *Perſia*, and mother of Artaxerxes Mnemon, and the young Cyrus. It is added, ſhe firſt ordered it to be practiſed on the perſon who brought the tidings of the death of Cyrus.

SCARABÆ'US, *the beetle*. This is an extremely numerous genus of inſects; and, in order to have a diſtinct idea of the differences of the ſpecies, they are arranged by Liſter into a ſort of method. The firſt general diſtinction is into thoſe which live on land, and thoſe which live in the water; of each of which there is a very great number. Thoſe beetles which live on land have ſome of them antennæ laminated at the end, and others have them ſharp-pointed. The outer wings, or caſes of the wings, in ſome are perfect, in others they ſeem mutilated. Some have the antennæ inſerted into a ſort of promuſcis. Theſe were called by the antients gurguliones, and in ſome there is only one juncture in this, in the middle; in others ſeveral near the end. Some have a ſharp-pointed inſtrument at their head; theſe are called cimices.

SCARABÆUS *tardipes*, the ſlow beetle. We have a very ſingular account of the longevity of this animal, and that without food, given by Mr. Baker from his own obſervation. In the year 1737 he found ſeveral beetles of this kind plunging themſelves in the mud at the bottom of an old ciſtern; theſe were about an inch in length, and of a ruſty black colour, and had long jointed antennæ: they had no wings, but only a thick ſhell, covering the whole body, and divided along the middle with a fiſſure, reſembling the meeting of the two caſe wings in other beetles; the tail turned up a little, and the legs were long, but moved ſlowly. Mr. Baker, chuſing one of the largeſt of theſe, threw it into a cup of ſpirits of wine; in a little time it appeared to be dead, and was ſhut up in a ſmall box, and laid by, but ſome months after it was found alive and well: it was then plunged again into ſpirits of wine, and left a much longer time; and after being taking out as dead, and put in the ſame box again for ſome time, when it was found again come to life. It had now thrice eſcaped from being plunged in ſpirits, and lived three months ſhut up without any ſuſtenance. After this the beetle was kept a month or two without ſuſtenance under a glaſs, and at the end of this time again put into ſpirits of wine, and left there a whole night; after this, however, it again recovered, and ſeemed the next day as well as before. He lived, in the whole, two years and an half, without any viſible food or drink. Several things were at times offered him by way of food, as bread, fruits, &c. and water ſet in his way, but he never touched either. It ſeems very probable that this creature received a ſufficient nouriſhment from the particles floating in the air; and it is very poſſible that lizards, ſnakes, &c. when they live ſo long without any viſible food, are ſupplied in the ſame manner, though at other times they are capable of digeſting more ſolid matters; as doubtleſs was alſo the caſe with the beetle, when in its own natural ſtate. This is an inſtance of a creature's ſubſiſting without viſible food, longer than we have any other account of any kind; but it is poſſible, that, though the larger animals cannot long ſubſiſt without ſupplies of ſolid food, yet many inſects may find nouriſhment enough for their tender bodies in the particles floating in the air, though we want obſervations for the proof of it.

While kept under the glaſs, it did not walk about much, but uſually placed its noſe cloſe againſt one edge of it for the benefit of the air: it was of an agreeable aromatic ſmell, and, when touched, communicated its ſcent to the fingers, which did not go off in a long time. Its ſmell is ſtronger in winter than in ſummer. This creature not only bears the plunging in ſpirits of wine much longer than any other animal, but it bears the exhauſted receiver of an air pump without any injury or uneaſineſs. It has been kept under it half an hour, and would walk about without any concern; only, when the air was let in, it appeared ſtartled, and drew up its legs for about a minute.

SCARABÆ'US *virax*, the cankerworm. This laſt term is uſed, in the tranſlation of our Bibles, to ſignify a very deſtructive inſect, of the nature of the locuſt, and uſually mentioned as its companion. The Septuagint gives it the name βροῦχος, bruchus, a name ſignifying an animal which makes a great noiſe, as this inſect does in eating and in flying. We generally underſtand by this word a reptile, but it certainly means no other than that ſort of beetle, which we call the cockchaffer, or dor; a flying inſect very remarkable for the humming noiſe it makes with its wings when in motion, and which, when it is found in ſwarms ſitting upon the hedges, makes a continual noiſe in eating like the ſawing of wood. This creature deſerves very well to be placed with the locuſt, as a deſtroyer of the fruits of the earth. Our own experience in Norfolk has given a very late proof of this; and the hiſtories of Ireland ſhew that this creature has, in that kingdom, devoured every green leaf from the trees, for whole tracks of land at a time. That we have a wrong tranſlation of the word bruchus in cankerworm, is evident from the ſcriptures themſelves; for the prophet Nathan expreſly ſays it is a fly, and has wings, which cannot agree with any thing of the nature of what we underſtand by the word worm, which always ſignifies with us a reptile, or a creeping animal. This prophet has indeed deſcribed them ſo well, that it is wonderful that ſo obvious a thing ſhould not have been obſerved by the commentators. He ſays, they ſpoil and then flee away; they camp in the hedges in the day, and, when the ſun ariſeth, they flee away, and their place is not known where they are. That is, they then retire again to the hedges, and hide themſelves among the trees, where they lie quiet and concealed till the ſun ſets again. It is plain, by comparing theſe words with the common animal here mentioned, that the bruchus of the Old Teſtament is the ſame with our cockchaffer, and that the prophet has given us the natural hiſtory of the animal he deſcribes in this ſhort account.

SCA'RBOROUGH *Water*. — The water of this medicinal ſpring has been the ſubject of great conteſts and diſputes among the phyſical people; all allowing it conſiderable virtues, but ſome attributing them to one ingredient, others to another. Dr. Witty alledges that its material principles are alum, nitre, and vitriol of iron; but, though this author declares, that theſe principles are all to be ſeparated out of it, Dr. Tonſtall, on the other hand, affirms that it has no vitriol of iron in it, but a ſtone powder and a clay, leaving ſand at the bottom of the veſſel; and therefore that it is apt to breed the ſtone, and is bad in the gout, jaundice, and all other diſeaſes where indurations of the parts, or ſtony concretions in the body, are the cauſe: and this author ſeems to ſpeak very experimentally, when he alledges that he never had any ſymptoms of the ſtone till he drank the Scarborough water, but acquired that diſeaſe during the courſe of it.

Alum ſtone diſſolved in water is always found to yield a purple tincture with galls, and therefore the colouring an infuſion of this, or other vegetable ſubſtances, by the Scarborough water, which is by all allowed to contain this ſtone, is no proof of any vitriol of iron being contained in it, other than ſuch a ſmall portion of it, as is always found in this alum ſtone. All waters, which have diſſolved iron, will yield vitriol as a ſalt from that metal on evaporation. The cliffs about Scarborough yield abundance of ſalt in ſhoots and efferveſcences, plainly owing to the waters of the ſpring; yet all theſe are nitro-aluminous, none of them at all vitriolic. If the Scarborough water is ſet by for ſome days, after it is taken freſh from the ſpring, it precipitates a ſediment; which, being examined, is found not to be of a ferruginous nature, but a mere glebe of alum.

Upon the whole, the virtues of alum and vitriol are ſo far different, that it muſt be eaſy to ſee which of the two ſalts the water partakes moſt of, by its virtues; but as to the ſtony matter, which one of theſe diſputants calls an inſipid clay, and the other a ſandy ſtone, it is no other than ſpar, which is contained in all water; and which has been in general ſo far from being accuſed of breeding the ſtone in the bladder, that the general conſent of mankind has ſeemed to eſteem it a cure for that diſorder. The ſpar, in the form of the lapis Judaicus and oſtracites, and the very waters, which are ſo impregnated with it, as to incruſt every thing with it that is put into them, are given for the cure of this diſeaſe. *Phil. Tranſ.* N°. 85.

SCA'RFED, in the ſea-carpenters language, is the ſame as pierced, or faſtened or joined in; thus they ſay the ſtern of a ſhip is Scarfed into her keel. They alſo imply by it, that the two pieces are ſhaped away ſlanting, ſo as to join with one another cloſe and even; which they call wood and wood.

SCA'RY, in huſbandry, a term uſed by the farmers for a barren land, which has a poor or thin ſward, or coat of graſs upon it. *Plot's Oxford.*

SCATCH-*mouth*, in the manege, a bit-mouth, differing from a cannon-mouth in this, that the cannon is round, whereas a Scatch is more upon the oval. That part of the Scatch-mouth that joins the bit-mouth to the branch, is likewiſe different; a cannon being ſtayed upon the branch by a fonceau, and a Scatch by a chaperon, which ſurrounds the banquet. The effect of the Scatch-mouth is ſomewhat greater than that of the cannon-mouth, and keeps the mouth more in ſubjection. Commonly ſnaffles are Scatch-mouths.

SCENT-*bags*, in natural hiſtory, a name given by Tyſon to thoſe peculiar pouches, or bags, which certain animals, as the civet-cat and muſk animal, have for the receiving the matter of their perfume. Theſe bags are common to more animals than is generally ſuppoſed, and in all have much the ſame qualities, the matter they contain being in moſt of them fœtid and diſagreeable, while contained in the bag, and only becoming ſweet and pleaſant when dried, or taken at leaſt from the animal, and ſmelt in ſmall quantities. The weaſel and pole-cat with us have bags of this kind, and the famous bag, or pouch of the opoſſum, is of the nature of theſe; though it ſerves alſo to the other great purpoſe of receiving and ſheltering the young in time of danger. It contains, like the reſt, a tough and viſcous matter; which ouzes out of the glands, and is of a very offenſive ſmell, while the creature lives; but, as ſoon as it is taken out and dried, the ſmell changes into a fine perfume. The gland of the aper moſchiferus, as Tyſon calls it, is of this kind, containing a glutinous humour of a very offenſive ſmell when freſh, but, when dried, becoming ſweet and perfumed as muſk. *Philoſ. Tranſ.* N°. 239.

SCEP'TICISM (*Dict.*)— The ancient Scepticiſm conſiſted in doubting of every thing, in affirming nothing at all, and in keeping the judgment in ſuſpenſe on every thing. Sextus Empiricus makes Scepticiſm to conſiſt in a faculty of oppoſing all appearances, of making all, even contrary things, equally probable, and of proceeding firſt to an ἐποχὴ, ſuſpenſe of mind, and then to an intire undiſturbedneſs or tranquillity.

Hence theſe great maxims of theirs: Οὐ μᾶλλον τοῦτο ἢ ἐκεῖνο, this no more that: Παντὶ λόγῳ λόγος, &c. every reaſon has another againſt it; and Οὐδὲν ὁρίζω, I determine nothing.

The proper character then of Scepticiſm is an ἀκαταληψία, neutrality, or ſuch a diſpoſition of mind as does not, upon any occaſion, incline to any thing more than the contrary thing.

This heſitancy of the ſceptics is well deſcribed by Ariſtocles in Euſeb. de Præpar. Evan. All things are equally indifferent, uncertain and undeterminate: neither our ſenſes, nor our opinions, give us either truth or falſhood: therefore, neither the one, nor the other, are to be credited; but all things to be left on a level, without admitting any opinion, inclination or motion of the mind at all.—It is added, that the ſceptics carried this ſuſpenſe of theirs ſo far, as to deny, that any thing is either good or evil, juſt or unjuſt, true or falſe, or that any thing is this, more than that.

It is from this acatalepſia of the ſceptics that Des Cartes ſeems to have borrowed his great principle of doubting of all things; as is owned by many of his followers. — It muſt be owned, there is ſome difference between the doubting of the ſceptics, and that of the Carteſians. In phyſical matters, it is true, there does not ſeem a great deal of difference; and Des Cartes, in that reſpect, may, without much injuſtice, be deemed a ſceptic: but this may be ſaid in his favour, that the great Socrates was ſo far a ſceptic himſelf; phyſical and ſenſible things, he held, were all dubious, and, at beſt, but probable.

The origin of Scepticiſm is ſomewhat obſcure. Pyrrho, who lived under Alexander the Great, and made the tour of India in his retinue, is uſually reputed the author; whence Pyrrhonians and ſceptics are ordinarily uſed indifferently.

It muſt be owned, however, that the great dogma of the ſceptics had been countenanced, and even cultivated before Pyrrho, by Democritus, Heraclitus, &c.—Sextus Empiricus ſays,

says, expressly, that all that Pyrrho did, was to improve, illustrate, and inforce the dogma, and form the retainers thereto into a sect.

Democritus's philosophy was near akin to Scepticism; for upon his observing, that honey seemed sweet to some, and bitter to others, he concluded, that it was neither sweet nor bitter; and thereupon, pronounced οὐ μᾶλλον, non magis, which is pure Scepticism.—Yet the same Sextus adds, that Democritus was no sceptic.

Though Plato argues very strenuously against the acatalepsy of the sceptics; yet it is certain that dogma received a great part of its encouragement from Socrates's school, and Plato's academy. Nay, it was a great controversy among the ancients, whether Plato himself were a sceptic or dogmatist? Indeed, Plato's decisive way of speaking, in many cases, seems to leave no great room for such a doubt; but it is certain, his followers of the new academy, founded by Arcesilas, gave much into this way; and Nihil scitu was held by them a principle.

Sextus Empiricus observes, that Socrates himself had a tincture of Scepticism; some even make him the author of it, from that customary saying of his, 'I know nothing but this, that I know nothing.' If this were the origin of Scepticism, it must be owned, it was mightily improved afterwards, before Metrodorus said, 'I know nothing, not even this, that I know nothing.' The same Sextus however adds, that Plato, introducing his master, in his Gymnastic Dialogues, disputing with the sophists, makes him act the part of a sceptic.

Some have even charged Job, and Solomon, with Scepticism, from their proposing a great number of questions, without deciding any of them. The philosopher of Kiel, who has published a dissertation on Scepticism, fetches its origin still higher: he will have the devil the author thereof, who made our first parents doubt of the word of God himself; and drew them in, the first proselytes to Scepticism.

SCE'PTICS *, Sceptici, a sect of ancient philosophers, founded by Pyrrho, whose distinguishing tenet was, that all things are uncertain and incomprehensible; contraries equally true; that the mind is never to assent to any thing, but to keep up an absolute hesitancy or indifference. See SCEPTICISM.

* The term Sceptic, in its original Greek, σκέπτικος, properly signifies considerative and inquisitive; or a man who is ever weighing the reasons on one side and the other, without ever deciding between them: it is formed from the verb σκέπτομαι, I consider, look about, deliberate.

SCIADE'PHORI, Σκιαδηφόροι, among the Athenians, an appellation given to the stranger women residing in Athens, because they were obliged, at the festival Panathenæa, to carry umbrellas to defend the free women from the weather. *Potter, Archæol. Græc.*

* The word is derived from σκιαδιον, an umbrella, and φέρω, I carry.

SCIAMA'CHIA, the fighting with a person's own shadow, a sort of exercise prescribed by the ancient physicians, in which the motion of the arms, and other parts of the body, were of very great service in many chronic cases.

SCIA'RRI, in natural history, the matter which runs down in burning torrents from the craters of Mount Ætna.

This matter, when cold and hard, is hewed and employed at Catania, and other places. It is chiefly used for the basements and coinage of buildings. It probably contains mineral and metallic particles, being a ponderous, hard, grey stone.

Some of the Sciarri are coarse, and others fine and polished on the surface; some of them are black, others reddish, and others of the colour of iron; and many of them have coverings of pure sulphur over the whole surface, or a part of it. Some very fine and smooth ones, resembling iron, but very light, are found in, or near the mouths of the eruption; and some are very hard and heavy, and of a mixed nature, seeming to be the result of many sorts of minerals melted together. These latter, when the mountains have poured out streams of fire, always remain in the places, and are the substance that was on fire cobled again.

At the time of the most terrible eruptions of this kind, these heaps of Sciarri, which sometimes appear to be solid rocks of metalline matter, are only a sort of covered arches, under which the melted matter yet continues liquid and running, and bursts out, at times, in the several parts of their sides or surfaces. The general appearance of a train of these Sciarri, left after the eruption of such a rivulet of fire, is much like that of the Thames, or some other such large river, in the time of a severe frost, the rocks of Sciarri rising above the general surface, like the clods of ice in that scene; the colour only differing, the great quantities of the Sciarri in these places being of a deep bluish hue.

It is remarkable, that the substance of these Sciarri, even while melted and running in streams down the hill, is so firm and solid, that no weight will sink into it, nor any instrument make its way through the surface, any more than a solid mass of cold metal. It has been supposed by some, that the flowing matter concreted into the common pumice stone, but that is a vulgar error, the pumice being a wholly different substance. *Philos. Trans.* N°. 49.

SCIATHE'RICUM *Telescopium*, a horizontal dial with a telescope, adapted for observing the true time, both by day and night, to regulate and adjust pendulum-clocks, watches, and other time-keepers. It is the invention of the ingenious Mr. Molyneux, who has published a book with this title, containing an accurate description of this instrument, its uses and application.

SCI'LLA, *squills (Dict.)*— Although these roots are imported chiefly for medicinal use, yet are they worthy of being cultivated in every good garden, for the beauty of their flowers, which make a very handsome appearance, when they are strong roots.

The best time to transplant these roots is in May, when their leaves are decayed: and, if their roots are brought from abroad, if they can be procured firm at the season, or a little after, they should be planted in pots of light sandy earth, and placed in the windows of the green-house; where, if they are blowing roots, they will flower the July following.

These plants must be preserved in shelter during the winter-season; because, if their leaves are destroyed by frost in winter, the roots are subject to perish: but, in summer, they should be exposed to the open air, and in dry weather must be frequently watered; especially during the season their leaves are on, or that they are in flower: but, when the roots are in a state of rest, they should have but little moisture; for wet at that time will rot them. They are pretty hardy, and only require to be sheltered from hard frost; but must have as much free air as possible in open weather.

SCI'NCUS, *the skink*, in zoology, the name of a species of lizard, called also by some the land crocodile, crocodilus terrestris, and well known in the druggists shops as an ingredient in several compositions.

It resembles the smaller sort of lizards, being usually about six inches long, and its usual thickness is that of a man's thumb. It is of a silvery greyish colour, scaly, and has a rounded tail; its head is of an oblong figure; its nose sharp; and its feet, as it were, alated, having five toes each, armed with very sharp claws. It is very common in Egypt and Arabia. *Worm. Mus.*

SCIRRHUS *hepatis*, in medicine, a disease consisting in an indurated tumor of the liver, occasioned by a stagnation of the humours which grow thick there, from an exhalation of their more fluid and subtile parts.

This differs from the infarctus hepatis, not only in degree but in its symptoms, for it almost always is attended with a hectic, or with œdemato-hydropic swellings.

Signs of it. These are a tumor and hardness in the right hypochondrium, or region of the liver, always evident to the patient, and often sensibly perceived by any body else, on touching the part. To this are to be added dull tensive pains, and a sense of weight hanging there, and usually asthmatic symptoms, and a dry cough. It becomes painful to lie on the left, or opposite side; and with these a hectic comes on, with a wasting of the upper parts, and swelling of the inferior ones; first of the feet, but afterwards upwards to the belly, which finally become very obstinate and truly ascitic. The urine in this case is small in quantity, and of a deep orange colour, and thick consistence. It has usually a mucid sediment, and sometimes a thick one of a rose colour.

Causes of it. These are usually either an omission of artificial discharges of the blood, by habitual bleedings at spring and autumn, or a suppression of the natural ones, by the menses or hæmorrhoidal vessels: an improper treatment of intermitting fevers with astringents, of quartans with large quantities of bark, and of acute fevers with too cooling a regimen, or a violent quantity of the volatile salts, or a condensation of the humours in a simple infarction, by means of cold external applications. The stopping hæmorrhages, which nature had brought on for her relief in plethoras, have also been sometimes known to occasion a Scirrhus of the liver; as have also external injuries by blows, falls, and the like.

Prognostics. A recent Scirrhus of the liver admits of a cure, but this not without great difficulty, and in a more confirmed one there is very little hope. This tumor has a continual tendency to corruption, either by sphacelation, or by an inflammatory suppuration; neither of which can happen successfully, for the first must occasion instantaneous death, and the latter exulceration, and a succeeding fatal hectic.

A Scirrhus of the liver often follows, and sometimes precedes a jaundice of the most violent kind.

Method of treating it. The bowels are first to be cleansed and relaxed by a clyster, made of a decoction of mallows, camomile flowers, mullein, and fennel seed; after this, bleeding in the foot is to be ordered, and then the nitrous and other resolvent medicines are to be given, such as tartar of vitriol, and the like. After this medicated wines should be drank as the common drink, prepared with bryony and arum roots, centaury, hyssop, and maidenhair leaves, sassafras, senna, black hellebore, and rhubarb; and, externally, plasters of the resolvent and strengthening kinds are to be applied. But, after all directions for the treatment, it is to be acknowledged, that an obdurate and inveterate Scirrhus admits of no remedy. *Junker's Consp. Med.*

SCIU'RUS, *the squirrel*, in the Linnæan system of zoology, makes a distinct genus of animals, the characters of which are: that the creatures have four toes on the fore-feet, and five on the hinder, with palms made for climbing and leaping, and all have woolly tails. *Linnæi System. Natur.*

We have five species of this little animal described to us. First, the common English kind. Secondly, the great grey Virginia one. Thirdly, the black-backed kind of Ceylon. Fourthly, the American flying squirrel. And, fifthly the Barbary kind.

The common English squirrel is well known, and is distinguished from the others by its size and colour. It is something larger than the weasel, but shorter-bodied; its back and sides are reddish, its throat and belly white; and it generally carries its long hairy tail erect over its back, so that it serves it for a shade. It is common in our woods, and feeds on all sorts of fruit, but principally on hazel nuts; which it gathers in the season, and lays up for its winter store. The same species of squirrels with ours is found in Poland and Russia, grey or ash-coloured.

The second, or great grey American squirrel, is very common in Virginia, and is of the size of a rabbet. It is of a dark iron grey, such as some rabbets are of; its fore feet have only four toes, its hinder ones five.

The third, or black-backed squirrel, is found in the island of Ceylon, and called by some rukkaia, from the noise it makes. The hair on its back is sometimes grey.

The fourth, or flying squirrel, is a very small kind; its back is of a dusky mouse-coloured grey; its throat and belly white; its eyes small, black, and prominent, resembling those of the mouse kind; its tail is very long, and very broad and flat. It has a thin and lax skin on each side, which is fixed to the fore and hinder legs, and consequently, on the extending its legs, this skin expands on each side like a sort of a sail: this it always does in leaping, and is by that means carried a great way; and hence has arisen the opinion of its flying. It is very common in New Spain, and is sometimes met with in the colder American countries. It very much approaches to the mouse kind in many particulars, receding from the nature of the squirrel. Its fur is short, like that of the rat or mouse; not long, like the other squirrels. It never erects its tail on its back, nor turns, or twists it round, as the other squirrels do. It has a very beautiful black line on each side the face, near the eyes.

The fifth kind, or Barbary squirrel, is of a mixed colour, between black and reddish, and is very beautifully variegated all down the sides with brown and white longitudinal streaks, laid in a regular alternate order, and each reaching the whole length of the body. These lines are, in some of these creatures, not brown and white, but black and white; and the tail, when in a state rest, is seen elegantly streaked with the same colours, but when the creature erects it, the hairs standing all upright, the beauty of this variegation is hid. The belly of this creature is blue and white. It is smaller than our squirrel, and has shorter ears, which are roundish, and lie close on the head. The whole head has much of the figure of a frog's, in all other respects it is perfectly like our squirrel. *Ray's Synop. Quad.*

SCNIPS, in natural history, a name given by authors to the small species of gnat, always found about the oak-tree feeding on the juices of its leaves, which it sucks by means of its sharp trunk.

SCOLO'PAX, in ichthyography, the name of a sea-fish called in English the trumpet or bellows.

SCLA'REA, *clary*, in botany, a genus of plants, whose characters are:

It is a verticillate plant, with a labiated flower, consisting of one leaf, whose upper lip (or crest) is hooked; but the under lip (or beard) is divided into three parts, the middle segment being hollow and bifid: out of the flower-cup rises the pointal, attended by four embryoes, which afterwards turn to so many roundish seeds inclosed in an husk, which was before the flower-cup.

SCOLOPEN'DRA, in zoology, an insect of a very slender and long body, very smooth, and of a yellowish or reddish colour, furnished with a vast number of legs, and having two long antennæ, and a bifid tail.

It is used by some as a depilatory, being boiled in wine. *Dale's Pharmacop.*

There is a species of this animal, which naturally shines in the dark in the manner of a glow-worm, but with a fainter and more general light. Every part of the body of this animal will emit sparks, if pressed in the dark. It is covered with a soft down, or short and fine hair, much resembling in texture the downy matter which grows on the back of colt's-foot leaves. The two sides of the animal are covered also with two other lists or stripes; these go off from the main stripe at the top, and these are about a quarter of an inch broad; they are covered with a fine and soft hairiness, of more than a quarter of an inch long, of a fine changeable red and green colour, and of prodigious beauty and brightness. Among this long hair of the stripes on the sides, there are set a vast number of long and sharp prickles; they are about the same length with the hair, but they are as stiff as a hog's bristle, and are very sharp at the points, and of a black colour; there are several hundreds of these on the two sides.

The tail, or smaller end, terminates on the back in two scales, which are very bright and fine; under this is the anus, at which the creature voids its excrements. The larger end has no part in the common characters of a head except the mouth; but, as it has this, and stands opposite to the tail, it is properly enough called so in description. It has no horns, no eyes, nor any other of the common organs of insects heads.

The mouth is very wide, in proportion to the size of the creature, and is not placed at the extremity, but somewhat under the belly part; so that, when the back of the creature is viewed, the mouth is not seen. The belly is smooth and flat, and is covered with a thin skin, much paler-coloured than that of the back, and irregularly variegated with a number of brown spots, of different sizes and shapes. Within an inch of the tail there are seen on this under part several marks, like those of the annular divisions of the bodies of insects, but they do not shew themselves on the back.

The legs are placed in two rows, each of the whole length of the body of the fish; they begin from the angle of the mouth on each side, and are continued to the tip of the tail.

Those standing near the mouth are longer than others, which gradually decrease till they are very short at the tail; the longest are about a quarter of an inch in length, and the shortest not a sixth of that length.

The whole number of legs is seventy-two, thirty-six standing on each side. From within the body, through the middle of each leg, there passes a cluster of three or four prickles; these are larger or smaller, according to the size of the leg, and vary also in number, the longest legs having most of them; they give strength and firmness to the legs, serving them in the place of bones, and issuing out beyond the end of the leg, in the way of claws; they serve the creature for the laying fast hold of any thing it pleases. On each side of the upper, or back part of the fish, there are also placed a number of soft, flat, and smooth fins; these stand near the legs, and are placed face to face in such a manner, that each foot has its corresponding fin. The fins are exactly of the same number with the legs, and, like them, are largest towards the head, and go off gradually tapering towards the tail.

These serve the creature in the office of a fish, giving it power to swim in the water, as the others serve it as a reptile to crawl upon the ground at the bottom. The fins on each side are fringed with the same changeable-coloured hair that the stripes on the back are.

On opening the body there appears a muscular organisation, elegantly contrived for working so great a number of legs and fins. This appears in form of one large and broad red muscular congeries, and from this there are propagated on each side thirty-six pair of rays, or oblong and slender muscles, every pair serving for the motion of one leg and one fin. These are distinctly visible, and represent the spine and ribs in some fish. And in this the wonderful care of nature is seen, in regard to this little animal, which, by means of these distinct muscles, is able to move every single leg or fin separately, and consequently can put as many, or as few as it pleases, in motion at a time. It is plain also, from the structure of the body of this creature, that it can at pleasure roll up its body into a round form, and in that case will appear as a globe covered with long and sharp prickles: this is probably its practice, when in danger of being devoured, and may serve it on many occasions. It has been thought by some that Rondeletius means this creature by his physalus; but this does not appear to be the case on a careful examination. *Philos. Trans.* N°. 225.

SCO'LYMUS, *the golden thistle*, in botany, a genus of plants, whose characters are:

The whole plant hath the appearance of a thistle: the flower consists of many half-florets, which rest on the embryoes; each of these are separated by a thin leaf; and on the top of each embryo is fastened a little leaf: these are contained in a scaly empalement, which incloses the seed.

SCO'MBER, *the mackarel*, a well known sea-fish of the thynnus kind, and distinguished from the other fish of that genus by its extremely small and thin scales; by its bluish green colour on the back, variegated with undulated and crooked black lines; by the forkedness of its tail, and the very substance of the fin of it, being almost entirely wanting at the angle of it; and by the largeness of its eye, in comparison of the amia, and other fish of this kind, which most resemble it in other respects. *Willughby's Hist. Pisc.*

SCONCE (*Dict.*) — Some Sconces are made regular, of four, five, or six bastions; other are of smaller dimensions, fit for passes, or rivers; and others for the field.—Such are,

First, triangles with half bastions; which may be all of equal sides, or they may be something unequal. However it be, divide the sides of the triangle into three equal parts, one of these three parts will set off the capitals and the gorges; and the flanks, being at right angles with the sides, make half of the gorge.—Secondly, square, with half bastions; whose sides may be betwixt 100 and 200 feet, and let one third of the sides set off the capital and the gorges, but the flank (which raise at right angles to the side) must be but one half of the gorge or capital, that is, on the sixth part of the side of the square.—Thirdly, square with half bastions and long.—Fourthly, long squares. Fifthly, star redoubt of four points.—Sixthly, star redoubt of five or six points.—Seventhly, plain redoubts, which are either small, or great. The small are fit for court of guards in the trenches, and may be squares of twenty feet to thirty. The middle sorts of redoubts may have their sides from thirty to fifty feet; the great ones from sixty to eighty feet square.

SCORBU'TUS, *the scurvy (Dict.)*—There are some who derive all diseases from the scurvy, which indeed must be allowed to create, or mimic, most other maladies. Boerhaave tells us it produces pleuretic, cholic, nephritic, hepatic pains, various fevers, as hot, malignant, and intermitting; dysenteries, faintings, anxieties, dropsies, consumptions, convulsions, palsies, fluxes of blood; in a word, it may be said to contain the seeds and origin of almost all distempers. A cachexy, or ill habit, is much of the same nature with the scurvy. It is supposed by physicians, that the immediate cause of the scurvy lies in the blood, the fibrous part of which is thick, and the serum too thin and sharp; and that hence arises the great difficulty in the cure, because, in the correcting of one part, regard must be had to the other. It is well known how extremely difficult it is to cure an inveterate scurvy; how many scorbutic patients have grown worse by an injudicious course of evacuations; how many are even rendered incurable by the treatment of inconsiderate physicians; and how difficult, tedious, and uncertain the cure is, in the hands even of the best, who are obliged to use such variety and change of medicines, in the different stages of that malady; which nevertheless may be cured, says the bishop of Cloyne, by the sole, regular, constant, copious use of tar-water. In the cure of the scurvy, the principal aim is to subdue the acrimony of the blood and juices; but as this acrimony proceeds from different causes, or even opposite, as acid and alkaline, what is good, in one sort of scurvy, proves dangerous, or even mortal, in another. It is well known, that hot anti-scorbutics, where the juices of the body are alkalescent, increase the disease; and four fruits and vegetables produce the like effect in the scurvy caused by acid acrimony. Hence fatal blunders are committed by unwary practitioners, who, not distinguishing the nature of the disease, do frequently aggravate, instead of curing it. The bishop says, if he may trust what trials he has been able to make, this water is good in the several kinds of scurvy, whether acid, alkaline, or muriatic; and he believes it the only medicine that cures them all, without doing hurt in any. In a high degree of scurvy a mercurial salivation is looked on by many as the only cure; which, by the vehement shock it gives the whole frame, and the sensible secretion it produces, may be thought to be more adequate to such an effect: but the disorder, occasioned by that violent process, it is to be feared, may never be got over. The immediate danger, the frequent bad effects, the extreme trouble, and nice care attending such a course, do very deservedly make people afraid of it. And, though the sensible secretion therein be so great, yet in a longer tract of time the use of tar-water may produce as great a discharge of scorbutic salts by urine and perspiration; the effect of which last, though not so sensible, may yet be greater than that of salivation; if it be true that insensible perspiration is considerably more than all the rest of the sensible secretions together.

SCO'RDIUM *(Dict.)*—This plant is propagated in our gardens for medicinal use; by parting the roots, or planting slips or cuttings in March, in beds of moist earth, at four or five inches distance, in July they will be in flower, and fit to cut for use. But every other year the bed should be renewed, and that always on a fresh spot of ground, for they do not succeed well on the same. *Miller's Gard. Dict.*

SCO'RIA *(Dict.)*—Some authors call by this name that saline mass, which is produced by melting ores and metals together with saline and reducing fluxes. But the word Scoria is not properly to be understood of all this mass, but only of the vitrified particles which are lodged between, and adhere to the small masses of the salts, and which may be separated from them by water. *Cramer's Art of Assaying.*

SCORIFICA'TION, in metallurgy, is the art of reducing a body either entirely, or in part, into scoriæ.

It is used by metallurgists, in order that any metal, imprisoned in a solid body, may, on account of its weight descend and separate itself therefrom; and, finally, if that be required, be itself wholly or in part converted into scoriæ.

All fixed bodies are subject to this alteration, not totally excepting even gold and silver. There are also, among the volatile bodies, some that may be fixed, and which assume the form of scoriæ, by adding fixed bodies to them.

It is often proper to make this Scorification in a vessel that may absorb the scoriæ, and retain only the metallic part of the mass under trial. In this case the operation is called coppelling, and vessels made of ashes, called tests and coppels, serve for this purpose. It is evident in these processes, that a great attenuation of the scoriæ is necessary, that they may be able to pass through the vessel; nor is there any fitter body to promote this operation than lead, which, by its undergoing itself a like attenuation in the fire, disposes other bodies to be reduced into a subtile scoriæ for the same attenuation.

SCO'RPION, in natural history, an insect frequently found in the hot countries. The opinions of authors are very different as to the sting of this creature, some asserting that there is an opening in it, through which a poisonous liquor is thrown into the wound made by it, as is the case in the tooth of the viper, &c. and others affirming that there is no such opening.

Galen affirms that there is none, but most of the writers of the middle ages assert that there is. But the whole is set in the clearest light by Signior Redi, who took the pains of examining microscopically the stings of the Scorpions brought alive from Tunis, Egypt, and Italy. These he nicely examined by the best glasses in the musæum of the Great duke of Tuscany, and could find no aperture: but, not satisfied with this, he pressed the stings to try if he could make any liquor flow out of them; they were, however, so hard and horny, that squeesing could have no effect on them; and, finally, he caused a Scorpion to strike upon a plate of iron, but no liquid was found thereon; so that he began to conclude Galen's opinion right, when he accidentally discovered an exceedingly small drop of white liquor upon the sting, and this he afterwards found in all the trials he made with several Scorpions. And Mr. Lewenhoek discoverd an opening on each side of the sting of this creature, for the emission of the poison, which he supposes is not discharged, till the sting is buried in the wound. *Baker's Microscope.*

Mr. de Maupertuis, having caused Scorpions to bite several animals, of which very few died, or suffered any more than the pain of the sting, is of opinion, that oil of Scorpions and other vulgar antidotes to the poison of these animals have rather got their reputation from the innocence of the sting of these creatures, than from any considerable virtue in the medicines. *Mem. de l'Acad. Scienc.* 1731.

Water SCORPION, *scorpio palustris*, a name given to a very remarkable species of water insect. It is a very thin and light little creature, yet is but a very slow mover. Its head is very small, and is hard to the touch, and of a paler brown than the rest of the body; and this is terminated by a very fine and sharp proboscis, of the same colour and texture. The eyes are small, but prominent, and very hard and black. The shoulders are broad and flat, they are of the same colour with the head, and are wrinkled on the surface. The triangular spot between the wings is black and shining, the body is of a bright red lead colour on the back, and of a faint dusky brown on the belly, and is composed of six joints, covered with a sort of scales. The outer wings are very hard and firm, and lie very far over one another; they are opake, and of a dark muddy brown, without any variations: the inner wings are of a dusky white veined with a red-lead colour. The two fore-legs are broader and thicker than the rest, and end in short blunt claws; these the creature never walks with, but always uses them as arms: the hinder pair are the longest, and both they and the middle ones end in a sharp claw; they are all of a pale brown, and somewhat transparent. The tail is long and straight; it is composed of two slender bristles, of a pale brown; the creature scarce ever separates these. It lives among the weeds in clear standing waters, and is continually watching for its prey. It feeds on other insects, and is particularly fond of the cicada aquatica, or worm of the great libella. It seizes its prey with the fore-legs, and holds it fast in them, while the proboscis pierces into the body, and sucks the juices.

SCORPION *fly*, in natural history, a name given by Mouffet and other writers to a kind of fly, remarkable for carrying the end of its tail turned up in form of the Scorpion's sting.

There are two very beautiful species of these. The one has silvery wings, variegated with three transverse streaks of black towards the ends; the head is black, and the breast, shoulders, and feet whitish; the rest of the body is black. The tail, which represents a sting, has five joints, three of which are red, and the others black; the end of the tail is also forked, and the forks black, turned up like the sting of a Scorpion.

The other resembles this in many respects, but the end of the tail is thicker, and the forks blunter; the head is dunnish, the mouth long, and each wing variegated with six black spots, of a large size.

SCORPIU'RUS, *caterpillar*, in botany, a genus of plants, whose characters are:

It hath a papilionaceous flower, out of whose empalement rises the pointal, which afterwards becomes a jointed pod, convoluted like a snail, or caterpillar, having a seed in each joint, which is, for the most part, of an oval figure.

SCORZONE'RA, *viper-grass*, in botany, a genus of plants, the characters of which are:

It hath a semi-flosculous flower, consisting of many half florets, which rest upon the embryoes, which are included in one common empalement, which is scaly: the embryoes afterwards become oblong seeds, which are furnished with down.

These plants may be propagated by sowing their seeds in the spring upon a spot of light fresh soil. The best method of sowing them is, to draw shallow furrows by a line about a foot asunder, into which you should scatter the seeds, thinly

covering

covering them over about half an inch thick with the same light earth; and, when the plants are come up, they should be thinned where they are too close in the rows, leaving them at least six inches asunder; and, at the same time, you should hoe down all the weeds to destroy them: and this must be repeated as often as is necessary; for, if the weeds are permitted to grow among the plants, they will draw them up weak, and prevent their growth.

SCRATCH, in the salt works, the name of a calcarious earthy or stony substance, which separates from sea-water in boiling it for salt.

This forms, in a few days, a thick crust on the sides and bottoms of the pans, which they are forced to be at the pains of taking off once in a week or ten days, otherwise the pans burn away, and are destroyed. See SALT.

This is no other than the same substance which crusts over the insides of our tea-kettles, and is truly a spar, sustained more or less in all water, and separable from it by boiling. The shells of sea-fish have great affinity in their substance and nature with this, both being powerful alkalies, and both easily calcining into lime.

The magnesia alba, so celebrated in Germany for its mild purgative and alkaline virtues, seems very nearly allied to this earth; and it is probable, according to Hoffman, that the purging virtues of many springs are owing to the quantities they contain of this substance.

SCRATCH *pans*, in the English salt-works, a name given to certain leaden pans, which are usually made about a foot and half long, a foot broad, and three inches deep, and have a bow, or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling. See SALT.

The use of these pans is to receive a calcarious earth, of the nature of that which incrusts our tea-kettles, which separates from the water in boiling; this substance they call Scratch; and these pans, being placed at the corners of the salt pan, where the heat is least violent, catch it, as it subsides there.

SCROBI'CULUM *cordis*, in anatomy, the pit of the stomach. See STOMACH, *Dict.*

SCROPHULA'RIA, *fig-wort*, in botany, the name of a genus of plants, whose characters are:

It hath an anomalous flower, consisting of one leaf, gaping on both sides, and generally globular, cut, as it were, into two lips; under the upper one of which are two small leaves: the pointal rises out of the flower-cup, which afterwards turns to a fruit or husk, with a roundish-pointed end, opening into two divisions, parted into two cells by an intermediate partition, and full of small seeds, which adhere to the placenta.

The root of Scrophularia is esteemed externally as a remedy for the piles and the king's evil. It is generally made into an ointment for these purposes; but some give it also internally in diet drinks.

This root is of a very singular figure, by which it is easily distinguished at sight from all other medicinal roots. It is usually of the thickness of a man's finger, or more, of an oblong figure, nearly as thick at the one end as the other, and full of protuberances on the surface, resembling a kind of little kernels; and between there are a great many fibres, which strike deep into the ground. The root itself has no great smell, but its taste is somewhat acrid and disagreeable.

SCU'LPTURE *(Dict.)*— To perform any thing in the way of Sculpture, they begin with making a model of earth, or wax.— For earthern models, they use but few instruments: their hands and fingers do almost the whole.— For waxen models, to a pound of wax they put half a pound of colophony; some add turpentine, melting the whole with oil of olive; some add a little vermilion, or other matter, to give it a colour. It is wrought and molded with the fingers, like earthern models.

For Sculpture in wood, which we properly call carving, the first thing required, is, to chuse a wood proper for the particular kind of work.—If it be any thing large, and require a deal of strength and solidity; the hardest and most durable wood is to be chosen, as oak, or chesnut: for smaller works they use pear-tree and service-tree. But, as these woods are very hard, for little delicate works, they use softer woods, only close, and of a fine grain: such is the linden-tree, which the chissel is found to cut more easily, and cleanly, than any other wood.

For large works, if it be only single figures, it is better they consist of several pieces, than of a single one, by reason of the liableness of the latter to warp; for every large piece may probably not be dried to the heart, however it may appear without-side.—Observe, that the wood will not be fit for working, till after it have been cut at least ten years.

SCULPTURE *in marble and stone.*— The first thing they do, is cut of a great block of marble to saw another of the size required, which is performed with a smooth steel saw without teeth, casting water and sand thereon, from time to time: then they fashion it, by taking off what is superfluous with a stubbed point, and a heavy mallet; after this, bringing it near the measures required, they reduce it still nearer with another finer point.—They now use a flat cutting instrument, having two notches in its edge, or three teeth; then a chissel to take off the scratches the former has left.—This last instrument they use with a deal of delicacy, giving thereby a softness and tenderness to their figure; till, at length, taking rasps of different degrees of fineness, by degrees they bring their work into a condition for polishing.— To polish, or make the parts smooth and sleek, they use pumice-stone and smalt; then tripoli, and when a still greater lustre is required, a skin and burnt straw.

When any considerable work is undertaken, as a statue, basso relievo, or the like, they always make a model, beforehand, of clay; but as this shrinks in drying, and easily cracks and breaks, they only use it to make a mould of plaister, or stucco, wherein they make a figure of the same matter, which serves them thenceforth for a model, and by which they adjust all their measures and proportions.

To proceed the more regularly; on the head of the model, they place an immoveable circle, divided into degrees, with a moveable ruler, or index fastened in the center of the circle, and divided likewise into equal parts. From the end of the ruler hangs a thread with a plummet, which serves to take all the points to be transferred thence to the block of marble, from whose top hangs another plummet like that of the model.— See *Plate* XLII. *fig.* 6.

SCU'RVY *grass*, *cochlearia*, in medicine, is a powerful attenuant and resolvent; and on that principle is an excellent medicine in all diseases arising from a viscid state of the fluids, and particularly in the Scurvy. The best way of taking it, is to eat the whole herb by way of sallad.

The Scurvy, however, is a disease so various, that the same medicine cannot be good for all the kinds. Accordingly Scurvy-grass proves hurtful, where the Scurvy is attended with a redness in the face, palpitations of the heart, frequent feverish heats, head-achs, purgings, and the like; in all which, acrid medicines of any kind do harm.

SCUTELLA'RIA, *scull-cap*, in botany, the name of a genus of plants, whose characters are:

The empalement of the flower is of the lip-kind; the upper segment resembling an helmet, and is divided into three segments; the middle being broad and concave; but the other two are narrow and plain: the beard, or lower lip, is divided into two equal segments: the calyx, having a cover, contains a fruit resembling the heel of a slipper or shoe: which character is sufficient to distinguish it from all the other genera of this class.

SCU'TUM, in natural history, the name of a genus sea-shells, the characters of which are: that it is a shell of an irregular figure, which on the lower part represents, in some measure, a shield; on the surface it has the shape of a five-leaved flower; its mouth is in the middle of the base, and the aperture for the anus at the edge.

SCY'TALA *.— The Lacedæmonians invented a secret method of writing by means of the Scytala, which was a wooden roll. Two of these were made of an equal length and thickness; one the ephori, principal magistrates of Sparta, kept at home, the other was given to their general who marched to fight their battles. When these magistrates had a mind to send him secret orders, they took a long narrow slip of parchment, which they rolled exactly round the Scytala they kept for themselves; on this they wrote their intentions, and what they wrote, while the parchment was applied on the Scytala, contained a complete and connected meaning; but, when it was taken off, the writing was disjoined, and the connection of the words separated in such a manner, that no body could understand the meaning, but the general, by applying the parchment on the fellow Scytala which he had in his possession.

* The word is Greek σκυτάλη, a staff.

SCY'THIAN, a word used very often in the old Greek writers on the Materia Medica, to distinguish the peculiar sort of gum, or other drug, brought from that place. The Scythian and Indian drugs have been by many supposed different kinds of the same medicine; but this is an error, for it appears very obvious, on comparing the writings of Galen, Aëtius, Ægineta, and other of the later writers among the Greeks, with those of Dioscorides, Theophrastus, and the other old ones, that the words Scythian and Indian mean the same thing, and that what the old writers have called Indian, these have called Scythian.

The meaning of this is, that those things were called Scythian, which were brought from the country of Indo-Scythia, or that part of Scythia which lay at the coasts of the river Indus: but it is to be observed, that though the later Greek writers mean this by their term Scythian, yet the word is used in a very different sense by the Arabians, Avicenna, Serapio, and others; and that, wherever they mention a drug under the name of Scythian, they mean that it comes from the northern parts of Scythia, on the confines of Europe. These authors having understood, of this Scythia, what the Greek writers have said of the other, have made no small errors in regard to the history of drugs, having given bdellium, and many other gums, the produce of only the Scythia of the Greek medical writers, to the frozen Scythia beforementioned.

SEA (*Dict.*)—The sea differs in faltnefs in different parts; it is, in general, obferved, that in the hotteft climates the water is falteft.

When falt water freezes, it hath been thought to let fall all its falt; the ice of Sea water, and the water melted from it, tafting frefh, and being good for boiling meat and peafe in. Captain Middleton, being in Hudfon's Streights in July 1738, took ice from under the furface of the Sea, which he melted till he got forty quarts of water; thefe he evaporated to drynefs, and out of that quantity had only fix ounces of falt, or about $\frac{1}{213}$. *Phil. Tranf.* N°. 461.

General motion of the SEA. Mr. Daffie of Paris, in a work publifhed about fixty years ago, has been at great pains to prove that the Sea has a general motion, independent of winds and tides, and of more confequence in navigation than is ufually fuppofed. He affirms that this motion is from eaft to weft, inclining towards the north, when the fun has paffed the equinoctial northward, and that during the time the fun is in the northern figns; but the contrary way, after the fun has paffed the faid equinoctial fouthward; adding, that, when this general motion is changed, the diurnal flux is changed alfo: whence it happens, that in feveral places the tides come in during one part of the year, and go out during the other; as on the coafts of Norway, in the Indies, at Goa, Cochinchina, &c. where, while the fun is in the fummer figns, the Sea runs to the fhore; when in the winter figns, from it. On the moft fouthern coafts of Tonquin and China, for the fix fummer months, the diurnal courfe runs from the north with the ocean; but, the fun having repaffed the line toward the fouth, the courfe declines alfo fouthward. *Philof. Tranfact.* N°. 135.

Bafon of the SEA, *fundus maris*, a term ufed by geographers, and other writers, to exprefs the bottom of the Sea in general.

Our honourable Mr. Boyle is the firft who has written any thing on that part of the globe, and he has given us a treatife exprefsly upon it; but this only gives an account of its irregularities, and unequal depths, and is founded on the obfervations communicated to him by mariners, and people of too little curiofity to be depended upon for great difcoveries.

The ingenious Count Marfigli has, fince his time, given us a much fuller account of this part of the globe, in a great part from his own experiments in many places, particularly along the coafts of Provence and Languedoc.

The entire bafon of the Sea is of fuch immenfe extent, and covered in many places with fuch an unfathomable depth of water, that it is not to be expected that it can be traced in every part; but as the whole may be gueffed at, from fome part of it, and as its general figure is of no confequence in a fearch of this kind, the obfervations of this curious author are of great value, in forming a judgment of the whole.

The materials, which compofe the bottom of the Sea, may very rationally be fuppofed, in fome degree, to influence the tafte of its waters; and Marfigli has made many experiments to prove, that foffil coal, and other bituminous fubftances, which are found in plenty at the bottom of the Sea, may communicate in great part its bitternefs to it. We are not, however, to judge haftily, that there are not fo many beds of thefe at the bottom of the Sea, as would be neceffary for fuch a purpofe, or to judge too haftily againft the exiftence of any other fubftances there, becaufe we do not find proofs of them by the plummet, which in founding brings up other fubftances, and not thefe; for the true bottom of the Sea is very often covered and obfcured from us by another accidental bottom, formed of various fubftances mingled together, and often covering it to a confiderable depth.

The entire gulf of Lyons, fituated between Cape Quiez in Roufillon, and Cape Croifit in Provence, forms a bank above the furface of the water at the fhore, of the exact and perfect figure of an arch; and within this there is formed another fuch arch, making the bottom of the Sea in that place for a very great way from fhore, which is of different depths in various places, but ufually between fixty and feventy fathoms.

It is a general rule among failors, and is found to hold true in a great many inftances, that the more the fhores of any place are fteep and high, forming perpendicular cliffs, the more deep the Sea is below; and that, on the contrary, level fhores denote fhallow Seas. Thus the deepeft part of the Mediterranean is generally allowed to be under the height of Malta. The obfervation of the ftrata of earth, and other foffils, on and near the fhores, may ferve to form a very good judgment, as to the materials which are found in its bottom. The veins of falt and of bitumen doubtlefs run on the fame, and in the fame order in which we fee them at land; and the ftrata of rocks, that ferve to fupport the earth of hills and elevated places on fhore, ferve alfo, in the fame continued chain, to fupport the immenfe quantity of water in the bafon of the Sea. It is probable alfo that the veins of metals, and of other mineral fubftances, which are found in the neighbouring earth, are in the fame manner continued into the depths of the Sea. The particles of metals, in this cafe, are probably carried off into deep water, and funk among the fofter matter of the bottom; but fome of the lighter minerals feem to have given colour to thofe beautiful crufts, which are found upon many Sea plants, and which lofe their luftre in the drying. The fubterranean rivers, and currents of water, make great changes in what would be the natural furface of the bottom of the Sea, where they arife, each having a peculiar bafon of its own. We are informed by numerous inftances of fubterranean currents, and, as we fee them break out in rivers on the furface of the earth in fome parts, fo in others we may be well affured thrt they break up the bottom of the Sea, and empty their frefh waters into the falt mafs.

In this cafe, the rufhing up continually of fuch a body of water makes a roundifh cavity, and its running fome one way lengthens and carries on that cavity, till, by degrees it is loft, as the frefh water by degrees becomes blended with the falt. Thus every river, that arifes in the bottom of the Sea, alters the form of its furface, and makes a bafon for itfelf, in which it runs a confiderable way. Many Seas near the fhore, and when the water is tolerably clear, fhew the traces of thefe currents to the naked eye from the furface, and the water taken up from them is found more or lefs frefh. The coral fifheries have given us occafion to obferve, that there are many, and thofe very large, caverns or hollows in the bottom of the Sea, efpecially when it is rocky; and that the like caverns are fometimes found in the perpendicular rocks, which form the fteep fides of thofe fifheries. Thefe caverns are often of great depths, as well as extent, and have fometimes wide mouths, equal to their largeft diameter in any part, but fometimes they have only narrow entrances into large and fpacious hollows. It is the common opinion of the people about the place, that thefe caverns are prepared by nature for the circulating of the Sea water; but that operation, however neceffary, may be performed as well without, as with thefe caverns, and they feem in reality to be only accidental.

We daily meet with immenfe hollows and caverns, naturally made in rocky mountains; and as this part of the bottom of the Sea is almoft all rock, and its fides of the fame nature, it is no wonder that the fame accidents fhould happen, and like hollows be found, though with no particular intent of providence in their ufe. Nay there is this farther reafon to expect them in the rocks buried under the Sea than in thofe in hills, that the latter are in a ftate of reft and quiet, whereas the former are in continual reach of water, which will infinuate itfelf into every crack or crevice nature has left in them, and may be eafily fuppofed to have burrowed its way in a fmall hole made by nature, till it has formed of it a very large one.

It feems plain from the whole, that the bafon of the Sea was at the creation, or at its fecond formation after the univerfal deluge, covered with, or compofed of the fame fubftances, as the furface of the reft of the earth is, that is, of rocks, clay, and fand, and other fuch fubftances. The common obfervations of feamen feem indeed to make againft this opinion, but they may be eafily folved, fo as not to overthrow it. The plummet which they let down in founding, ufually brings up with it a matter compofed of mud, tartarous incruftations, or of dead weeds and broken fhells, or numbers of various bodies of this kind, cemented together into a firm mafs by fome fparry or tartarous matter, depofited from among the water, and agglutinating them together: thefe form an artificial bottom, covering the natural one; but it is eafy to fee, that fuch a cruft or coat as this muft needs have been formed over the true bottom, in places where numbers of animals and vegetables are produced, and decay again, and where the waters being at reft have time to depofit their ftony matter, in the fame manner as the waters of feveral of our petrifying, or rather incruftating fprings do. And that thefe decayed fubftances, and this ftony matter, falling to the bottom together, and there lying undifturbed, muft neceffarily have formed juft fuch a cruft as is found; and the natural bottom of the Sea, whether of ftone, of fand, or of clay, muft be covered by fuch accidental concretions, and that probably to fuch a depth, that it is not eafy now to break through it. There are places however where, by fome accidents, this fort of adventitious cruft either has never been formed, or elfe has been removed. In thefe places we find the natural bottom, as defcribed, that is, of the fame nature with the ftrata in the body of the earth. The fimile the Count Marfigli has made, between the bafon of the Sea and a cafk of wine, is very expreffive and juft. When wine has been a long time kept in a cafk, the whole internal furface of that cafk is fo covered and incruftated over with tartar, that it feems within to be really compofed of it; yet, as we know that this cafk is of wood, we are very certain that the true inner furface of it is of the fame texture and nature with the tree from which it was cut, though we cannot get off the accidental furface formed by the liquor kept in it, and wholly covering it.

We very frequently meet with fine and pure fand at the bottom of the Sea, and in thefe places are apt to believe that we certainly have the true and original bottom, but this

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is rather to be looked on as a probability than a certainty; and, where the sand is more than ordinarily fine, there is always reason to suspect that the course of some subterranean river has brought it there, by opening into the Sea in this part; and that this is one of those particular basons, which these rivers form to themselves within the bason of the Sea, and which continue only to a small distance from their source.

The bottom of the Sea is covered with a variety of matters, such as could not be imagined by any but those who have examined into it, especially in deep water, where the surface only is disturbed by tides and storms, the lower part, and consequently its bed at the bottom, remaining for ages perhaps undisturbed. The soundings, when the plummet first touches ground on approaching the shores, gives some idea of this. The bottom of the plummet is hollowed, and in that hollow there is placed a lump of tallow; this, being at the bottom of the lead, is what first touches ground, and the soft nature of this fat receives into it some part of those substances, which it meets with at the bottom: this matter, thus brought up, is sometimes pure sand, sometimes a sort of sand made of the fragments of shells, beat to a sort of powder; sometimes it is made of a like powder of the several sorts of corals, and sometimes it is composed of fragments of rocks: but besides these appearances, which are natural enough, and are what might very well be expected, it brings up substances which are of the most beautiful colours. Things of as fine a scarlet, vermilion, purple, &c. as the finest paint could make them, and as yellow as a solution of gamboge, are common; and sometimes, though not so frequently, the matter brought up is blue, green, or of a pure snowy whiteness. These coloured matters sometimes seem to have made up the whole bottom or mass of the surface, but more usually they have been formed upon other things, as upon the mud, or upon larger pieces of shells, corals, and the like, in the manner of tartarous crusts, and those in some degree resembling the crustaceous coats of some of the Sea plants. The colours of these substances are not merely superficial and transient, but many of them are so real and permanent, that they may be received into white wax melted, and poured upon them, or kept in fusion about them; and, when thus examined, they seem as if a proper care might make them of great value, as paints of the finer kinds, where little is to be used.

The same coloured matters that thus coat the substances, found at the bottom of the Sea in these places, are also sometimes found extended over the surface of Sea plants of the harder kind, which grow in deep water. They are always, in this case, in a sort of liquid form, being lodged within, or embodied among a sort of jelly or glue of a transparent substance, which in these cases perfectly coats over the whole plant. In this state it gives the naturalist, who is present at the fishing up his treasures, a transient prospect of a very elegant kind; but this vanishes, while he admires it. A piece of coral, or other hard Sea plant, thus coated over, appears, as it rises to the surface of the water, of a delicate green, blue, or purple; but, when taken above water, it is found that this fine colour is only in the coat of glue or jelly which covers the plant: as soon as this is wiped off, the colour is carried away with it, and the coral shews its own native tinge; and it is to no purpose to attempt the preserving it, by suffering this glue to dry upon the plant, for the colour flies away by degrees, as the moisture evaporates; and the coral or plant, whatever it be, is only so much the less beautiful, than it naturally would have been, as it is covered with a dry yellowish dirty looking horny matter. These are beauties in the submarine plants, therefore, which can be only seen by those who venture out, in order to take them up.

The small quantities of these elegant colours, which we thus find spread over the surfaces of plants and other bodies, as we approach deep water, may give a rational idea of what we should find, were we able to examine the bottoms of the Sea in its deep and unfathomable recesses. It is easy to conceive, that in these places we should find great quantities of the most beautiful substances. *Marsigli, Hist. Phys. de la Mer.*

Dead SEA. Dr. Perry made several experiments on the water of the dead Sea, in order to find what particles it contained. Upon infusing some scrapings of galls in it, it becomes of a bright purple colour, but that not till it has stood a considerable time. On adding oil of tartar per deliquium to it, it becomes turgid, and looks as if globules of fat were fluctuating in it; this unctuous matter, upon its long standing in repose, comes together in form of a sediment at the bottom. On pouring spirit of vitriol into it, it deposits a milk-white greasy sediment, which, after standing twelve hours, occupies about one fifth part of the liquor. On putting a small quantity of saccharum saturni to it, it deposits a small quantity of a greyish powder. Being severally and separately mixed with a solution of sublimate, with spirit of sal armoniac, and with sugar of violets, it neither ferments, nor deposits any sediment, nor changes colour, except with the sugar of violets, with which it becomes green. It is highly saturated with salt, so that it is to common water in specific gravity, as five to four; and it has so acrid and styptic a taste, that, on being held in the mouth, it constringes it in the manner of alum.

From all these experiments it appears, that this water is impregnated with a sort of an acrid and alkaline nature, and a matter partly of a sulphureous, partly of a bituminous nature. *Phil. Trans.* N°. 462.

SEA *adder*, an English name for a Sea fish of the acus kind, called by Willughby the acus lumbriciformis.

It is a small fish of a cylindric shape, without scales, and of a greenish brown colour, with some admixture of a reddish yellow. The snout is long and hollow, and the mouth opens upwards at its end. The eyes are small, and their iris red. The gills are four on each side, but are covered by a membrane, and the whole body divided into rings like the common earth-worm. It is usually about three or four inches long, and of the thickness of a goose quill. It has but one fin, which is situated on the back. The anus is much nearer the head than the tail, and under the snout there is always a fleshy tubercle. The fish is common on the coast of Cornwall. *Willughby, Hist. Pisc.*

SEA *breaches*, a term used by the farmers to express the overflowing of their low lands near the Sea by the Sea water.

Sea salt, moderately used, is a great improvement to all lands, but too much of it kills all sorts of vegetables, except such as nature has intended to live among it. The Sea, breaking in upon lands thus, injures them greatly. The owner is to stop the breach by which it entered with all possible diligence, and then trenches and drains must be cut through all parts of the land, to carry the salt water into some one low place, from which it may be emptied by means of an engine; or, if it be small in quantity, it may be laded out by hand over the bank; or, if yet less, the sun and winds may dry it away: but, in either case, the place where it was suffered to rest must be covered with a large quantity of fresh earth, to take off from the too great saltness of the other; and the whole land should be plowed for three or four years, to let in the rains and air to freshen it. *Mortimer's Husb.*

SEA *bream*, in ichthyology, the English name for the fish called by the generality of authors the pagrus and phagrus. According to the new system of Artedi, it is a species of the spari, and is distinguished by the name of the red sparus with the skin carried into a sinus at the roots of the back fins, and the pinna ani.

SEA *cow*, the English name of the manati, a species of fish so different from all the other of the cetaceous tribe, to which it properly belongs, that Artedi, in his new system of ichthyology, allots it a peculiar generical name, which is thricechus.

SEA *fox*, an English name for a fish of the squalus kind, called also the Sea ape; both names being given on occasion of the length of its tail in proportion to the body.

SEA *plants*. Count Marsigli, who was at indefatigable pains in collecting the various Sea plants of several places, divides all those productions into three classes.

The first class contains the soft, or herbaceous ones; the second, the ligneous ones, or such as are of a woody hardness; and the third, those which are of the hardness of stone. Of the first class are the algas, called Sea wrecks, the fucuses, or Sea oaks, the Sea mosses, or confervas, and the different species of spunges.

Of the second kind are those called lythophyta by the ancients, as if their hardness approached to that of stone. All these consist of two substances, a cortical and an internal: the cortical part, while in the Sea, is soft, but, in drying, it becomes as hard as chalk, or thereabouts, easily crumbling to pieces between the fingers; this is what deceived the ancients into an opinion of its being of a stony nature. The internal substance, properly speaking, seems more of the nature of horn than of wood: if it is burnt, it throws out a spume or froth, like that which horns or feathers of animals yield in the fire, and their smell in burning is of the same kind. The branches of these plants are very pliable, bending in the manner of whale-bone, and they give the same resistance to a knife in the cutting.

The stony plants, which should properly be called the lythophyta, but which never are called so, are the several species of coral, madrepora, and the like. The madrepora differs from the coral, in having its surface pierced with almost innumerable holes.

The algas are the only Sea plants which have any roots, properly so called; these therefore grow out of the soft bottom of the Sea, as other plants out of the earth, but all the other Sea plants, without exception, appear fixed upon hard and solid bodies, incapable of affording them any nourishment; such as stones, shells, pieces of iron, of wood, &c. and sometimes on other plants; and they are not fastened to these substances by fibres passing into, or surrounding them, but merely by a foot or pediment, capable of only fixing them down, not of drawing nourishment from the substances, were there any there. From this observation the author concludes, that all the plants which have no roots may be properly said to be all root, or to perform the office of roots in their whole substance, ftance, or that they take in nourifhment in every part by certain pores, which in many are vifible, and cover the whole furface.

This manner of receiving nourifhment, he alfo obferves, very well fuits their condition, fince they are always furrounded on all fides, with that water by which they are to be nourifhed; whereas the plants, which grow at land, have only a part of them buried in the earth, from whence they are to be fupplied with the proper juices. The roots of land plants, therefore, have only the neceffary organs for receiving fupplies, whereas the Sea plants he finds to be all over covered with fmall glandules, whofe office it is to receive and to convey, into the internal parts of the plant, the proper juices for its nourifhment, and thefe he obferves are, in general, of a glutinous and milky nature. The great difference between the land and Sea plants is feen in this familiar inftance; a land plant will remain frefh for a long time, in all its parts, on one end of the ftalk only being plunged in water; but a Sea plant, if part of it be out of water and part in, will always be frefh and vigorous in that part which is under water, while the part that is dry will wither and decay. It is eafy hence to fee, that the feveral parts of the land plants have connections with, and dependences, on one another; whereas, in the Sea plants, every part takes in its own nourifhment, and lives and flourifhes wholly independent of the reft. After having gone through this general fyftem, the author defcends to feveral remarkable particulars. He mentions an inftance of a fucus, whofe ftalk, when in its growing ftate, is a quarter of an inch in diameter, yet in drying fhrinks up fo much, as to be no thicker than a fingle thread. Another fpecies, called by the fifhermen the Sea orange, from its refemblance to an orange in fhape, he obferves, is properly a fucus; it has neither ftalk nor branches, but confifts wholly of this globular body; it is not a folid fubftance, but a membrane of about one-ninth of an inch in thicknefs, regularly diftended into this fhape, by being filled with Sea water. All over the fides of this cavity there are fixed flender filaments, which traverfe the whole, and probably receive nourifhment from the water contained in the cavity, and diftribute it to the feveral parts of the fides where they are inferted.

Another Sea plant, this author mentions, only appears in the fhape of a bark; it affixes itfelf to the branches of the lythophyta, when they have loft their natural bark, and fometimes, in the fame manner, coats and crufts over the furfaces of ftones. When it is frefh, it is of a lively red, of the confiftence of a mufhroom, and about the thicknefs of the back of a common knife, and its external furface is full of fmall prominences, which contain a glutinous juice; round about thefe alfo there ftand feveral yellow tubercles, which, with the red of the ground of the plant, make upon the whole a very beautiful appearance. Its under furface is perfectly fmooth and gloffy. This feems a much more remarkable plant, as to the manner of its vegetation, than thofe which grow on other plants at land.

The fame author obferves, that feveral of the fpunges, when taken out of the Sea, have a motion of the nature of a fyftole and diaftole, which lafts as long as there remains any of the Sea water in their cavities. Some of the Sea plants, which while growing are as foft as the fucufes, yet when dried are as eafily rubbed to powder between the fingers, as the bark of the lithophytons. There is one of the lithophytons, which carries fo large a quantity of branches, that they make the refemblance of leaves; but, as thefe leaf-like branches are all truly of the fame nature with the reft of the plant, this is no exception to the general rule, that the lithophyta have no leaves. One of the fpecies of lithophyton is naturally deftitute of a bark, and is covered in the place of one with a glutinous fubftance, of the nature of varnifh; this is moft abundant at the foot. The whole plant is full of prickles, and thefe appear the moft plainly on the fummits of the branches, where this glutinous varnifh is more thinly fpread. On this part of the plant, alfo, there appear certain globules of a glutinous matter, when it is taken out of the water, which, when it is again plunged into it, fpread themfelves over the whole furface of the branches.

The madreporæ grow in the fame places with the coral; they often hang pendulous from the hollow rocks, and often grow erect on the flat ones. They ufually change colour, when taken out of the water, and are of very different kinds, and different degrees of hardnefs; many of them are as hard as common ftones, and many others are fo brittle, that it is fcarce poffible to touch them without breaking their branches.

The flowers of the thorny and naked lithophyton appear to be wholly like thofe of coral, and like them they are not found to contain any folid feed. *Mem. de l'Acad. Par.* 1710.

SEA-*ficknefs* is faid to be prevented by drinking Sea-water mixed with wine.

SEA-*fwallow*, the name of a bird of the larus, or gull kind, called by authors fterna, and common on our coafts. See the article STERNA.

SEA-*turtle-dove*, in zoology, the name by which we commonly call the little diver, called by Mr. Ray columba Greenlandica.

It very much refembles the coulterneb or anas arctica of Clufius, only it is much fmaller, and its legs are red, and it has no hinder toe. Its beak is long, not compreffed or flatted fideways, as in that bird, and a little crooked and fharp at the end. It has a large white fpot on each fide of the fore-part of its head, and, excepting that, it is all over black. *Ray's Ornithology.*

SEAL (*Dict.*)— The king's great Seal is that whereby all patents, commiffions, warrants, &c. coming from the king, are fealed. The keeping hereof is in the hands of the lord high chancellor, who is hence alfo denominated lord-keeper. —Indeed, there is fome difference between the lord-chancellor and lord-keeper; not in office, but in the manner of creation, the latter being made by the delivery of the great Seal to him by the king, but the former having likewife a patent.

The king's privy Seal, is a Seal ufually firft fet to grants that are to pafs the great Seal.

The ufe of Seals is very ancient: in Daniel, chap. xiii, we read that Cyrus fet his Seal on the temple of Bel: but Seals are ftill older; for Jezebel, in 1 Kings, chap. xxi, feals the orders fhe fent for Naboth's death with the king's ring.— In effect, as the ancient Seals were all engraven on the collets, ftones, &c. of rings, and as the original ufe of rings, it is afferted, was only to be in a readinefs for the fealing of acts, inftruments, &c. Seals fhould be as ancient as rings themfelves.

Thefe fealing-rings, called annuli fignatorii, figillares, cirographi or cerographi, it is faid in ancient authors, were firft invented by the Lacedæmonians, who, not content to fhut their chefts, armories, &c. with keys, added Seals to them: and to this end, at firft, made ufe of worm-eaten wood, the impreffions whereof they took on wax, or foft earth: but they at length found the art of engraving figures, or rings, the impreffions of which they took in the fame manner.— This, however, muft be granted, that, even in Mofes's time, the art was known of engraving, not only on metals, but alfo on precious ftones.

Indeed, it does not appear that the ring had any other ufe among the primitive Jews befides ornament: but at length it was ufed to Seal inftruments, contracts, diplomas, letters, &c. inftances whereof we have in the third book of Kings, xxi. 8. Efther viii. 10. Xenophon. Hellen. lib. I. Quint. Curt. lib. vi. Juft. lib. xliii. cap. iii. where we learn, the keeping of the emperor's Seal was become a particular office. — Lucian adds, that Alexander gave his to Perdiccas, thereby appointing him his fucceffor.

Pliny obferves, that in his time there were no Seals ufed any where but in the Roman empire: at Rome, he tells us, they were become of abfolute neceffity, infomuch that a teftament was null without the teftator's Seal, and the Seals of feven witneffes: but it does not appear that the Romans had any fuch things as public Seals; nor that their edicts, and contracts, were fealed, not even in the times of the emperors.

In France, the cuftom anciently was, inftead of figning their inftruments, &c. only to Seal them; as appears from an infinity of ancient charters, which are not figned at all: the reafon whereof was, that in thofe days very few people were then able to write; no body could read and write but clerks.

In England, the firft fealed charter we find extant, is that of Edward the Confeffor, upon his founding of Weftminfter-abbey: yet, we read of Seals in the MS. hiftory of king Offa.

Before the time of William the Conqueror, the Englifh did not Seal with wax, but only made a golden crofs on the parchment, and fometimes an impreffion on a piece of lead, which hung to the grant with a filken ftring, and was deemed an abundant authorifing of the grant itfelf, without either figning or witneffes.— The colour of the wax wherewith the king's grants were fealed, was ufually green, to fignify that the act continued for ever frefh, and of force. The ufual impreffion on all laymens Seals, till the year 1218, was a man on horfeback, with a fword in his hand; afterwards, they began to engrave their coats of arms on their Seals: only the archbifhops and bifhops, by a decree of cardinal Otto, who was legate here in 1237, were to bear, in their Seals, their title, office, dignity, and even their proper names.

Du Chefne obferves, that none below the dignity of a knight had any right to a pendent Seal, called authenticum.

The emperors long fealed all their acts of importance with a golden Seal; and the golden bull of Charles IV, for the election of an emperor, takes its name from the gold Seal hanging to it, which is called bull.

The pope has two kinds of Seals: the firft ufed in apoftolical briefs, and private letters, &c. called, the fifherman's ring.— This is a very large ring, wherein is reprefented St. Peter, drawing his net full of fifhes.

The other is ufed in bulls, reprefenting St. Peter's head on the right, that of St. Paul on the left, with a crofs between the two: on the reverfe is fometimes the pope's name, and arms.

The impreffions of the firft Seal are taken in red wax, thofe of the fecond, in lead.

SEASONS (*Dict.*)— *Plate* VII, *fig.* 9, in the Dictionary, reprefents the various Seafons of the year. When the earth is

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in ♋, it is plain that the rays of the ſun S illuminate the north pole, and that all thoſe who live in north latitude, the days are longer than their nights; and thoſe who live in ſouth latitude the contrary, the ſouth pole being then wholly in darkneſs. And, when the earth is in ♑, the very contrary happens, the north pole then being wholly in darkneſs, and ſouth pole illuminated. When the earth is either in ♈ or ♎, the days and nights are equal in every part of the globe. The figure repreſents the earth in every one of the ſigns, whereby the viciſſitudes of the Seaſons are rendered very conſpicuous.

SE'BESTEN, SEBESTENA, *myxa*, in pharmacy, &c. a fruit reſembling a little plum or prune; which, when ripe, is of a deep red colour, bordering on black; very ſweet, and the fleſh, or pulp, glutinous, or ſticky.

The Syrians make a kind of glue, or birdlime, of the Sebeſtens, called birdlime of Alexandria. The fruit is eſteemed pectoral, cooling, and emollient; though not much uſed in medicine. The ſtone within it is triangular.—It brought its name from Arabia, whence Pliny obſerves it came in his time into Italy.

SEBUÆ'I, a ſect among the ancient Samaritans; whom St. Epiphanius accuſes of changing the time expreſſed in the law, for the celebration of the great annual feaſts of the Jews. Serrarius conjectures, that they were thus called, from their celebrating the feaſt of the paſſover on the ſeventh month, called by the Hebrews ſeba, ſeventh.—Druſius rather takes them to have been denominated from Sebaia, the leader of a ſect among the Samaritans; as the followers of Doſitheus were denominated Doſithei; which two ſects ſome Jewiſh doctors ſuppoſe to have ſubſiſted at the ſame time.—Scaliger derives the name from the Hebrew ſebua, week; as who ſhould ſay, Hebdomadites, becauſe of their celebrating every ſecond day of the ſeven weeks, between Eaſter and Whitſuntide. Yet the ſame Scaliger, in his anſwer to Serrarius, gives a different explication.—In effect, all that has hitherto been advanced, on the point, is mere conjecture.

SEBU'RAI *, SEBURÆI, a name which the Jews give to ſuch of their rabbins or doctors, as lived and taught ſome time after the finiſhing of the talmud.

* The word is derived from סבר, *ſeber*, I think, whence סברא, *ſebara*, opinion, ſentiment; and thence סבראי, *ſebari*, or *Seburai*, opinionative.

The reaſon of this appellation, ſay the rabbins, is that, the Talmud being finiſhed, publiſhed, and received in all the ſchools and ſynagogues, theſe doctors had nothing to do, but diſpute for, and againſt, the Talmud and its deciſions. Others ſay, it was becauſe their ſentiments were not received as laws, or deciſions, as thoſe of the Miſchnic and Gemaric doctors were; but were held as mere opinions. Others, as the author of Scalſcheleth Hakkabala, or Chain of Tradition, tell us, that the perſecution, the Jews underwent in thoſe times, not allowing them to teach quietly in their academies, they only propoſed their opinions on the compoſition of the Miſchna.

The firſt and chief of the Seburai was R. Joſi, who began to teach in the year 787 of the æra of contracts; which, according to R. David Gautz, falls on the year of the world 4236; and who, according to R. Abraham, was 38 years preſident of the Jewiſh academy.

This æra of contracts is the ſame with that of the Seleucidæ, the 787th year whereof falls on the year of Chriſt 476, which, of conſequence, is the æra of the origin of the Seburai; whoſe reign did not hold long: Buxtorf ſays, not above ſixty years; but R. Abraham and others, not fifty. The laſt of them was R. Simona.—They were ſucceeded by the Gaons of Geonim.

SECA'LE, *rye*, in botany, the name of a genus of plants, whoſe characters are:

The flowers have no leaves, but conſiſt of ſeveral ſtamina, which are produced from the flower-cup: the flowers are collected into a flat ſpike, and are diſpoſed almoſt ſingly: from the flower-cup riſes the pointal, which afterwards forms an oblong ſlender ſeed, incloſed in an huſk, which was before the flower-cup; this differs from wheat in having a flatter ſpike, the awn larger, and more naked. See RYE.

SE'CULAR *Games* (*Dict.*)—The Secular games were alſo called Terentine games, ludi Terentini, either by reaſon Manius Valerius Terentinus gave occaſion to their inſtitution; for that, having been warned, in a dream, to dig in the ground in a place near the Campus Martius, called Terentum, he there found an altar inſcribed to Dis, or Pluto and Proſerpine: upon which, as had been foretold him in his dream, three of his children, born blind, recovered their ſight; and he, in gratitude, performed ſacrifices, on the ſame altar, for three days and three nights ſucceſſively.—Or by reaſon here was an altar of Pluto buried deep under ground, becauſe the water of the Tyber terram tereret, eat into the ground in this place.

The Secular games laſted three days, and as many nights; during which, ſacrifices were performed, theatrical ſhews exhibited, with combats, ſports, &c. in the circus.

Their origin, and inſtitution, is delivered at length by Val. Maximus: the occaſion thereof, according to this writer, was, to ſtop the progreſs of a plague. — The firſt who had them celebrated at Rome, was Valerius Publicola, the firſt conſul created after the expulſion of the kings, in the year of Rome 245. — The ceremonies to be obſerved therein were found preſcribed in one of the books of the Sibyls.

At the time of the celebration of the Secular games, heralds were ſent to invite all the world to a ſolemnity no body had ever yet ſeen, nor was ever to ſee again.

Authors are not agreed as to the number of years wherein theſe games returned; partly, becauſe the quantity of an age or ſeculum among the ancients is not known, and partly on other accounts: ſome will have it, that they were held once every hundred years, and that the ſeculum, or age, was our century.—This Varro and Livy ſeem to expreſs in very plain terms; yet others will have it, that ſeculum comprehended 110 years, and that the Secular games only returned in that period, that is, at the beginning of every 111th year; which opinion is countenanced by Horace, in his Secular poem, v. 21.

Be this as it will, it is certain they ſometimes did not ſtay for the 111th, nor even for the 100th year, for the celebration of theſe games. Auguſtus, for inſtance, held them in the year of Rome 736; and Caligula again in the year of Rome 800, and of Chriſt 38, viz. 64 years after the former; and Domitian, again, in ſtill leſs time, viz. in the year of Chriſt 87, at which Tacitus aſſiſted in quality of quindecimvir, as he himſelf tells us, Annal. lib. xi. c. 11. This was the ſeventh time that Rome had ſeen them from their firſt inſtitution.

The emperor Severus exhibited them the eighth time 110 years after thoſe of Domitian: Zoſimus ſays, theſe were the laſt; but he is miſtaken, for in the year of Rome 1000, fifty years after thoſe of Severus, the emperor Philip had them celebrated with greater magnificence than had ever been known.—We find them repreſented on medals.

SE'CUNDANS, in mathematics, an infinite ſeries of numbers, beginning from nothing, and proceeding as the ſquares of numbers in arithmetical progreſſion, as 0, 1, 4, 9, 16, 25, 36, 49, 64, &c.

SECU'NDINES (*Dict.*)— It very often happens that theſe are retained in the womb after child-birth, and great miſchiefs enſue from it. The aſſiſtance of a ſkilful hand is, in many caſes, neceſſary to the getting them out; and this is to be done with great care and ſpeed, before the uterus cloſes itſelf upon them, otherwiſe, they occaſion terrible hæmorrhages, faintings, and often inflammatory and putrid fevers.

The patient herſelf may greatly promote the expulſion of theſe, by any forcible emotion of the body, as by a forced cough, or by ſneezing; the midwife at the ſame time is gently to pull them by the navel ſtring, but this muſt be done very cautiouſly, for fear of its breaking. If this fails, the cautious introducing the hand often ſets all right, or the uſe of gently pellent medicines may be called in; and to theſe may be added broths, with ſaffron in them, and by the uſe of common clyſters great good is often done: but, if after all this care there yet remain ſome fragments of them behind, there uſually ariſes a fever within twelve hours; and, in this caſe, the utmoſt care muſt be taken to prevent putrefaction, and expel the remains of them. To theſe purpoſes medicines prepared with myrrh, amber, ſaffron, and the cortex Eleutherii, are of the greateſt ſervice; and to theſe may be added occaſionally the colliquating and attemperating ſalts, ſuch as tartarum vitriolatum and nitre. *Junker's Conſp. Med.*

SERCUI'DACA, *hatchet-vetch*, in botany, the name of a genus of plants, whoſe characters are:

It has a papilionaceous flower, out of whoſe empalement riſes the pointal, which afterwards becomes an upright, plain, articulated pod, containing in each joint a rhomboid ſeed, having a notch on the inner ſide.

SE'DER *Olam* (*Dict.*)—The great Seder Olam commences at the creation of the world, and comes down as low as the war of the pſeudo-meſſiah Barchochabas, under Adrian, fifty-two years after the deſtruction of the temple of Jeruſalem, and, of conſequence, to the 122d year of Chriſt.—It is almoſt all taken from the ſcripture, excepting the end. It is the work of R. Joſa, ſon of Hhelpeta of Tſippora, who lived in the ſecond century, about the year one hundred and thirty, and was maſter of the famous R. Juda Hakkadoſch, the compiler of the Miſchna.

The leſſer SEDER *Olam* is an abridgment of the former, brought down as far as Mar Sutra, who lived four hundred and fifty years after the deſtruction of the temple of Jeruſalem, or five-hundred and twenty-two years after Chriſt.—F. Morin, continually bent upon diminiſhing the antiquity of the principal books of the Jews, endeavours to prove it to have been wrote about the year of Chriſt one thouſand one hundred and twenty four, as indeed is expreſſed at the beginning: but R. Dav. Gantz. has overthrown this opinion in his Tſemahh David, and ſhewn, that the date, in the beginning, is an interpolation.

The two chronologies were firſt printed at Mantua in one thouſand five-hundred and fourteen, quarto; again, at Baſil, by Frobenius, in one thouſand five-hundred and eighty, octavo: at Venice in one thouſand five-hundred and forty-five, quarto: at Paris, with a Latin verſion of Genebrard, in 12°.—They have been ſince reprinted at Amſterdam, in one thouſand ſeven-hundred and eleven.

SEDI'TION, among civilians, is uſed for an irregular commotion of the people, or an aſſembly of a number of citizens

without

without lawful authority, tending to disturb the peace and order of the society.

SEDR, or SEDRE, the high-priest of the sect of Ali, among the Persians.

The Sedr is appointed by the emperor of Persia, who usually confers the dignity on his nearest relation.

The jurisdiction of the Sedr extends over all effects destined for pious purposes, over all mosques, hospitals, colleges, sepulchres, and monasteries. He disposes of all ecclesiastical employments, and nominates all the superiors of religious houses.—His decisions, in matters of religion, are received as so many infallible oracles: he judges of all criminal matters, in his own house, without appeal, and is, without contradiction, the second person in the empire.

The Sedr, however, has not any indelible character, but frequently quits his post, for another purely secular one.—His authority is balanced by that of the mudsitehid, or first theologue of the empire.

SE'DUM, *houseleek*, in botany, the name of a genus of plants, whose characters are:

The flower consists of several leaves, which are placed orbicularly, and expanded in form of a rose; out of whose flower-cup rises the pointal, which afterwards turns to a fruit, composed, as it were, of many seed-vessels, resembling husks, which are collected into a sort of head full of small seeds.

House-leek is very cooling, and in that intention is often used in outward applications.

SEED (*Dict.*)—The exterior form, and even the internal structure, of the generality of vegetable Seeds have been supposed by some so much alike in the several kinds, and of so little curiosity and beauty in the whole, that they have been little regarded by the curious; but, when nearly examined with the help of microscopes, they are found to be worthy of a greater attention; those which appear most like to one another, when viewed by the naked eye, often proving as different, when thus examined, in their several forms and characters, as the different genera of any other bodies of the creation. If their external forms carry all this variety and beauty about them, their internal structure, when laid open by different sections, appears yet more admirable.

The Seed of the musk scabious is amazing in its shape and structure: it resembles in figure an octagonal vase, with a scalloped brim; the whole is bell-fashioned, having ribs or divisions, which run down from the mouth of the vase, and, thence becoming narrower, form the bottom. Between these ribs, down to the beginning of the narrow part, it is clear, though not wholly transparent, and from thence to the bottom the ribs are hairy. This vase contains a seed, which is like a pestle standing in a mortar. The pestle stands loose in an octagonal case, but the narrowness of the mouth of this vase hinders the pestle's being drawn out, because its extremity within is rounded, and thicker than any other part of it. From its upper end there arise five spiculated aristæ or awns, whose little thorns are directed upwards, and are thereby prepared to cause the Seed to recede from any thing that might injure it on being touched. The bason, from which these aristæ rise, is of a fine green colour, and they are of an elegant shining brown.

The Seed of the angelica is one of the most fragrant in its smell in the world. When the outer husk of this seed is pulled off, the nucleus appears of a brownish colour, and of an elliptical shape. By the help of the microscope we soon discover what it is that produces this charming smell; this is a fine amber-coloured gum, which appears laid in ridges, disposed alternately with others of a brownish colour, longitudinally, all over the seed; and on the flat side there is a white part, which is a sort of theca, which receives a very minute stylus from the pedicle that supports it.

The medicinal Seed, commonly known in the shops under the name of grain of paradise, is one that promises very little from its external appearance, being only a brown Seed of an irregular surface, with many flats and angles, and having an apex like the mouth of a purse, when drawn together with a string; from this unpromising aspect, however, there arises a very wonderful appearance on dissection. In a longitudinal section we see first the edge of the brown cortex, next within that appears a black pitchy substance, and, within that, a very white matter, lodged in a radiated form: this resembles a fine white salt, and is probably a mixture of a volatile salt and a farinaceous matter. Its radiated disposition, and extremely pungent taste, favour also this opinion. But there is in this Seed a yet far more curious particular than these; the center of every Seed is occupied by a small piece of perfect camphor: that is, in all respects, the same with the common camphor sold in the shops, and is always of the figure of a vinegar cruet, having a round large bottom, and a long and narrow neck. This is invariably the appearance in every Seed, and that not only in this, but in other Seeds of the same kind.

The Seed of the great maple, which we commonly, but improperly, call the sycamore-tree, consists of a pod and its wing: two of these grow upon a pedicle with the pods together, which makes them resemble the body of an insect with its expanded wings. The wings are finely vasculated, and the pods are winged with a fine white down, resembling silk: this contains a round compact pellet, covered with a brown membrane, that sticks very closely to it. When this is pulled off, instead of discerning a kernel, as in other Seeds, there appears an entire green plant, folded up in a most surprising manner. The pedicle of this is about two eighths of an inch long, and its feminal leaves of about six eighths each: between these the germina of the next pair of leaves are plainly visible to the naked eye, but with a microscope they are seen with the greatest beauty and perfection.

These, and a number of such other beauties in this part of the creation, are described at large by Dr. Parsons in his work, intitled a Microscopic Theatre of Seeds, to which we refer for the rest. *Phil. Transf.* N°. 474.

Many experiments have been made, in order to prove that the Seeds of plants derive their constituent matter from the woody central parts of the plant. Thus apple-trees, when they grow hollow, will bear good fruit, but with empty and imperfect Seeds. Barberry-trees, when the roots are bored through, are said to bear fruit absolutely without Seeds; and the gardeners say, that, if the woody part of the roots of parsley be cut out, the plant will continue to thrive in all appearance, but that it will never afterwards produce Seeds that will propagate the species. It is to be acknowledged that hollow oaks and elms produce Seed that is as good as that growing on the soundest trees of the same species; but the elm is all timber to the bark, and an oak, when it is putrid to the heart, may still have firm wood enough to convey a proper nourishment from the root to the acorn. The roots may be found, when the body of the tree is very much decayed by water let in at the top of the pollard tree, or at the loppings of the branches; and we see that beans, wheat, and other grain, grow well, if the eyes and parts next adjoining be whole, though the beans be full of great holes in other parts, or the main body of the wheat be cut off with sciffars.

The people who recommend boring the barberry roots, to have fruit without stones, order therefore that the borings be very complete in the roots for that purpose. It is observed, in countenance of this doctrine, that some trees are less fruitful, or even altogether barren, by the excessive growth and hardness of the timber, and these are cured by cross hackings or cuts, done with sharp instruments through the bark, and into the wood: they also do the like injuries to the roots on the same occasion, and often split them lengthwise, putting a stone into the slit, that they may not grow together again. When this remedy is applied both to the stem and roots, it seldom fails of success; but, when only to one, it sometimes misses.

As the heart of the wood, or its more solid substance, are supposed to furnish the matter of the Seeds, the bark is supposed to furnish the matter of the pulp of the fruit. The experiment has been made, by debasing and vitiating its juice, and the fruits have accordingly been debased. Thus if rests be made for water on the body of a Kentish codling tree, and water poured frequently into these cavities, so as always to keep up a supply for the bark, the apples will grow to an immoderate size, and be insipid; part of their pulp will be so relaxed as to look like the pulp of a lemon, and, on hanging but a moderate time on the tree, they will be as rotten, as if laid on heaps, when fully ripe. *Philos. Transf.* N°. 46.

Change of SEED, a term used by the farmers to express the common and, as they suppose, necessary custom, of changing among one another the Seed of their lands, as wheat, and the like; it being a received opinion, that the Seed produced on one land will grow better on another, than on that which produced it, though the same species of plant be sown.

Seeds, in their natural climate, do not degenerate, unless culture has improved them; they then indeed are liable, upon omission of that culture, to return to their natural state again. Whatever benefit arises to the farmer from the changing the Seed of the same species, is from causes which are themselves the effects of different climates, such as heat and moisture, which may vary very much in the same neighbourhood. There is a mountain in the Mogul's country, which on the south side produces Indian plants, and on the north side European ones, from different exposures. Some land retaining water longer is colder, and some letting it pass off quicker is warmer; as it may also be from the nature and figure of its parts, which retain more of the sun's heat than others. Sandy and gravelly grounds are always warmer than others, if they have some hollow and spungy stratum underneath, that will let the water pass off.

The benefit arising from the change of Seed is owing to these changes, not to the change of food; and these causes shew their effects chiefly in the generation of the Seed. Flax Seed, brought from Holland, and sown here, will produce as fine flax as it does there, but, in the next generation, it will degenerate, become coarser; by this means it will continue to degenerate every year, till after two or three years it is no better than our own Seed produces, and yet the land shall be as good for this coarse sort, as when it produced the fine; so also it is, when the Seeds of our own wheat are changed between farmer and farmer. And thus silk-worms hatched and bred in France, of eggs brought from Italy, will make as fine silk as the Italian;

PLATE XL. *Engraved for the Supplement* *Facing* Semifloscular

Printed for J Hinton in Newgate Street but the eggs of those laid in France will produce worms that make no better silk than those produced in France, though their food is all the while the same.

Common barley, once sown in the burning sands in Wiltshire, will for many years after, if sown on indifferent warm ground, be ripe sooner than any other barley by two or three weeks; but, if sown on cold grounds farther north, it will be as late as any other barley, after two or three years. The weeds, which perplex the farmers in every field, grow as strong and troublesome one year as another, and that without any change of Seed at all. These seem therefore to have been the natural produce of our soil, and corn and other useful plants to have been brought from other places, and improved by culture; these will therefore no longer retain their perfection and value, than such culture is continued to them.

Laurembergius has carried this notion of degeneracy and change from the soil, so far as to affirm that wheat will, in some places, degenerate into rye; and in other places, rye will be exalted into wheat by the soil: but those who are acquainted with botany know, that a horse might as soon be changed into a bull by feeding in an improper pasture, as one plant degenerate into another by fault of the soil. *Tull's Husbandry.*

SEE'DY, in the brandy trade, a term used by the dealers to express a fault that is found in several parcels of French brandy, which renders them unsaleable. The French suppose that these brandies obtain the flavour, which they express by this name, from the weeds which grow among the vines, from whence the wine, of which this brandy was made, was pressed.

However it be, the thing is evident, and the taste not of any one kind; but some pieces of brandy taste strongly of aniseed, some of caraway-seed, and some of other of the strong flavoured seeds of plants, principally of the umbelliferous kind; so that it shall be rather taken for aniseed, caraway, or some other water, than for brandy.

The proprietor of such brandies is always at great trouble to get them off, and usually is reduced to the necessity of mixing them in small quantities with pieces of other brandies, so as to drown and conceal the taste; and, where he has not opportunities of doing this, is obliged to sell them on very disadvantageous terms.

The business of rectification of spirits is very little understood abroad, though very much practised with us; and a man in France or Holland, who could take off this taste from these brandies, might get great advantages by it. There is no doubt but that the same means, which we use to rectify malt spirits, that is, to clear it of its nauseous and stinking oil, which always rises with it in the first distillation, would also serve to purify these brandies, and, by leaving these extraneous oils behind, render them as well tasted as any others; since there is no question, but that the oil of malt, which is a principle of the same ingredients with the spirit, is more firmly united to it than flavouring oils in the brandy, which are not the produce of the grape, but of some foreign matter only accidentally mixed with it.

It is a mistake to imagine, that all the brandies made in France are so fine as those which we meet with on the keys of London; on the contrary, there are many hundred pieces made every year, which are as badly flavoured as our coarsest malt spirit: but the case is this, they send the best brandies and the best wines to England, where they can get the best prices for them. In Holland, on the contrary, the mart of goods of all sorts, it is sometimes difficult to pick one piece of good brandy out of fifty, the general run of them being either feedy, musty, oily, or otherwise infected with some unnatural and disagreeable flavour; and these are the sorts which in France they despair of curing by re-distillation, or bringing to the state of three fifths, or trois cinques, as they express their stronger brandies. *Shaw's Essay on Distillery.* See TROIS CINQUES.

SE'GMENTS *of leaves*, are the parts of such leaves of plants as are divided or cut into several threads.

SE'GUL, in Italian music, is often found before aria, allelujah, amen, &c. to shew that those portions or parts are to be sung immediately after the last note of that part over which it is writ. But, if these words se piace, or ad libitum, are joined therewith, it signifies that these portions may be sung, or not, at pleasure.

SEGUE'NZA, in the Italian music, sung in the Roman church, generally in prose. The Sequenza are often sung after the gradual, immediately before the gospel, and sometimes in the vespers before the magnificat. They were formerly more used than at present.

SEI'M, in agriculture, a term used by the farmers of Cornwall to express a certain determinate quantity of sea-sand which they use as manure to their lands.

They dredge this up on the sea coasts, and carry it as far toward the lands, where it is to be used, as they can by water. At the landing-place the farmers bring a train of horses to receive it, each horse carrying a Seim, that is, a sack of it, containing thirteen gallons. The land carriage of this sand, in Cornwall alone, is supposed to cost thirty-two thousand pounds annually; and yet the farmers find abundant encouragement to continue the use of it, it is so rich a manure. *Philos. Trans.* Nº. 103.

SEISA'CHTHEIA, a Σεισάχθεια, in antiquity, a public sacrifice at Athens, in memory of Solon's ordinance; whereby the debts of poor people were either entirely remitted, or at least the interest due upon them lessened, and the creditors hindered from seizing upon the persons of their debtors, as had been customary before that time. *Potter, Archæol. Græc.*

The word is Greek, and literally signifies the shaking off a burden.

SELF-*opens*, a term used by the miners in the north of England to express certain natural cavities or chambers, which are frequently met with, some near the surface, some at very great depths, some small, and others very large.

These are of various figures, and often run into strange sinuses. Dr. Lister, in accounting for the origin of earthquakes, supposes the whole crust of the earth to be more or less hollowed in this manner; which he also argues for, from the streams of waters which arise in large quantities from the sides of mountains, and must have communication with these Self-opens and supplies from them.

The natural hollows the doctor thinks to be the means of continuing and propagating earthquakes; the first cause of which he ascribes to the breath of the pyrites, which he also says is the pyrites itself tota substantia. This he observes takes fire of itself, on being exposed to the air in our sight, and may do so, from various other causes, under-ground. The sulphureous smell of the air and waters, before and after earthquakes, in the places where they happen, seems a proof that they owe their origin to some such sulphureous matter as this stone; and the rolling, and desultory noise of an earthquake, seems also to shew that it is not expanded any way at once, but is propagated through a chain of these subterranean hollows.

It is not necessary that we should suppose a continued chain of them, from the place where the earthquake begins to be felt, to the spot where it ends; but, if there are many of them irregularly scattered about the earth, the force of the explosion will be sufficient to burst through the solid parts between, and open a passage from one to the others, which may continue open no longer than the force continues, and after the shock is over close together again, so as to leave no trace where it was

Our miners not only find the natural caverns, but they also find them often full of what they call fire damps, which are inflammable vapours, of the very nature of those which occasion earthquakes, and, when fired, make the same explosions, and cause the same effects in a certain degree. These sometimes require a candle, or other actual fire, to come in contact, in order to kindle them; but sometimes they are found kindled of themselves, and flaming on the surface of the waters, in the bottoms of the pits, or at the fissures of the coal. *Philos. Trans.* Nº. 157.

SEMIFI'STULAR *flowers*, in botany, are such whose upper part resembles a pipe cut off obliquely; as in bush-wort, &c.

SEMIFLO'SCULOUS, in botany, a term used to express the flowers of a certain class of plants, of which the dandelion, hawkweed, and the like, are kinds.

This sort of flower consists of a number of semiflosculi, which are either disposed into one or more circles, and all comprehended in the same cup, which often becomes inverted, as the flower ripens. These Semifloscules are petals, hollow in their lower part, but in their upper half are flat, and continued in the shape of a tongue. These are often separated from each other by intermediate leaves, and are placed upon the embryo fruit, from which there stands out a slender capillament, divided at the end into two parts; often carried beyond the vagina, supported by five props. The embryo's are placed in the thalamus, or bottom of the cup, and finally become seeds, sometimes winged with down, sometimes naked, sometimes coronated, and sometimes foliated. See *Plate* XL. *fig.* 7. *Tourn. Inst.*

SEMILUNA'RES *cochleæ*, in natural history, the name of a genus of sea snails, so called, from their having semicircular mouths.

The characters of the genus are these: they are univalve shells of a compact body, with a flat, semicircular, and often dentated mouth. Some of the species have exerted apices, and some depressed.

SE'MINAL *leaves*, are two plain, soft, and undivided leaves, that first shoot forth from the greatest part of all sown seeds; which leaves are very different from those which do succeed on the same plant, in size, figure, surface, and position.

SEMINAL *root*, in natural history, a name given by Grew to that part of the seeds of plants, which may otherwise be called the inner body of the seed: this is distributed through the parenchyma of the seed, but is wholly different from it, and distinguished by Dr. Grew from the radicle, which becomes the plant root in its future growth. The parenchyma of the seed is, in some degree, that to the Seminal root, which the mould or earth is to the plant-root, or radicle; and the Seminal root is to the plant-root what the plant-root is to the trunk. *Grew's Anat. of Plants.*

SEMINI'FEROUS, *bearing or producing seed*, in botany, an epithet

epithet applied to those plants which produce large quantities of seed.

SE'MINARIES, in popish countries, are certain colleges, appointed for the instruction and education of young persons, destined for the sacred ministry. The first institution of such places is ascribed to St. Augustin. And the council of Trent decrees, that children, exceeding twelve years of age, shall be brought up, and instructed in common, to qualify them for the ecclesiastical state, and that there shall be a Seminary of such belonging to each cathedral, under the direction of the bishop.

In the Seminaries of France, none are taken in but young persons ready to study theology, and be ordained. And, for the maintenance of these Seminaries, certain benefices are allotted; or else the clergy of the diocese are obliged to maintain them. These colleges are furnished with halls for the public exercises, and little chambers or cells, where each student retires, studies, and prays apart. Such is the Seminary of St. Sulpitius at Paris.

In the reign of queen Elisabeth, the Roman Catholics projected the founding English Seminaries abroad, that from thence they might be furnished with missionaries, to perpetuate and increase their communion. Accordingly, the college of Douay was founded in 1569, at the expence of Philip II. King of Spain; and Dr. William Allen, an Englishman, was made head of it. In the year 1579, a college was founded at Rome, for the same purpose, by Gregory XIII. who settled 4000 crowns per annum for the subsistence of the society. The famous Robert Parsons, an English jesuit, was rector of this college. King Philip founded another of these nurseries at Valladolid in the year 1589, and one at Seville in 1593. The same prince founded St. Omers in Artois, in 1596. In the next century, more Seminaries were established, at Madrid, Louvain, Liege, and Ghent.

The two colleges of Douay and Rome received such great encouragements, that some hundreds of priests were sent off from thence into England.

By the statute of queen Elisabeth it is made a præmunire to contribute to the maintenance of a popish Seminary. And by one of king James I. no persons are to go, or be sent, to popish Seminaries, to be instructed or educated, under divers penalties and disabilities mentioned in the statute.

The Houses of the society de propaganda fide, established for the preparing ecclesiastics for missionaries among infidels and heretics, are also called Seminaries. The principal of these is that at Rome, called the apostolical college, or Seminary, or the Seminary de propaganda fide.

SE'MINARY, in gardening, is a seed-plot, adapted or set apart for the sowing of seeds. These are of different natures and magnitudes, according to the several plants intended to be raised therein. If it be intended to raise timber of fruit trees, it must be proportionably large to the quantity of trees designed; and the soil should be carefully adapted to the various sort of trees. Without such a place as this, every gentleman is obliged to buy, at every turn, whatever trees he may want to repair the losses he may sustain in his orchard, wilderness, or larger plantations; so that the necessity of such a spot of ground will easily be perceived by every one. But as I have already given directions for preparing the soil, and sowing the seeds in such a Seminary, under the article of NURSERY, I shall not repeat it in this place, but refer the reader to that article.

It is also as necessary, for the support of a curious flower-garden, to have a spot of ground set apart for the sowing of all sorts of seeds of choice flowers, in order to obtain new varieties; which is the only method to have a fine collection of valuable flowers; as also for the sowing of all sorts of biennial plants, to succeed those which decay in the flower-garden; by which means the borders may be annually replenished, which, without such a Seminary, could not be well done.

This Seminary should be situated at some distance from the house, and be intirely inclosed either with an hedge, wall, or pale, and kept under lock and key, that all vermin may be kept out; and that it may not be exposed to all comers and goers, who, many times, do mischief before they are aware of it. As to the situation, soil, and manner of preparing the ground, it has been already mentioned under the article of NURSERY; and, the particular account of raising each sort of plant being directed under their proper heads, it would be needless to repeat it here. *Miller's Gard. Dict.*

SEMI'NIUM, a term used by the writers on fossils to express a sort of first principle, from which the several figured stones, or as they are more usually called the extraneous fossils, are supposed to have their origin.

SEMITE'RTIAN, a kind of complex fever, which deserves our careful observation.

It begins with a horror, and goes off with a sweat, yet not so as to leave the patient entirely free from a fever. But, since it is complicated of an intermittent tertian and a continual quotidian, on one day it is more exasperated, and molests the patient with a horror, and frequently with something of a rigor, attended with bilious vomitings or stools, a burning heat, and exhalations of humid vapours. On the other day the patient is rather sensible of a cold than a horror, and is not much afflicted with heat or thirst; the pulse is more moderate, and the fever more gentle on all accounts; besides, on one day may be observed two kinds of fevers, on the other but one. A Semitertian fever is indeed but rare, but, where it is once settled, very dangerous. An exquisite Semitertian is, when the supplies of peccant matter for the intermittent tertian and continual quotidian are nearly equal; otherwise there cannot be a pure Semitertian, and consequently the disease, as it is thought, will the more easily give way to remedies. *Lommii, Med. Obs.*

Among the epidemic fevers of the intermittent and malignant kind, we, in practice, frequently meet with that species which consists of an intermittent tertian and a quotidian of the continual kind, for which reason it is by the Greeks called ἡμιτριταῖος; and by the Latins semitertiana.

This species of fever generally seizes the patient, in the forenoon, with a violent cold and horror, and a contracted pulse. This state is afterwards succeeded by an heat, which lasts for some hours, is accompanied with a frequent pulse, and remits without being totally removed upon the eruption of the Sweat. Towards the evening the heat is rather increased, after a gentle refrigeration; and next day the disorder is milder, and accompanied with thirst, till about the evening, after a slight horripilation, it again becomes more violent. But, on the third day, the horror again seizes the patient, and is succeeded by a more intense heat, whilst the state of the disorder is the same it was on the first day. So that there is always present a kind of growing fever, the exacerbation of which happens towards the evening; and on the third day, in the morning, this exacerbation is most conspicuous, and accompanied with a rigor. Besides, the strength is impaired, the appetite rendered languid, the sleep defective, and the urine thin and crude; whereas, after the paroxysm of a tertian, it is thick and high-coloured. In coughing a small quantity of crude matter is spit up. This species of fever is, also, frequently accompanied with a pain of the back and abdomen, which latter is, also, tumid. Some, upon the approach of the tertian paroxysm, are afflicted with a nausea and cardialgia; others vomit; others fall into deliquiums; and others become absolutely delirious.

This fever is almost unknown in some parts of Europe, the inhabitants of which generally take it for a malignant intermittent fever; but the former greatly differs from the latter, since it is neither contagious, accompanied with exanthematous efflorescences, nor attended with so considerable a loss of strength. Besides, it has every third day a conspicuous exacerbation accompanied with horror.

Others, in like manner, unjustly confound a Semitertian with a continual tertian; for the latter, otherwise than in the former, has its exacerbation only on the third day, but not in the evening; nor is it wholly continual; but, though it at first seizes with a continual heat, yet, on the third day, it generally loses its violence, and passes into an intermittent tertian.

Nor is a Semitertian to be confounded with a double tertian; for, though the latter seizes every day, yet the paroxysms correspond to each other, and the fever itself perfectly intermits; whereas, in a Semitertian, there is absolutely no intermission, but a remission. The paroxysm, also, happens about the evening, and is always double on the third day.

A Semitertian is, therefore, composed of two fevers, and must, therefore, have a double fomes, and a double cause; that is, the source of the continual fever in the mesentery, in consequence of the intercepted circulation of the blood through its structure, and its consequent inflammatory stagnation in the contiguous nervous coats. But the violent paroxysm, happening on the alternate days, has, as well as a tertian, its seat and cause in the intestines, and especially in the duodenum; for to the winding cavity of this intestine the lymphatic, bilious, and corrupted humours, in consequence of the disorder of the mesentery, are conveyed from the glands, the liver and pancreas; as also crude juices from the stomach, which constitute a morbid fomes; which, mixing with the blood, and being conveyed to the nervous membranes of the spine, induces a preternatural febrile motion.

Among the things which have a tendency to generate a Semitertian, we may reckon all those substances and circumstances which render the juices thick and impure, and especially fill the primæ viæ and vessels of the mesentery with sordes. Hence Semitertians are most generally incident to those, who, neglecting a salutary regimen, eat liberally of sweet, acid, fermentable aliments, and farinaceous substances fried with butter, sugar, and eggs; and to those who lead an idle and too sedentary life; who drink too little; who are too great lovers of sweet wines; or who indulge the passions of the mind, especially sorrow. Semitertians are, also, readily incident to persons after a recovery from acute disorders; to those who are costive; to those who frequently use drastic purgatives; and to such as have the menstrual or hæmorrhoidal discharge suppressed. These fevers are, also, less frequent at other seasons than in the autumn, the fruitful source of terrible fevers, on account of the variety and inequality of the weather, which is highly unfriendly to salutary perspiration,

tion. Semitertian fevers, also, frequently happen to those, who, when overheated, greedily drink cold liquors, or who, when sweating, sit down in moist places.

Semitertians are observed to be more frequent in some countries than in others. Thus Galen, Spigelius, and Baglivi, inform us, that they rage more in Italy than in other climates. And certainly, in that part of the world, the heat, during the day, generates many acrid recrementitious sordes, whilst the cold air of the night hinders the exclusion of these; and the cold drink, of which they are so very fond as to prepare it by putting ice into it, occasions, that the juices in the mesentery, where the resistance is small, and the circulation languid, as it were, stand still, and conceive an inflammatory stagnation. And thus a continual fever is generated, which is changed into a tertian, by the corrupted juices falling from the mesentery to the intestines. The like happens in Hungary, where a similar state of the air, and a liberal use of sweet and spirituous wines, frequently excite Semitertians.

Since, therefore, a Semitertian, besides the common cause of intermittents in the primæ viæ, has, for a foundation, an inflammation, and a continual disposition never to admit of a great remission of the symptoms, nor of a due time for recovering the strength, it is of a very dubious nature, and far more dangerous than a simple intermittent.

For this reason, its progress is quick, since, for the most part, it terminates on the ninth or thirteenth day, either in health, some other disease, or death.

When it is long protracted, the inflammation either comes to a suppuration, and the disorder is changed generally into an hectic or slow fever; or, when there is a violent obstruction of the mesentery, it terminates in a dropsy; or, which happens more rarely, when the primæ viæ are filled with sordes, it ends sometimes in a simple, and sometimes in a double intermittent.

But when the sweat not only breaks out in the decline of the paroxysm, but also on the seventh day, which is critical; or if, after this day, the intestines are put into a commotion, and a bilious, pituitous, or even a bloody flux, is produced, it is a good sign, and prognosticates the solution of the disease; or if there happen violent pains of the abdomen, which are increased at certain stated hours, the disorder is resolved by them, or afterwards terminated by a subsequent sanious and purulent diarrhœa, or an evacuation of a large quantity of black blood by stool.

On the contrary, when none of these circumstances happen, but rather a heat about the præcordia, a tension and pain in the whole region of the stomach, a vomiting, a hiccup, a restlessness, a tossing, and a trembling of the hands, are perceived, they are bad prognostics, and indicate that the inflammation has spread itself farther even to the stomach.

Those who die of a Semitertian are taken off under the access of a violent paroxysm, which keeps the type of a tertian, the inflammation, in the mean time, being far diffused and converted into putrefaction. Thus Spigelius, in his Lib. de Semitertiana, cap. 14, informs us, that he always found this to be the cause of the death of such patients, in the following manner: 'When, says he, I reflect upon what I have observed, in dissecting those who died of Semitertians, I can ascribe their death to nothing else but putrid stagnations in the vessels; for, in the carcasses of such persons, I found inflammations formed of bilious and pituitous blood, about the concave part of the liver, in the stomach, in the great and small intestines, in the mesentery, omentum, and spleen, and often in one or more of these parts, and sometimes in them all; and a supervening gangrene or sphacelus, though perhaps small, was found to be the cause of their speedy death.'

The cure. The two principal intentions to be pursued in the cure of a Semitertian, are,

1. With all expedition either to discuss or hinder the farther spreading of the inflammatory stagnation lodged in the coats of the mesentery and intestines, and exposing the patient to imminent danger.

2. To correct and gently evacuate the febrile matter during the intermission, having a due regard, at the same time, to the critical efforts of nature.

The former of these intentions is excellently well answered, by diaphoretic and gently nitrous powders exhibited frequently in small doses. Thus:

Take of the cerus of antimony, of prepared mother of pearl, and crabs eyes, each one drachm; of the solution of crabs eyes and depurated nitre, each half a drachm; reduce them to a powder, of which, every three hours, fifteen grains may be exhibited in a decoction prepared of two ounces of the roots of vipers-grass, one ounce of the shavings of hartshorn, one ounce of currans, and half an ounce of the roots of succory, boiled for half an hour in four quarts of water.

The same intention is answered, by exhibiting every three hours a spoonful or two of the resolvent and diaphoretic mixtures, prepared of the pectoral and analeptic waters of lily of the valley, galangals, carduus benedictus, vipers-grass, and black cherries, with the distilled vinegar of crabs eyes, diaphoretic antimony, the mixtura simplex, and the syrup of carduus benedictus.

By means of these, the sordes of the primæ viæ, which produce the disorder, being corrected and diluted, are best evacuated by solutions of manna, with a due portion of cream of tartar, rhubarb, raisins, and sal polychrestum; for these, without any commotion of the blood, irritation of the nervous parts, or loss of strength, cleanse the intestines, and greatly contribute to remove the infarctions of the mesentery. This intention is, also, answered by balsamic pills, prepared of bitter extracts, resinous and balsamic gums, and depurated aloes, together with the precipitating nitrous powder, moderately but frequently used. If the more subtile parts of the sordes are, by an increased perspiration, to be eliminated through the cutaneous pores, the essence of scordium mixed with an equal quantity of the anodyne mineral liquor, is of all other medicines the most safe and efficacious.

All cures are to be so managed, as never to disturb or interfere with the critical efforts of nature, but rather to assist them when defective, and moderate them when excessive.

Hence, it is highly prejudicial to exhibit purgatives, especially in the beginning of a Semitertian, since, by that means, the unprepared matter is agitated, the inflammation increased, and the disease disposed to a speedy, though a fatal event.

Saline detersives, exhibited by themselves, are not to be used in a Semitertian, especially in large doses, except antimoniated nitre, to which, and the sal polychrestum, Baglivi justly ascribed so much; for these are possessed of an aperient, diuretic, and gently laxative quality, and may sometimes be commodiously exhibited to the dose of fifteen grains, in a sufficient quantity of some proper decoction.

But if a Semitertian seizes a person who is costive, or if he is long costive during it, his body is only to be rendered soluble, by clysters prepared of paregoric and emollient substances, the carminative seeds, and Venice soap, that thus the primæ viæ may be freed from the excrementitious sordes; for, if this is neglected, nature seeks a way upwards, and excites a vomiting, especially when the biliary ducts in the liver are turgid with an acrid bile.

In the decline of the fever, the physician is to follow the tendency of nature, which often terminates the disorder by a flux, so that on this occasion the above-mentioned laxatives and balsamic pills are commonly used.

In a Semitertian, the physician is to be very cautious in exhibiting emetics, lest he should create a vomiting, or hiccup, or dispose the stomach to an inflammation: but if the peccant matter is to be evacuated by vomit, in consequence of the tendency of nature that way, the intention is sufficiently answered by drinking tepid water with salt, or a very gentle antimonial stimulus.

In a Semitertian, venesection is not proper, except there is a violent plethora, and an intense heat in persons as yet vigorous, and labouring under a suppression of critical hæmorrhages; for, in this case, venesection is absolutely necessary, in order to prevent a mortal inflammation of the intestines; but it is to be used in the very beginning, since, the sooner a proper quantity of blood is taken away, the sooner the cure is accomplished.

The patient is, also, carefully to avoid all hot substances, alexipharmic essences, bezoardic tinctures, a hot regimen, and large quantities of hot liquors; for, by means of these, the heat is increased, the critical discharge of the fomes of the disease through the intestines is disturbed, and the strength impaired by profuse sweats.

Astringent, too fixed, earthy, testaceous powders, and Peruvian bark, are not to be used in a Semitertian; for Baglivi observes, that, by means of these, either mortal inflammations, or slow and hectic fevers, have been brought on.

Though the patient should be afflicted with an exquisite pain of the abdomen, and frequent stools, he is nevertheless to abstain from sedatives, and is only to be relieved by anointing his abdomen with spirituous and corroborative liniments, whilst the tumult and commotion is to be checked by an internal exhibition of diaphoretics.

For ordinary drink, the most proper is the decoction beforementioned; as, also, a decoction of oats prepared in the following manner:

Take of clean washed oats, one pound; of the roots of succory, sarsaparilla, and vipers-grass, each one ounce; of the flowers of red poppy, six pugils; of antimoniated nitre, half an ounce; leaves of scabious, half an handful; and of pure nitre two drachms; boil them in five quarts of common water, to a consumption of a third part, and edulcorate with syrup of carduus benedictus, wild poppy, or citron juice.

In Semitertians, I have, also, found happy effects produced by decoctions of chamomile flowers, and the tops of yarrow, or by extracts prepared from these; for such decoctions and extracts safely alleviate the pains, especially of the hysteric and complicated kind, and, at the same time, by their bitterness, prove excellent antiscorbutic medicines, and restore the due tone of the parts.

As no fever more readily recurs than a Semitertian, so the patient is, after it, carefully to avoid the things already enumerated, as the procatarctic causes of the disorder. All things are to be used temperately; the body is to be kept soluble by mild laxatives; the increase of crudities is to be prevented by stomaftomachics; and, which is of all other circumftances the moft important, the perfpiration is carefully to be kept free and unobftructed; for as in all fevers, fo, alfo, in thofe of the Semitertian kind, the relapfes are far worfe and more obftinate than the original diforder.

Thefe are the general precepts, founded on reafon, and fupported by the indications of nature, by the obfervation of which the cure may be judicioufly attempted, and fuccefsfully performed. But the particular method is to be fuggefted by the fagacity of the phyfician, which is to direct him to the order, dofe, time, and ufe of proper medicines, which, being the fame with thofe employed in the cure of continual quotidian, tertian, and quartan intermittents, may be feen under thefe articles. *Frederic Hoffman.*

SE'MITONE (*Dict.*)— There are three degrees, or leffer intervals, by which a found can move upwards and downwards fucceffively from one extreme of any concord to the other, and yet produce true melody; and, by means whereof, feveral voices and inftruments are capable of the neceffary variety in paffing from concord to concord.— Thefe degrees are the greater and leffer tone, and the Semi-tone. The ratio of the firft is 8 : 9; that of the fecond 9 : 10.

The ratio of the Semi-tone is 15 : 16, its compafs is five commas; which interval is called a Semi-tone, not that it is geometrically the half of either of the tones, for it is more; but becaufe it comes fomewhat near it. It is alfo called the natural Semi-tone, and the greater Semi-tone, becaufe greater than the part it leaves behind, or its complement to a tone, which is four commas.— The Italians alfo call it feconda minore, or a leffer fecond.

Every tone of the diatonic fcale is divided into a greater and lefs, or a natural and artificial Semi-tone. Mr. Malcolm obferves, it was very natural to think of a divifion of each tone, where 15 : 16 fhould be one part in each divifion, in regard this, being an unavoidable and neceffary part of the natural fcale, would readily occur as a fit degree, and the more, as it is not far from an exact half-tone. In effect, the Semi-tones are fo near equal, that, in practice, at leaft, on moft inftruments, they are accounted equal, fo that no diftinction is made into greater or lefs.

Thefe Semi-tones are called fictitious notes, and, with refpect to the natural ones, are expreffed by characters called flats and fharps.

Their ufe is to remedy the defects of inftruments, which, having their founds fixed, cannot always be made to anfwer to the diatonic fcale.

By means of thefe we have a new kind of fcale, called the

SE'MI-TONIC *fcale*, or the *fcale of Semi-tones*: a fcale or fyftem of mufic, confifting of twelve degrees, or thirteen notes, in the octave, being an improvement on the natural or diatonic fcale, by inferting, between each two notes thereof, another note, which divides the interval or tone into two unequal parts, called femi-tones.

The ufe of this fcale is for inftruments that have fixed founds, as the organ, harpficord, &c. which are exceedingly defective on the foot of the natural or diatonic fcale.— For, the degrees of the fcale being unequal, from every note to its octave there is a different order of degrees; fo that from any note we cannot find any interval in a feries of fixed founds: which yet is neceffary, that all the notes of a piece of mufic, carried through feveral keys, may be found in their juft tune, or that the fame fong may be begun indifferently at any note, as may be neceffary for accommodating fome inftruments to others, or to the human voice, when they are to accompany each other in unifon.

The diatonic fcale, beginning at the loweft note, being firft fettled on an inftrument, and the notes thereof diftinguifhed by their names *a . b . c . d . e . f . g*; the inferted notes, or Semi-tones, are called fictitious notes, and to take the name or letter below with a ♯ as *c* ♯ called *c* fharp; fignifying, that it is a femi-tone higher than the found of *c* in the natural feries; or this mark ♭ called a flat, with the name of the note above, fignifying it to be a femi-tone lower. See FLAT and SHARP, in the *Dict.*

Now $\frac{15}{16}$ and $\frac{128}{135}$ being the two femi-tones the greater tone is divided into; and [illegible] and [illegible], the Semi-tones the lefs tone is divided into; the whole octave will ftand as in the following fcheme, where the ratio's of each term to the next are wrote fraction-wife between them below.

Scale of SEMI-TONES.

c . c ♯ *. d . d* ♯ *e . f . f* ♯ *. g . g* ♯ *. a . b*♭ *. b . cc*

[illegible]

For the names of the intervals in this fcale it may be confidered, that as the notes added to the natural fcale are not defigned to alter the fpecies of melody, but leave it ftill diatonic, and only correct fome defects arifing from fomething foreign to the office of the fcale of mufic, viz. the fixing and limiting the founds: we fee the reafon why the names of the natural fcale are continued, only making a diftinction of each into a greater and lefs.— Thus an interval of one Semi-tone is called a leffer fecond; of two Semi-tones, a greater fecond; of three Semi-tones, a lefs third; of four, a greater third, &c.

A fecond kind of femitonic-fcale we have from another divifion of the octave into Semi-tones; which is performed by taking an harmonical mean between the extremes of the greater and lefs tone of the natural fcale, which divides it into two Semi-tones nearly equal.— Thus the greater tone 8 : 9 is divided into 16 : 17, and 17 : 18; where 17 is an arithmetical divifion, the numbers reprefenting the lengths of chords; but, if they reprefent the vibrations, the lengths of the chords are reciprocal, viz. as 1 : $\frac{16}{17}$: $\frac{8}{9}$, which puts the greater Semi-tone [illegible] next the lower part of the tone, and the leffer [illegible] next the upper, which is the property of the harmonical divifion.— After the fame manner the leffer tone 9 : 10 is divided into the two Semi-tones 18 : 19 and 19 : 20, and the whole octave ftands thus:

c . c ♯ *. d . d* ♯ *e . f . f* ♯ *. g . g* ♯ *. a . b*♭ *. b . c*

[illegible]

This fcale, Mr. Salmon tells us, in the Philofophical Tranfactions, he made an experiment of, before the royal fociety, on chords, exactly in thefe proportions, which yielded a perfect concert with other inftruments, touched by the beft hands.— Mr. Malcolm adds, that, having calculated the ratio's thereof, for his own fatisfaction, he found more of them falfe than in the preceding fcale; but their errors were confiderably lefs, which made amends.

SE'NATE (*Dict.*)— The Senate's authority in the Roman republic was very confiderable; they decided what was to be done in matters of peace and war, without faying any thing to the people, to whom the fentiments of the faid body were communicated in thefe terms: Senatus decrevit, populus juffit. It was the Senate's right to give the firft audience to foreign ambaffadors, to difpofe of provinces, appoint triumphs, and receive letters from the generals of their armies concerning the fuccefs of the republic's arms. Their power came fomewhat to be leffened under the emperors; for Auguftus conftituted to himfelf a privy-council, confifting of a certain number of Senators, with whom he confulted concerning the moft important affairs of ftate. Tiberius endeavoured by little and little to affume the power into his own hands. Nero on the contrary ordered, that the Senate fhould retain their ancient rights and privileges; but we may fay with Tacitus, that all this was but a fpecious pretence, wherewith he was minded to colour his ufurpations. All authors are agreed, that the Senate of Rome was of great dignity and authority, but had not a full power nor an abfolute dominion, they having none to command, and much lefs to execute their orders, as Dionyfius of Halicarnaffeus has well obferved; we alfo meet with divers paffages in Livy to this purpofe; Senatus decrevit, populus juffit; that is, the Senate have thought it good, and the people commanded it: and, in fhort, the leaft tribune, that oppofed the Senate, could obftruct all their decrees; and the Senate gave out their orders to the confuls and prætors, no otherwife than if it pleafed them, fi eis ita videtur.

All the great magiftrates had a right to enter into the Senate, but not to give their opinions there, unlefs they were Senators: The fenators children had alfo the fame right, that they might betimes ufe themfelves to the affairs of the republic: the tribunes of the people at firft ftood at the door of the Senate, to know their deliberations, and to oppofe them, in cafe they were contrary to the rights of the people; but they were afterwards admitted in: the confuls, dictators, tribunes of the people, and the governor of Rome, in the conful's abfence, had a right to call the Senate together.

The Senate ufually met three times a month, viz. on the calends, nones, and ides, according to Suetonius: and this ftated affembly was called legitimus fenatus; and all the fenators were obliged to be prefent, under the penalty of a fine. They might be extraordinarily called together any day in each month; and this they called fenatus indictus, or edictus. Thefe affemblies might be held from morning to evening, in three places in the city, appointed for this purpofe, viz. in the temple of Concord, between that place and the capitol, at the gate Capena, and in the temple of Bellona, where they gave foreign ambaffadors audience, before they were introduced into the city. There were alfo a great many more places appointed for this purpofe, as, Curia Hoftilia, Pompeia, and Julia, which the augurs firft confecrated, according to Aulus Gellius and Varro.

The affembly of the Senate began with a facrifice offered to the gods; but Auguftus altered this cuftom, and ordered every fenator to offer a facrifice of wine and incenfe upon the altar of the god, in whofe temple the Senate met, before he took his feat, or could confult about any bufinefs, as Suetonius in his Life, c. 35, informs us. After which he was obliged to take an oath, by touching the altar, and calling the gods to witnefs, that he would give his opinion with fincerity, and without flattery. This being done, the fenators took their places, when the conful, or he who fat as prefident, propofed both the public and private bufinefs, which they were to confult about.

SE'NATOR (*Dict.*)— Romulus inftituted the firft hundred Senators at Rome, which made up the king's council: in order to be a Senator, a man muft be a citizen of Rome, or of the municipal cities that had the fame privileges or freedom: refpect was had to their manners, birth, and eftate: for

for a Senator ought to have a revenue of 4000 pounds for the maintenance of his dignity; but Auguftus required he fhould have 300000 crowns. He was to be at leaft thirty years old before he was made a Senator.

We are not without inftances of children affranchifed, and of perfons yet of a meaner condition, and even ftrangers, who have arrived at the dignity of Senators; but this was brought about either by intrigue, or the emperor's authority. The choice of Senators belonged at firft to the kings; the confuls afterwards were invefted with this power; and, laftly, the cenfors, being obliged every five years to take an account of them, fubftituted others in the room of thofe that were dead, or had been degraded: but, in the decaying time of the republic, the emperors arrogated this power to themfelves, and made as many Senators, and of what quality they pleafed.

The number of Senators varied according to various times: Romulus at firft created a hundred of them, which he called patres; and, after the alliance made with the Sabines, increafed their number to a hundred more. Tarquinius Prifcus, according to Livy, or, as others will have it, king Servius, added alfo an hundred, which he named Patres minorum gentium, becaufe they were not of fo noble an extract as the former. This number of 300 Senators continued to the time of C. Gracchus, tribune of the people; who, oppofing the nobles, made the people add 300 Roman knights to the reft, in order to counterbalance the number of the 300 Senators: thus the number of 600 Senators lafted to the time of Julius Cæfar, who being willing to gratify a great many brave men, who had faithfully ferved him in his wars againft Pompey, increafed the number to 1000 of all forts of people, without diftinction. But Auguftus, to purge this body that was in an ill habit, reduced it to the former number of 600. And fo, of the 300 Senators, the 200 created by Romulus were called Patricii majorum gentium, and the other 100 Adlecti, or Confcripti, a name which afterwards continued to be given to the whole fenate.

Among thefe Senators, there were fome who had a decifive vote, and fpoke their fentiments in the matters that were propofed; and others who did no more than follow thofe fentiments which to them appeared moft reafonable; and this made them be called Pediarii Senatores, who did not declare their own opinions, but fided with thofe whofe opinions they approved of: Aulus Gellius rejects this interpretation, and feems to follow that of Q. Baffus, who fays in his Commentaries, that thofe of the Senators who had never bore the office of curule magiftrate, went a foot to the fenate, and for that reafon were called Pedarii Senatores.

The Senators wore a very large purple tunicle with broad edges called lati-clavii; they had a right to fit or be carried in the curule chair, to affift at plays and fhews in the Orcheftra, and likewife at feafts and the banquet confecrated to Jupiter, in the capitol. The cenfors took an account of them every five years, calling them with a loud voice; and thofe whom they paffed over were degraded from the order of Senators, which were called præterire: but, if the perfon who was paffed over was minded to oblige the cenfor to tell the reafon of it, he was under an obligation to do it, fays Lipfius, and then he was degraded with the greateft ignominy and fhame; this being called ejicere fenatu. He, who was thus degraded, had the remedy of appealing to the people, who, in fpite of the cenfor, did many times re-eftablifh him.

SENEKA, *rattle-fnake-root.* See POLYGALA.

SENNA (*Dict.*)—The feeds fhould be fown early in the fpring, upon a good hot-bed; and, when the plants are come up, and are ftrong enough to tranfplant, they fhould be each planted in a fmall pot filled with light rich earth, and plunged into a frefh hot-bed, in order to bring the plants forward: for, as this is an annual plant, unlefs the plants are brought on in the fpring, they will not flower in this country: therefore, they muft be conftantly kept in the hot-bed all the fummer, obferving to admit plenty of air in warm weather; by which method I have frequently had this plant in flower, but it is very rare that they perfect their feeds in England.

If the feeds of this plant were fent to South Carolina, the plants might be propagated there, fo as to furnifh plenty of the leaves, to fupply the confumption of Great-Britain.

In the Weft-Indies, the inhabitants make ufe of the leaves of feveral fpecies of caffia, inftead of this plant; and, alfo, of thofe of the poinciana, or flower-fence, which is frequently called by them the true Senna.

SENSATION (*Dict.*)— To conceive the manner wherein Senfation is effected, obferve, that all the organs confift of little filaments, or nerves which have their origin in the middle of the brain, are diffufed thence throughout all the members which have any fenfe, and terminate in the exterior parts of the body; that when we are in health, and awake, one end of thefe nerves cannot be agitated or fhaken, without fhaking the other, by reafon they are always a little ftretched; as in the cafe of an extended chord, one part of which cannot be ftirred without a like motion of all the reft.

Obferve, further, that thefe nerves may be agitated two ways, either at the end out of the brain, or that in the brain.— If they be agitated from without, by the action of objects, and their agitation be not communicated as far as the brain; as frequently happens in fleep, when the nerves are in a ftate of relaxation; the foul does not then receive any new Senfation.— But if the nerves happen to be agitated in the brain, by the flux of the animal fpirits, or any other caufe; the foul perceives fomething, though the parts of thofe nerves, that are out of the brain, diffufed through the feveral parts of the body, remain at perfect reft: as likewife is frequently the cafe in fleep.

Laftly, obferve, that experience tells us, we may fometimes feel pain in parts of the body that have been entirely cut off, by reafon the fibres in the brain correfponding to them, being agitated in the fame manner, as if they were really hurt; the foul feels a real pain in thofe imaginary parts.

All thefe things feem to fhew, that the foul refides immediately in that part of the brain wherein the nerves of all the organs of fenfe terminate: we mean, it is there it perceives all the changes that happen with regard to the objects that caufe them, or that have been ufed to caufe them; and that it only perceives what paffes out of this part, by the mediation of the fibres terminating in it.

Thefe things premifed, it will not be difficult to explain how Senfation is performed: the manner whereof may be conceived from what follows. When the point of a needle, for inftance, is thruft againft the hand, that point ftirs and feparates the fibres of the flefh, which fibres are extended from that place to the brain, and when we are awake, are in fuch a degree of tenfion, as that they cannot be ftirred without fhaking thofe of the brain. If then the motion of the fibres of the hand be gentle, that of the fibres of the brain will be fo too; and, if the firft be violent enough to break any thing in the hand, the laft will be ftronger and more violent in proportion.— In like manner, if the hand be held to the fire, the little particles of the wood it throws off in great numbers, and with a great deal of violence, ftriking againft thefe fibres, and communicating a part of their agitation thereto; if the action be moderate, that of the extremities of the fibres of the brain, correfponding to thofe of the hand, will be moderate likewife: if it be violent enough to feparate any of the parts of the hand, as it happens in burning; the motion of the fibres in the brain will be proportionably more violent. This is what befals the body, when objects ftrike upon it.— We are now to confider how the mind is affected.

The mind, we have obferved, refides principally, if we may be allowed to fay fo, in that part of the brain where all the fibres of the nerves terminate. It attends here, as its fenfory, or office, to look to the prefervation of all the parts of the body; and, of confequence, muft be here advertifed of all the changes that happen, and muft be able to diftinguifh between thofe agreeable to the conftitution of the body, and thofe hurtful thereto. Any other abfolute knowledge, without a relation to the body, were ufelefs.— Thus, though all the changes in our fibres do, in reality, confift in motions, which ordinarily only differ as to more and lefs; it is neceffary the foul fhould confider them as changes effentially different; for, though in themfelves they differ but very little, yet, with regard to prefervation of the body, they are to be looked on as effentially different.

The motion, for inftance, which caufes pain, frequently differs exceeding little from that which occafions a pleafing titillation: it is not neceffary there fhould be an effential difference between thefe two motions; but it is neceffary there be an effential difference between the pain and the tickling, which thofe two motions occafion in the foul; for the agitation of the fibres, which accompanies the titillation, informs the foul of the good ftate of the body, that it is able to refift the impreffion of the objects, and that it need not apprehend its being hurt: but the motion which occafions pain, being fomewhat more violent, is capable of breaking fome of the fibres of the body; wherefore it is neceffary the foul be advertifed hereof by fome difagreeable Senfation, that it may provide againft it.

Thus, though all the motions which pafs in the body only differ in themfelves, as to more or lefs, yet, when confidered with regard to the prefervation of life, they may be faid to be effentially different: for this reafon it is, that the foul does not perceive the fhakes, or motions themfelves, which objects excite in the fibres of the flefh: it would be ufelefs to perceive them; and fhe would never be able, thence, to learn whether the objects were capable of doing hurt or good. But fhe perceives herfelf affected with Senfations, which differ effentially, and which fhewing precifely the qualities of the objects, as they regard the body, make her perceive diftinctly, whether or no thofe objects are capable of hurting it.

In effect, from a ftrict examination of the feveral fenfes, it appears, that fenfible objects act no otherwife upon the body, for the producing of Senfation, than by exciting a change in the extreme furface of the fibres of the nerves: the quality of which change depends on the figure, bulk, hardnefs, and motion of the object; fo that, according to all appearance, the moft different objects, which fhould agree in thefe four circumftances, would produce the fame Senfation.

From the various texture of the object, the diverfity of the nerve

nerve affected, the different fabric of the organ of fenfe, the different place in the medulla of the brain where the nerve arifes, and the different degree of motion wherewith the action of the object is applied, arife various Senfations, and ideas, in the mind; none of which reprefent any thing in the action of the object, on in the paffion of the organ. And yet the fame action of the fame object, on the fame organ, always produces the fame Senfation or idea: and the fame ideas neceffarily follow the fame difpofition of the fame fenfible organ, in the fame manner as if the idea perceived were the natural and neceffary effect of the action on the organ.

SENSE (*Dict.*)—Some ufe the word Senfe in a greater latitude; and define it a faculty whereby the foul perceives ideas or images of objects, either conveyed to it from without, by the impreffion of objects themfelves, or excited within by fome effort of the foul of the fenfory itfelf.

Under which notion, Senfe becomes diftinguifhable into two kinds, external and internal: correfponding to the two feveral manners wherein the images of the objects perceived are occafioned, and prefented to the mind, viz. either immediately from without, or from within; that is, either by what we commonly call the five external Senfes, hearing, feeing, &c. or by the internal ones, imagination, memory, and attention; to which fome add hunger and thirft.

But thefe internal Senfes are not ordinarily confidered in the notion of Senfes, nor implied under the word Senfe; but are thus only denominated by analogy.

The means, on the part of the mind, are always the fame; it being one and the fame faculty, whereby we fee, hear, &c.— The means, on the part of the body, are different; as different as are the objects we are concerned to perceive: for, the being and well-being of the animal being the end, nature had in view in giving him any perception of external bodies, by this, the meafure and manner of that perception is regulated: and we have fo many ways of perceiving, and of perceiving fo many things, as the relation we bear to external bodies renders neceffary for the prefervation, &c. of our being.

Hence thofe feveral organs of Senfe, called eye, ear, nofe, palate, and the univerfal one cutis; each of which is fo difpofed as to give fome reprefentation and report to the mind of the ftate of external things, the nearnefs, convenience, hurtfulnefs, and other habitudes; and each of them a different one, according to the degree, and immediatenefs, &c. of the danger, or conveniency. And hence the feveral exercife of thofe organs, hearing, feeing, fmelling, tafting, and feeling.

A late excellent author gives us a more ingenious, extenfive, and philofophical notion of Senfe.—On his principle, Senfe is defined a power of perception, or a power of receiving ideas; if what is abfolutely paffive may be properly called a power.

On fome occafions, inftead of power, he chufes to call it a determination of the mind to receive ideas.—The ideas thus perceived, or raifed in the mind, he calls fenfations. Senfe he confiders, either as natural or moral: and the natural, either as external or internal: though the diftribution is chiefly founded on the common ways of conceiving; for, in reality, they appear to be all natural and neceffary: fome reafons, however, for the diftinction, will be fhewn under the feveral articles thereof.

External SENSES, then, are powers of perceiving ideas, upon the prefence of external objects.—On fuch occafions, we find the mind is merely paffive, and has not power directly to prevent the perception, or idea, or to vary it at its reception; as long as the body is continued in a ftate fit to be acted upon by the external object.

When two perceptions are intirely different from each other, or agree in nothing but the general idea of fenfation; the power of receiving thofe different perceptions is called different Senfes. Thus feeing and hearing denote the different powers of receiving the ideas of colours and founds. And though colours, as well as founds, have vaft differences amongft themfelves; yet is there a greater agreement among the moft oppofite colours, than between any colour and a found: and hence all colours are deemed perceptions of the fame Senfe.

All the feveral Senfes feem to have their diftinct organs, except feeling, which is, in fome degree, diffufed over the whole body.

Internal SENSES (*Dict.*)— Of thefe there are two different fpecies, diftinguifhed by the different objects of pleafure, viz. pleafurable or beautiful forms of natural things, and pleafurable or beautiful actions, or characters of rational agents: whence the internal Senfes become divifible into natural and moral; though what we call the internal natural Senfe, our author calls fimply, and by way of eminence, the internal Senfe.

In reflecting on our external Senfes, we plainly fee, that our perceptions of pleafure, and pain, do not depend directly on our will. Objects do not pleafe us according as we incline they fhould: the prefence of fome objects neceffarily pleafes us, and the prefence of others as neceffarily difpleafes us; nor can we, by our will, any otherwife procure pleafure, or avoid pain, than by procuring the former kind of objects, and avoiding the latter. By the very frame of our nature, the one is made the occafion of delight, and the other of diffatisfaction. In effect, our fenfitive perceptions are pleafant and painful, immediately, and without any knowledge of the cafe of this pleafure and pain, or of the manner how they excite it, or are occafions of it, or without feeing to what further advantage, or detriment, the ufe of fuch objects might tend. Nor would the moft accurate knowledge of thefe things vary either the pleafure, or the pain, of the perception; however it might give a rational pleafure diftinct from the fenfible; or might raife a diftinct joy, from profpect of further advantage in the object, or averfion, from apprehenfion of evil. There is fcarce any object, which our minds are employed about, but is conftituted the neceffary occafion of fome pleafure or pain. Thus we fhall find ourfelves pleafed with a regular form, a piece of architecture, or painting, a compofition of notes, a theorem, an action, an affection, a character; and we are confcious that this pleafure naturally arifes from the contemplation of the idea then prefent in the mind, with all its circumftances, though fome of thofe ideas have nothing of what we call fenfible perception in them; and, in thofe which have, the pleafure arifes from fome uniformity, order, arrangement, imitation; and not from the fimple ideas of colour, or found, or mode of extenfion feparately confidered.

It feems hence to follow, that, when inftruction, education, or prejudice of any kind, raife any defire or averfion towards an object, this defire, or averfion, is founded on an opinion of fome perfection, or deficiency, in thofe qualities, for perception whereof we have the proper Senfes. Thus, if beauty be defired by one who has not the Senfe of fight; the defire muft be raifed by fome apprehended regularity of figure, fweetnefs of voice, fmoothnefs, foftnefs, or fome other quality perceivable by the other Senfes, without relation to the ideas of colour.

The only pleafure of Senfe, which our philofophers feem to confider, is that which accompanies the fimple ideas of fenfation; but there are vaftly greater pleafures in thofe complex ideas of objects, which obtain the names of beautiful and harmonious.— The power, then, whereby we receive ideas of beauty and harmony, has all the characters of a Senfe. It is no matter, whether we call thefe ideas of beauty and harmony perceptions of the external Senfes of feeing and hearing, or not: we fhould rather chufe to call thefe ideas an internal Senfe, were it only for the convenience of diftinguifhing them from other fenfations of feeing and hearing, which men may have without perception of beauty and harmony.

Moral SENSE (*Dict.*)— This moral Senfe of beauty, in actions and affections, may appear ftrange at firft view: fome of our moralifts themfelves are offended at it in my lord Shaftfbury, as being accuftomed to deduce every approbation, or averfion, from rational views of intereft. Our gentlemen of good tafte can tell us of a great many Senfes, taftes and relifhes for beauty, harmony, imitation in painting and poetry; and may we not find, too, in mankind, a relifh for a beauty in characters, in manners? The truth is, human nature does not feem to have been left quite indifferent, in the affair of virtue, to form to itfelf obfervations concerning the advantage or difadvantage of actions, and accordingly to regulate its conduct. The weaknefs of our reafon, and the avocations arifing from the infirmity and neceffities of our nature, are fo great, that very few of mankind could have framed thofe long deductions of reafon, which may fhew fome actions to be, in the whole, advantageous, and their contraries pernicious. The author of nature has much better furnifhed us for a virtuous conduct, than our moralifts feem to imagine, by almoft as quick and powerful inftructions, as we have for the prefervation of our bodies; he has made virtue a lovely form, to excite our purfuit of it, and has given us ftrong affections, to be the fprings of each virtuous action.

SE'NSITIVE *Plant* (*Dict.*)—The ftructure of the Senfitive plant is this: from the large ftems, or main branches of the whole, there part off feveral other leffer ones, and from thefe there go off others ftill lefs, which, by way of diftinction, may be called the ribs of the leaves, as they ferve to fupport a number of leaves arranged on each fide, and ftanding on fhort pedicles in pairs over-againft one another. Several other plants have this fort of compound leaves, as the caffia, colutea, and the like; and all thefe fhut their leaves together at night, and open them again in the morning, in the fame manner as the Senfitive plant does. This periodical opening and fhutting of the leaves is therefore common to many plants, not peculiar to the Senfitive plant; but the wonder in this is, that, befides having this motion periodical and regular, it is to be brought on at other times, and by accidents, there requiring no more than the touching the plant to make it clofe its leaves at any time of the day, which it foon afterwards naturally opens again. This is peculiar to this plant, and refembles the action of an animal which had been injured or frightened. A clofe obfervation alfo of the manner, in which this is performed, will give many hints towards the finding its caufe.

It is a very difficult thing to touch the leaf of a vigorous Sensitive plant so lightly, as not to make it close. Its sensation is extremely delicate; and its large rib or nerve, which runs along its middle, is as it were a hinge, on which the two halves of the leaf move, when they turn upon being touched, till they stand erect, and by that means meet one another. The slightest touch imaginable gives this motion to the side of the leaf which is touched, which is communicated immediately to the other side or half, and they move together; and, if the touch hath been a very little rougher, the opposite leaf on the same rib receives the impression, and closes up in the same manner with that which was actually touched.

Nor is this all; for, when the two sides of each of these leaves move upwards, the pedicle of each half moves upwards at the same time, and by this means they, in some measure, approach towards each other, and make the angles of their pedicles with the main rib, or stalk of the composite leaf, less than before; and the total motion of each leaf is composed of these two motions.

If the touch be still rougher, the whole arrangement of leaves on the same rib feel its influence on each side, and all close in the same manner with the single pair in the preceding instance; and, if the touch be yet stronger than this, the rib itself feels it, and attempts to close in its way, moving itself upwards towards the branch from which it is produced, just as the single pedicles of the leaves did towards it; and, if the touch be yet more hard and rough, the very branches have the sensation propagated to them, and apply themselves to the main stem or trunk of the shrub, as the simple leaves did before to their rib, and that rib to the branch; so that the whole plant in this state forms itself, from a very complexly-branched figure, into a sort of straight cylindric one. The motion which has, of all others, the greatest effect upon this plant, is a shaking one.

These three motions of the plant are performed by means of three distinct and sensible articulations; the first, that of the single leaf to its pedicle; the second, that of the pedicle to its branch; the third, that of the branch to the trunk. The primary motion of all which is the closing of the two halves of the leaf upon this rib, which ought also to be performed in a similar manner, and by a similar articulation: this, however, is much less visible than the others.

These motions are wholly independent on one another, as may be proved by experiment. It should appear, that, if the stalks are moved and collapse towards the branches, or these towards the trunk, that the leaves, whose motion is usually primary to these, should be affected also; yet experiment proves, that it is possible to touch the branches in such a manner, as to affect them only, and make them apply themselves to the trunk, while the leaves feel nothing of the touch: but this cannot be, unless the branches are so disposed, as that they can fall to the trunk without suffering their leaves to touch any other part of the plant in their passage; because, if they do, they immediately become affected. Winds and heavy rains cause the Sensitive plants to shut up their leaves, while easy showers do not at all affect them: it is plain from hence, that the agitation of the plant by the wind, and the strokes given by the large and hasty drops of rain, are what cause the contraction.

By whatever accident the plant has been made to close its leaves, it always regularly opens them again afterwards. This, however, requires different times, according to several circumstances, as the time of the day, the season of the year, and the more or less vigorous and healthy state of the plant: sometimes this is done in ten minutes, sometimes it requires half an hour. And the manner is not less different than the time; for sometimes the leaves unfold themselves first, and sometimes the branches; whereas sometimes all is done at once, and the whole plant seems in motion at a time.

In endeavouring to account for the motions of this plant, Mess. Du Fay and Du Hamel have conjectured, that they are performed by means of a sort of very nice and fine hinges, which communicate one with another by means of very minute and slender cords, which occasion them to act as we see when the plant is sufficiently disturbed, and these cords shaken; and what gives a strong probability to this conjecture is, that the decayed and dying leaves of this plant perform this motion as regularly and vigorously, as those which are fresh and full of juice. It seems plain, that, while the juices are evaporating, and the parenchymatous substance of the leaves drying up, these more solid parts, the lines and cordages, retain their figure; and, consequently, if it is by means of these that the motion is always performed, it will be as well performed in these as in the fresher leaves; which could not be the case, were it owing to the juices.

The natural opening and shutting of the leaves of this plant, at night and morning, are not so fixed but that they are variable also, according to circumstances of place, temperature, &c. In the month of August, a Sensitive plant was carried in a pot out of its usual place into a dark cave; the motion that it received in the carriage shut up its leaves, and they did not open for twenty-four hours afterwards. At this time they became moderately open, but afterwards subject to no changes at night or morning, but remained three days and nights with their leaves in the same moderately open state. At the end of this time they were brought out again into the air, and there recovered their natural periodical motions, shutting every night, and opening every morning, as naturally and as strongly as if it had not been in this forced state; and, while in the cave, it was observed to be very little less affected with the touch, than when abroad in the open air.

Repeated experiments have proved, that it is not the light of the day that opens these plants, nor the darkness of the night that closes them; neither is it the alternate warmth of the day, and cold of the night, that have this effect, since it shuts in nights that are much warmer than the days often are, in which it opens; and the increasing the heat of the place in which it is kept, and marking the increase or decrease on the thermometer, have not been found to have the least effect, as to its sooner or later opening or shutting its leaves.

The most probable conjecture seems, that it is not great heat, or great cold, such as it can bear, that brings on this effect, but the sudden change from one to the other; and this is confirmed by this experiment: that, if one of these plants be raised under a glass bell or case, and the bell or covering be taken off, it immediately closes, even though it be in the middle of the day; and this is also observed, that, the more open or exposed the plant stands, the more strong and lively are its shutting and opening; and that they are most observable in summer, and much less so, when it is kept in a close stove in winter.

The great heats of summer, when there is open sunshine at noon, affect the plant in some degree like cold, causing it to shut up its leaves a little, but never in any great degree. The plant, however, is least of all affected about nine o'clock in the morning, and that is, consequently, the properest time to make experiments on it. A branch of the Sensitive plant, cut off and laid by, retains yet its property of shutting and opening in the morning for some days; and it holds it longer, if kept with one end in water, than if left to dry more suddenly.

The leaves only of the Sensitive plant shut up in the night, not the branches; and, if it be touched at this time, the branches are affected in the same manner as in the day, shutting up, or approaching to the stalk or trunk, in the same manner, and often with more force. It is of no consequence what the substance is with which the plant is touched, it answers alike to all; but there may be observed a little spot, distinguishable by its paler colour in the articulations of its leaves, where the greatest and nicest sensibility is evidently placed.

SENTENCE, in grammar (*Dict.*)—In every Sentence there are two parts necessarily required; a noun for the subject, and a definite verb; whatever is found more than these two, affects one of them, either immediately, or by the intervention of some other, whereby the first is affected.

Again, every Sentence is either simple or conjunct: a simple Sentence is that consisting of one single subject and one finite verb.—A conjunct Sentence contains several subjects and finite verbs, either expressly or implicitly.

A simple Sentence needs no point or distinction; only a period to close it: as, 'A good man loves virtue for itself'.—In such a Sentence, the several adjuncts affect either the subject or the verb in a different manner. Thus the word 'good' expresses the quality of the subject, 'virtue' the object of the action, and, 'for itself,' the end thereof.—Now none of these adjuncts can be separated from the rest of the Sentence: for, if one be, why should not all the rest? And, if all be, the Sentence will be minced into almost as many parts as there are words.

But, if several adjuncts be attributed in the same manner either to the subject or the verb, the Sentence becomes conjunct, and is to be divided into parts.

In every conjunct Sentence, as many subjects, or as many finite verbs as there are, either expressly, or implied, so many distinctions may there be. Thus, 'My hopes, fears, joys, pains, all center in you:' and thus Cicero, 'Catilina abiit, excessit, evasit, erupit.'—The reason of which pointing is obvious; for, as many subjects or finite verbs as there are in a Sentence, so many members does it really contain. Whenever, therefore, there occur more nouns than verbs, or contrariwise, they are to be conceived as equal. Since, as every subject requires its verb, so every verb requires its subject, wherewith it may agree: excepting, perhaps, in some figurative expressions.

Indeed, there are some other kinds of Sentences which may be ranked amongst the conjunct kind, particularly the absolute ablative, as it is called: Thus, 'Physicians, the disease once discovered, think the cure half wrought:' where the words, 'disease once discovered', are equivalent to, 'when the cause of the disease is discovered.'— So also in nouns added by apposition; as, 'The Scots, a hardy people, endured it all': so also in vocative cases and interjections; as, 'This, my friend, you must allow me:' And, 'What, for heaven's sake, would he be at!'

The case is much the same, when several adjuncts affect either the subject of the Sentence, in the verb, in the same manner; or at least something, whereby one of them is affected: as, 'A good, wise, learned man, is an ornament to the commonwealth:' where the several adjectives, denoting so many qualities of the subject, are to be separated from one another.—

 Again,

Again, when I say, 'Your voice, countenance, gesture terrified him': the several nominative cases denote so many modes of the verb, which are likewise to be distinguished from each other. The case is the same in adverbs; as, 'He behaved himself modestly, prudently, virtuously'.—In the first example, the adjuncts immediately affect the subject; in the third, the verb; in the following one, another adjunct: as, 'I saw a man loaden with age, sickness, wounds.'

Now, as many such adjuncts as there are, so many several members does the Sentence contain; which are to be distinguished from each other, as much as several subjects, or finite verbs: and that this is the case in all conjunct Sentences, appears hence, that all these adjuncts, whether they be verbs or nouns, &c. will admit of a conjunction copulative, whereby they may be joined together.—But, where-ever there is a copulative, or room for it, there a new member of a Sentence begins.

SE'PTICS, among physicians, an appellation given to all such substances as promote putrefaction.

From the many curious experiments made by Dr. Pringle to ascertain the Septic and antiseptic virtues of natural bodies, it appears that there are very few substances of a truly Septic nature. Those commonly reputed such by authors, as the alcaline and volatile salts, he found to be no wise Septic. However, he discovered some, where it seemed least likely to find any such quality; these were chalk, common salt, and the testaceous powders. He mixed twenty grains of crab's eyes, prepared with six drachms of ox's gall, and an equal quantity of water. Into another phial he put an equal quantity of gall and water but no crab's-eyes. Both these mixtures being placed in the furnace, the putrefaction began much sooner, where the powder was, than in the other phial. On making a like experiment with chalk, its Septic virtue was found to be much greater than that of the crab's-eyes: nay, what the doctor had never met with before, in a mixture of two drachms of flesh with two ounces of water and thirty grains of prepared chalk, the flesh was resolved into a perfect mucus in a few days.

To try whether the testaceous powders would also dissolve vegetable substances, the doctor mixed them with barley and water, and compared this mixture with another of barley and water alone. After along maceration by a fire, the plain water was found to swell the barley, and turn mucilaginous and sour; but that with the powder kept the grain to its natural size, and though it softened it, yet made no mucilage and remained sweet.

Nothing could be more unexpected, than to find sea-salt a hastener of putrefaction, but the fact is thus: one drachm of salt preserves two drachms of fresh beef in two ounces of water, above thirty hours, uncorrupted, in a heat equal to that of the human body; or, which is the same thing, this quantity of salt keeps flesh sweet twenty hours longer than pure water. But then half a drachm of salt does not preserve it above two hours longer. Twenty-five grains have little or no antiseptic virtue, and ten, fifteen, or even twenty grains manifestly both hasten and heighten the corruption. The quantity, which had the most putrefying quality, was found to be about ten grains to the above proportion of flesh and water.

Many inferences might be drawn from this experiment. One is, that since salt is never taken in aliment beyond the proportion of the corrupting quantities, it would appear that it is subservient to digestion, chiefly by its Septic virtue, that is, by softening and resolving meats: an action very different from what is commonly believed.

It is to be observed that the above experiments were made with the salt kept for domestic uses. *Pringle's Observ. on Dis. of the Army.*

SEPTIFO'LIOUS *Plants*, they are such has have but seven leaves.

SERJA'NIA, a name given to a genus of plants by father Plumier, who discovered them in America, in honour to the reverend father Philip Sergeant, who was of the order of the Minims, and a person well versed in the knowledge of botany and physic.

The characters of the genus are:

It hath a rose-shaped flower, consisting of four or more leaves, which are placed in a circular order: from whose flower-cup arises the pointal, which afterwards becomes a fruit composed of three cells having three wings, and each cell containing one round seed.

SE'RIES (*Dict.*)—The doctrine of Series is of extensive use in mathematics, and has been carried far, though not so far as could be wished. It would far exceed the limits of our design to enter into a detail of the discoveries relating to this subject.

A Series being proposed, one of the principal questions concerning it, is, to find the law of its continuation. For this no universal rule can be given; but it often happens, that the terms of the Series, taken two and two, three and three, or in greater numbers have an obvious and simple relation, by which the Series may be determined and produced indefinitely. Thus, if unity be divided by $1-x$, the quotient will be a geometric progression, any term of which will be to the next antecedent term as x to 1. And by this property the Series $1+x+x^2+x^3+$ &c. may be distinguished and produced ad infinitum. In like manner, in other cases of division, other Series's will arise, the terms of which will have a constant relation to each other, and this relation recurring always throughout the Series, they have been called recurring Series by Mr. de Moivre, who first considered them, and applied them to the solution of several intricate problems.

In many cases, the relation of the terms of a Series is not constant, as it is in those arising from division. Yet this relation often varies according to a certain law obvious upon inspection. Thus in the Series $1+\frac{1}{2}x+\frac{3}{8}x^2+\frac{5}{16}x^3+\frac{35}{128}x^4+$ &c. the terms may be continued indefinitely by the continued multiplication of these fractions $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, &c. And the following Series. $1+\frac{1}{6}x+\frac{3}{40}x^2+\frac{5}{112}x^3+\frac{35}{1152}x^4+$ &c. may be continued by the multiplication of the fractions $\frac{1\times1}{2\times3}$, $\frac{3\times3}{4\times5}$, $\frac{5\times5}{6\times7}$, $\frac{7\times7}{8\times9}$, &c.

Series's of this kind may be defined by differential equations. The equation defining a Series is that which assigns the relation of the terms generally by their distances from the beginning. To do this Mr. Stirling conceives the terms of the Series to be placed as so many ordinates on a right line given by position, and he, for the sake of simplicity, takes unity as the common interval of these ordinates. The initial terms of the Series he denotes by the initial letters of the alphabet, A, B, C, D, &c. A being the first, B the second, C the third, &c. And he denotes any term in general by the letter T, and the rest following it in order, T′, T″, T‴, T⁗, &c. He denotes the distance of the term T from any given term, or from any given intermediate point between two terms, by the indeterminate quantity z: so that the distances of the terms T′, T″, T‴, &c. from the said term or point, will be, $z+1$, $z+2$, $z+3$, &c. for the increment of the absciss is the common interval of the ordinate, or terms of the Series applied to the absciss.

These things being premised, let this Series be proposed, 1, $\frac{1}{2}x$, $\frac{3}{8}x^2$, $\frac{5}{16}x^3$, $\frac{35}{128}x^4$, &c. in which the relations of the terms are $B=\frac{1}{2}Ax$, $C=\frac{3}{4}Bx$, $D=\frac{5}{6}Cx$, $E=\frac{7}{8}Dx$, &c. The relation in general will be defined by the equation, $T'=\frac{z+\frac{1}{2}}{z+1}Tx$, where z denotes the distance of T from the first term of the Series. For, by substituting 0, 1, 2, 3, 4, &c. successively in the place of z, the relations of the terms of the proposed Series will arise. In like manner, if z be the distance of T from the second term of the Series, the equation will be $T'=\frac{z+\frac{3}{2}}{z+2}Tx$, as will appear by substituting the numbers -1, 0, 1, 2, 3, 4, &c. successively for z. Or, if the indeterminate z denotes the place of the term T in the Series, its successive values will be 1, 2, 3, 4, &c. and the equation will be $T'=\frac{z-\frac{1}{2}}{z}Tx$.

It appears therefore that innumerable differential equations may define one and the same Series, according to the different points from whence the origin of the abscissa z is taken. And, on the contrary, the same equation defines innumerable different Series's by taking different successive values of z. For in the equation $T'=\frac{z-\frac{1}{2}}{z}Tx$, which defines the Series abovementioned, when 1, 2, 3, 4, &c. are the successive values of the abscissæ; if $1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, &c. be successively substituted for z, the relations of the terms arising will be $B=\frac{2}{3}Ax$, $C=\frac{4}{5}Bx$, $D=\frac{6}{7}Cx$, &c. from whence the Series A, $\frac{2}{3}Ax$, $\frac{8}{15}Ax^2$, $\frac{16}{35}Ax^3$, $\frac{128}{315}Bx^4$, &c. will arise, which is different from the former. But the equation will always determine the Series from the given values of the abscissa and of the first term, when the equation includes but two terms of the Series; as in the last example, where the first term being given, all will be given. But, when the equation includes three terms, two must be given; and three must be given, when it includes four, and so forth.

If the Series x, $\frac{1}{6}x^3$, $\frac{3}{40}x^5$, $\frac{5}{112}x^7$, $\frac{35}{1152}x^9$, &c. be proposed, where the relations of the terms are, $B=\frac{1\times1}{2\times3}Ax^2$, $C=\frac{3\times3}{4\times5}Bx^2$, $D=\frac{5\times5}{6\times7}Cx^2$, &c. the equation defining this Series will be $T'=\frac{2z-1\times2z-1}{2z\times2z+1}Tx^2$, or $T'=\frac{4zz-4z+1}{4zz+2z}Tx^2$, where the successive values of z are 1, 2, 3, 4, &c. *Stirling's Methodus differentialis, in the Introduction.*

This may suffice to convey a notion of these differential equations, defining the nature of Series's. But, as to the application of these equations in finding the sums of Series's, it would require a treatise to explain it. We must therefore refer the curious to that excellent one just quoted, as also to Mr. de Moivre's Miscellanea Analytica, and several curious papers by Mr. Euler in the Acta Petropolitana.

A Series often converges so slowly as to be of no use in practice. Thus, if it were required to find the sum of the Series $\frac{1}{1.2}+\frac{1}{3.4}+\frac{1}{5.6}+\frac{1}{7.8}+\frac{1}{9.10}+$ &c. which lord Brounker

found

found for the quadrature of the hyperbola true to 9 figures, by the mere addition of the terms of the Series, Mr. Stirling computes that it would be neceſſary to add a thouſand millions of terms for that purpoſe; for which the life of man would be too ſhort. But by that gentleman's method the ſum of the Series may be found by a very moderate computation.

Recurring SERIES, is uſed for a Series which is ſo conſtituted, that, having taken at pleaſure any number of its terms, each following term ſhall be related to the ſame number of preceding terms according to a conſtant law of relation.

Thus in the following Series,

A B C D E F

$1 + 2x + 3xx + 10x^3 + 34x^4 + 97x^5 +$ &c. in which the terms being reſpectively repreſented by the capitals A, B, C, D, &c. we ſhall have

$$D = 3Cx - 2Bxx + 5Ax^3$$
$$E = 3Dx - 2Cxx + 5Bx^3$$
$$F = 3Ex - 2Dxx + 5Cx^3, \text{ \&c.}$$

Where it is evident, that the law of relation between D and E is the ſame as between E and F, each being formed in the ſame manner from the three terms which precede it in the Series.

The quantities $3x - 2xx + 5x^3$ taken together and connected with their proper ſigns is what Mr. de Moivre calls the index or the ſcale of relation. Sometimes the bare coefficients $3 - 2 + 5$ are called the ſcale of relation. And this ſcale of relation ſubtracted from unity is called the differential ſcale. Thus in the foregoing Series the ſcale of relation being $3x - 2xx + 5x^3$, the differential ſcale will be $1 - 3x + 2xx - 5x^3$.

A recurring Series, with its ſcale of relation, being given, the ſum of that Series continued in infinitum will alſo be given. For inſtance, ſuppoſe a Series $a + bx + cxx + dx^3 + ex^4 +$ &c. where the relation of the coefficient of any term to the coefficients of any two preceding terms may be expreſſed by $f - g$; that is, $e = fd - gc$; and $d = fc - gb$, &c. Then will the ſum of the Series continued in infinitum be, $\frac{a + bx - fax}{1 - fx + gxx}$

To facilitate the intelligence of this rule by a particular example, aſſume any Series whereof the two firſt coefficients are given, ſuch as 2 and 5, and ſuppoſe f and g to be reſpectively 2 and 1; then we ſhall have the following Series, $2 + 5x + 8xx + 11x^3 + 14x^4 + 18x^5 +$ &c.

And the ſum $= \frac{2 + 5x - 4x}{1 - 2x + xx} = \frac{2 + x}{\overline{1-x}^{\,2}}$

For the proof divide 1 by $\overline{1-x}^{\,2}$

$1 - 2x + xx)\,1\,(1 + 2x + 3xx + 4x^3 +$ &c. which

multiplied by $2 + x$

$2 + 4x + 6xx + 8x^3 +$ &c.

gives $+ x + 2xx + 3x^3 +$ &c.

the product $= 2 + 5x + 8xx + 11x^3 +$ &c. $=$ the given Series.

Analogous rules might be derived for more complex caſes; and Mr. de Moivre's general rule is,

Firſt, take as many terms of the Series as there are parts in the ſcale of relation. Secondly, ſubtract the ſcale of relation from unity, the remainder is the differential ſcale. Thirdly, multiply the terms taken in the Series by the differential ſcale, beginning at unity, and ſo proceeding orderly, remembering to leave out what would naturally be extended beyond the laſt of the terms taken. Then will the product be the numerator, and the differential ſcale will be the denominator of a fraction expreſſing the ſum required.

But we muſt here obſerve that, when the ſum of a recurring Series extended ad infinitum is found by Mr. de Moivre's rule, it ought to be ſuppoſed, that the Series converges indefinitely, that is, that the terms may become leſs than any aſſigned quantity. For, if the Series diverges, that is, if its terms continually increaſe, it is not true, that the rule gives the ſum. For the ſum in ſuch caſes is infinite, or greater than any given quantity, whereas the ſum exhibited by the rule will often be finite. The rule therefore in this caſe only gives a fraction, the reduction of which into a Series gives the propoſed Series.

Thus $\frac{1}{\overline{1-x}^{\,2}}$, reduced to an infinite Series gives the recurring Series $1 + 2x + 3xx +$ &c. whoſe ſcale of relation is $2 - 1$ and its ſum by the rule will be $\frac{a + bx - fax}{1 - fx + gxx} = \frac{1 + 2x - 2x}{1 - 2x + xx} = \frac{1}{\overline{1-x}^{\,2}} =$ the quantity from which the Series aroſe. But this quantity cannot in all caſes be deemed equal to the infinite Series $1 + 2x + 3xx$, &c. For, ſtop were you will, there will always be a ſupplement required to make the product of the quotient by the diviſor equal to the dividend. When the Series, indeed, converges infinitely, the ſupplement diminiſhing continually, it becomes leſs than any aſſigned quantity, and is therefore, without error, reputed nothing; but, in diverging Series, this ſupplement becomes indefinitely great, and the Series deviates indefinitely from the truth.

A recurring Series being given, the ſum of any number of the terms of that Series may be found. This is prob. III. p. 73. Miſcel. Analyſ. and prop. V. p. 196. of the Doctrine of Chances. One ſolution of the ſimpleſt caſe will be ſufficient to give an idea of the method there uſed.

Let there be a geometric progreſſion $a + ax + ax^2 + ax^3 +$ &c: it is required to find the ſum of a number n of its terms. Then will the laſt term be ax^{n-1}. Suppoſe the progreſſion continued ad infinitum, and we ſhall have two infinite progreſſions, the firſt beginning with a, and the ſecond with ax^n. Now the difference of the ſum of theſe two muſt be the ſum of the number n of terms. By the rule the ſum of the firſt infinite progreſſion will be $\frac{a}{1-x}$; and the ſum of ſecond will be $\frac{ax^n}{1-x}$. But $\frac{a}{1-x} - \frac{ax^n}{1-x} = \frac{a - ax^n}{1-x}$, which will therefore be the ſum of a number n, of terms.

This quantity $\frac{a - ax^n}{1-x}$ is equal to $\frac{ax^n - a}{x - 1}$, which laſt expreſſion, calling $ax^{n-1} = l$, will be equivalent to this, $\frac{lx - a}{x - 1}$, which is the common rule for finding the ſum of any geometric progreſſion of which a, the firſt term; x, the ratio; and l the laſt term are given.

The Series reſulting from the diviſion of unity by $\overline{1-x}^{\,p}$ or $\frac{1}{\overline{1-x}^{\,p}} = \overline{1-x}^{\,-p}$ is $1 + px + p \times \frac{p+1}{2}xx + p \times \frac{p+1}{2} \times \frac{p+2}{3}x^3 +$ &c. And the ſum of any number of terms expreſſed by n of this Series will be $\frac{1 - x^n}{\overline{1-x}^{\,p}} - \frac{nx^n}{\overline{1-x}^{\,p-1}} - \frac{\frac{n}{1} \times \frac{n+1}{2}}{\overline{1-x}^{\,p-2}}x^n - \frac{\frac{n}{1} \times \frac{n+1}{2} \times \frac{n+2}{3}}{\overline{1-x}^{\,p-3}}x^n -$ &c. which is to be continued till the number of terms $= p$.

This theorem is of uſe in finding the ſums of progreſſions of figurate numbers, and others.

Suppoſe, for inſtance, it were required to find the ſum of any number n of terms of the geometric progreſſion $1 + x + xx + x^3 +$ &c. generated by $\frac{1}{1-x}$. Here $p = 1$. And the ſum will conſequently be $= \frac{1 - x^n}{\overline{1-x}^{\,p}} = \frac{1 - x^n}{1 - x}$.

Again, if the ſum of a number n of terms of the Series $1 + 2x + 3xx + 4x^3 +$ &c. were required. The Series is generated from $\frac{1}{\overline{1-x}^{\,2}}$. Then $p = 2$. And the ſum $= \frac{1 - x^n}{\overline{1-x}^{\,2}} - \frac{nx^n}{1-x}$. Suppoſe $x = 1$, then will the ſum be $\frac{nn + n}{2} = n \times \frac{n+1}{2}$ which is the ſum of the arithmetical progreſſion $1 + 2 + 3 + 4 +$ &c. continued to the number n of terms. But it is to be obſerved that it requires a particular artifice to derive the ſum from the general rule: for at firſt ſight the ſum appears under this form $\frac{1 - 1}{\overline{1-1}^{\,2}} - \frac{n}{1-1}$ which determines nothing.

In like manner, the ſum of a number n of terms of the Series of triangular numbers will be found to be $n \times \frac{n+1}{2} \times \frac{n+2}{3}$, as in Miſcel. Analyſ. p. 168.

By the like methods the ſum of any number of ſquares, cubes, &c. of the natural Series of numbers may be found. Which may alſo be done by Sir Iſaac Newton's differential method.

3° In a recurring Series any term may be obtained whoſe place is aſſigned. For, after having taken ſo many terms of the Series, as there are terms in the ſcale of relation, the Series may be protracted till it reach the place aſſigned. But, if that place be very diſtant from the beginning of the Series, the continuation of the terms will prove laborious: other methods have therefore been contrived.

Theſe queſtions have been reſolved in many caſes, beſides thoſe of recurring Series. But, as there is no univerſal method for the quadrature of curves, neither is there one for the ſummation of Series; there being a great analogy between theſe things, and ſimilar difficulties ariſing in both.

SERMONES, the title Horace gives to his Satires.

The critics are divided about the reaſon of the name. The opinion of father Boſſu ſeems well grounded; a mere obſervation of feet and meaſure, ſuch as we find in Plautus, Terence, and in Horace's Satires, he thinks, is not ſufficient to conſtitute verſe; to determine the work to be poetical, or diſtinguiſh it from proſe; unleſs it have ſome farther air or character

racter of poetry, ſomewhat of the fable, or ſublime. Hence it is that Horace calls his Satires proſe Sermones. *Dict. de Trevoux.*

SERMONS, orations or diſcourſes delivered by the clergy of the Chriſtian church, in their religious aſſemblies.

In the ancient church, immediately after the reading of the pſalms, and leſſons out of the ſcriptures, before the catechumens were diſmiſſed, followed the Sermon, which the biſhop, or ſome other, appointed by him, made to the people. This, being done in the preſence of the catechumens, was therefore reckoned a part of the miſſa catechumenorum, or ante-communion ſervice. Such diſcourſes were commonly termed homilies, ὁμιλίαι, which ſignifies indifferently any diſcourſe of inſtruction to the people. Among the Latins they were frequently called tractatus, and the preachers, tractatories.

Preaching, anciently, was one of the chief offices of a biſhop; inſomuch that, in the African churches, a preſbyter was never known to preach before a biſhop in his cathedral church, till St. Auſtin's time. In the eaſtern church, preſbyters were indeed allowed to preach before the biſhop; but this was not to diſcharge him of the duty, for ſtill he preached a Sermon at the ſame time after them. In the leſſer churches of the city and country, the office of preaching was devolved upon the preſbyters; but deacons never were allowed to perform it. There are numberleſs paſſages in the writings of the fathers, which ſpeak of preaching as a duty indiſpenſably incumbent on a biſhop. Many canons of councils either ſuppoſe, or enjoin it: and, in the imperial laws, there are ſeveral edicts of the ſecular power to the ſame purpoſe.

It has been a queſtion, whether laymen were ever allowed by authority to make Sermons to the people. It is certain, they did it in a private way, as catechiſts, in their catechetic ſchools at Alexandria, and other places; but this was a different thing from public preaching in the church. Sometimes the monks, who were only laymen, took upon them to preach; but this was cenſured, and oppoſed, as an uſurpation of an office that did not belong to them. Yet, in ſome caſes, a ſpecial commiſſion was given to a layman to preach; as in the caſe of Origen, who was licenſed by Alexander, biſhop of Jeruſalem, to preach and expound the ſcriptures in the church, before he was in orders. As to women, whatever gifts they could pretend to, they were never allowed to preach publicly in the church; agreeably to the apoſtolic rule, Let your women keep ſilence in the churches, &c. But they might teach thoſe of their own ſex, as private catechiſts, and prepare them for baptiſm. And this was the office of the deaconeſſes. The Montaniſts were a noted ſect for giving the liberty of preaching to women, under the pretence of inſpiration by the ſpirit; for they had propheteſſes, women-biſhops, and women-preſbyters.

Next to the perſons, the manner, in which the office of preaching was executed, comes to be conſidered. And firſt it is obſervable, that they had ſometimes two or three Sermons preached in the ſame aſſembly, firſt by the preſbyters, and then by the biſhops. When two or more biſhops happened to be preſent in the aſſembly, it was uſual for ſeveral of them to preach, one after another, reſerving the laſt place for the moſt honourable perſon. In ſome places, they had Sermons every day, eſpecially in Lent, and the feſtival days at Eaſter. In many places, they had Sermons twice a day, for the better edification of the people. But this is chiefly to be underſtood of cities and large churches: for in the country pariſhes there was not ſuch frequent preaching.

The next thing to be obſerved is, their different ſorts of Sermons, and different way of preaching. Theſe are diſtinguiſhed into four kinds: 1. Expoſitions of ſcripture. 2. Panegyrical diſcourſes upon the ſaints and martyrs. 3. Sermons upon particular times, occaſions, and feſtivals. 4. Sermons upon particular doctrines, or moral ſubjects. There are examples of all theſe kinds in St. Chryſoſtome's and St. Auſtin's homilies, the two great ſtandards of preaching, in the Greek and Latin churches. But, though moſt of theſe were ſtudied and elaborate diſcourſes, penned and compoſed before-hand, yet ſome were alſo extempore, ſpoken without any previous compoſition, and taken down in ſhort-hand from the mouth of the preacher. Origen was the firſt that began the way of extempore preaching in the church.

Upon this account it was uſual for the preacher to uſher in his diſcourſe with a ſhort prayer, for divine aſſiſtance. In this ſenſe we are to underſtand St. Chryſoſtome, when he ſays, We muſt firſt pray, and then preach. Sometimes, before they began to preach, they uſed the common ſalutation, Pax vobis, Peace be with you; to which the people anſwered, And with thy ſpirit. And ſometimes they prefaced the Sermon with a ſhort form of benediction, eſpecially in times of calamity and diſtreſs, or of happy deliverances out of them. Sometimes they preached without any text, and ſometimes upon more texts than one. Neither did they entertain their auditory with light and ludicrous matters, or fabulous and romantic ſtories, ſuch as thoſe with which preaching ſo much abounded in the age before the reformation.

And, as they were careful in the choice of their ſubject, ſo were they in the manner of dreſſing it up, and delivering it, that they might anſwer the true ends of preaching. St. Auſtin has laid down excellent rules, for the practice of Chriſtian eloquence; and, if we will take his character of the ancient preachers, it was, in ſhort, this: that their diſcourſes were always upon weighty and heavenly matters, and their ſtyle anſwerable to the ſubject, being plain, elegant, majeſtic, and nervous; fitly adapted to inſtruct and delight, to convince and charm their hearers. It was no part of the ancient oratory to raiſe the affections of the auditory, either by geſticulations, or the uſe of external ſhews and repreſentations of things in their Sermons, that is now very common in the Romiſh church. As to the length of their Sermons, ſcarce any of them would laſt an hour, and many not half the time. And among thoſe of St. Auſtin there are many, which a man may pronounce diſtinctly, and deliver decently, in eight minutes. They always concluded their Sermons with a doxology to the Holy Trinity. And it is farther obſervable, that the preacher uſually delivered his Sermon ſitting, and the people heard it ſtanding; though there was no certain rule about this, but the cuſtom varied in different churches.

It was a peculiar cuſtom in the African church, when the preacher chanced to cite ſome remarkable text, in the middle of his Sermon, for the people to join with him in repeating the cloſe of it. St. Auſtin takes notice of this in one of his Sermons, where, having begun thoſe words of St. Paul, The end of the commandment is — the people all cried out, Charity, out of a pure heart. But it was a much more general cuſtom for the people to teſtify their eſteem for the preacher, and approbation of his Sermon, by public applauſes, and acclamations in the church. Thus, we are told, the people applauded St. Chryſoſtome's Sermons, ſome by toſſing their garments, others moving their plumes, others laying their hands upon their ſwords; and others waving their handkerchiefs, and crying out, Thou art worthy of the prieſthood, &c. Many of the auditors practiſed the art of notaries, and took down the Sermons of the moſt eminent preachers, word for word, as they delivered them. By this means ſome of their extempore diſcourſes were handed down to poſterity, which elſe would have died with the ſpeaking.

The Roman catholics call the Sermon, the prone. After the goſpel, the preacher goes to the bottom of the ſteps of the altar, on the epiſtle ſide, where he kneels down, and offers prayers to God for the action he is going about. Then he aſcends the pulpit; where he firſt bows to the croſs, and then to the chief of the congregation. He likewiſe croſſes himſelf; and, whenever he pronounces the name of Jeſus and Mary, he takes off his cap, and bows. In Italy, he does the ſame thing, whenever the reigning pope is named in the Sermon. Before the biſhop, or when the holy ſacrament is ſolemnly expoſed on the altar, it is uſual to preach bare-headed.

The manner of preaching in Italy is very indecent, the behaviour of the preachers being like that of ſtage-dancers: they are extravagant in their geſtures, they ſtrike with their hands and feet, roll their eyes, and walk from one end of the pulpit (which is very long and wide) to the other, with immoderate and ridiculous vivacity. Their fineſt Sermons (ſays a celebrated traveller) are thoſe that raiſe the moſt laughter. 'The Capuchins (adds he) never preach, but on terrible ſubjects; they ſeize their own beards, clap their hands, and ſcream enough to fright one. The other day, I heard a Carmelite, who was preaching to the repentant nuns of the holy croſs, on the ſubject of Mary Magdalen. In order to raiſe a more exalted idea of the ſacrifice his penitent had made of the pleaſures of the world, he ſpent a whole quarter of an hour in painting her out as the moſt charming creature under heaven: not one feature, in the moſt perfect body, was omitted; and he talked more like a moſt accompliſhed painter, than a preacher.' In Italy, there are ſeldom any Sermons, but in the time of Advent and Lent. The friars preach in their convents upon topics, which we may call eternal; for they ſeldom loſe ſight of their founders, or of ſome particular practices, which they are fond of, ſuch as the roſary, and ſcapulary, and St. Francis's girdle. In ſome cities of Italy, are itinerant preachers, who carry about with them little moveable pulpits.

In Spain they often preach in the public ſquares and high ſtreets, and ſeldom fail of a numerous audience. The preachers take great pains to affect their hearers, and to this end they frequently ſtrike their breaſt or face, and the whole congregation does the ſame thing. They who draw moſt tears are thought the beſt preachers.

The Greek Chriſtians ſeldom have any Sermons. Preaching, as Tournefort aſſures, is ſo far aboliſhed, that there is ſcarce a pulpit to be ſeen in all their churches: however, when a father does attempt to mount the roſtrum, he delivers himſelf in the moſt awkward manner imaginable; and has two crowns for his diſcourſe, which conſiſts only of a tedious train of empty words, without the leaſt order or coherence, and which the preacher himſelf (ſays our author) underſtands no more than the people.

SERPENT, *ſerpens*, in zoology, the name of a genus of animals, which Mr. Ray defines to be creatures breathing by means of lungs, having only one ventricle in the heart, having no feet, and having a long body, covered with ſcales.

To which he adds, that in cold seasons they can bear hunger a long time. The greater part of the Serpent class are poisonous, and dangerous in their bite, leaving a mischievous liquor in the wound, made by their tooth, which, mixing by this means immediately with the blood, is of fatal consequence; though the whole creature may be eaten with safety, or even the poisonous liquor, which does this mischief in the wounded, tasted without hurt.

Notwithstanding that Serpents respire by means of lungs, they do not take in and discharge their breath by such short intervals as other animals, but what they have once inspired will serve them a long time; for as they are of a cold nature, and therefore their necessary warmth very small, they do not require such an eternally renewed supply of that pabulum of vital heat, as those which have more of it; and as with us they lie half the year torpid, and half dead, their vital warmth at that time, like fire smothered under ashes, barely exists, and needs perhaps no more air than what the creature took in at one inspiration, before its laying itself down for the season, which serves it till the life-renewing spring returns.

Serpents, according to Mr. Ray, may be divided into the poisonous and the harmless; the first having long dentes exerti, with poisonous liquors contained at their bottom, which on biting they discharge into the wound: the others wanting these teeth, and this poison.

They may also be divided, in regard to their generation, into the oviparous and viviparous; but this is a less firmly founded distinction than may be supposed, since all Serpents are truly and properly produced of eggs; and the only difference is, that some deposit their eggs in dung-hills, and the like places, to be hatched by accidental heat; while others retain those eggs to be hatched in their own bodies, and so bring forth living young ones. Of the first kind is the common snake, of the latter the viper. *Ray's Syn. Quad. et Serp. p.* 284. *See Plate* XLIII. *fig.* 1.

SERPENS *bubalinus.*—Mr. Cleyer has given a very remarkable account, in the German Ephemerides, of the prodigious size and voracious appetite of this Serpent, and its manner of feeding. This gentleman assures us that they grow to the length of five feet, and are surprisingly daring in attacking large creatures for prey. Their neck, he observes, is so small, in proportion to the creatures they seize, that it is a wonder that they can swallow them whole, which yet experience shews they certainly do, having no power of tearing them to pieces. This gentleman saw a complete stag taken out of the belly of one of these snakes, with all its limbs remaining on: and at another time a wild goat which had been swallowed in the same manner, and from another a complete porcupine, a very troublesome morsel; and there was once an instance, in the Molucca islands, of a woman big with child being thus sucked down whole by one of these creatures. *Ray's Syn. An.*

The method of their managing their prey is this: when thoroughly lank, lean, and hungry, the Snake lies in wait for any thing it can seize; he darts out upon the prey, and, seizing it with his mouth, winds his body round that of the creature; and this he is able to do with such force, that he will often, in twisting himself firmly round the creature, break the bones within its skin. This he continues, and at the same time is biting, with his terrible mouth, all the tender parts of the creature, till he has destroyed it; or, if it be an animal too strong to be killed by these simple folds, it will drag it to some neighbouring tree, and, tying it fast against that, draw its body so forcibly round it, as to crush all its bones to pieces by the help of that solid resisting body. The part it usually seizes with its teeth, at the same time, is the creature's nose, which he bites so forcibly as not only to stop the breath, but to occasion a discharge of blood, which helps to forward its destruction.

But the most singular attack, ever known to have been made by this creature, is that recorded by the same author, of its seizing a buffalo; which it destroyed in the manner above described, though it was a long time about it, and was obliged to have recourse to the method of tying it up to a tree, against which it broke its bones severally, with a noise that was heard to a great distance. When the creature had thus destroyed its prey, it continued breaking of the bones, till there was not one left whole in the body, and the whole resembled a shapeless mass of matter.

The jaws and throat of this, and of the other Serpent-kind, though small and narrow, are prodigiously extensible, and made so by nature, for the swallowing these morsels. The Snake, when the prey lay in this state before it, licked it all over, and covered it thick with its saliva, and that so regularly, that the whole carcase looked as if daubed over with glue. This done, it opened its jaws to a monstrous extent, and sucked in the head of the prey, and, continuing incessantly sucking, at length drew down the whole body.

This is a work of time, and very often two or three days are employed in it. And, when the animal is thus got down, the snake is swelled and bloated up all over with it, and is no longer in a state of offending, or even of defending itself, or so much as running away; and the people of the places where this species is common, well know this, and find it an easy thing to destroy them in this state, and are very happy when they catch one, as their flesh is a very delicate food. *Ephem. Germ. Ann.* 12. *Obs.* 7.

SERPENT, in music, a wind-instrument, serving as a bass to the cornet, or a small shawm, to sustain a chorus of singers in a large vessel. It had its name Serpent from its figure, as consisting of several folds or wreaths, serving to take off its length, which would otherwise be six or seven feet; it is usually covered with leather, and consists of three parts, a mouth-piece, neck, and tail. It has six holes, by means whereof they give it the compass of two octaves.

SERPENT-*stones*, a name given by some to the cornua ammonis, a beautiful fossil shell, which resembles a Serpent coiled up.

These are frequent in many parts of the world, besides the plenty we have of them in England, and elsewhere. The accurate observer, Mr. Harenberg, found prodigious numbers of them on the banks, and among the sand of a river in Germany. He traced this river through its several windings for many miles, and among a great variety of belemnitæ, cornua ammonis, and cochlitæ, of various kinds. He found also great quantities of wood, of recent petrifaction, carrying in it at that time the plain marks of the axe, by which it had been cut from the trees then growing on the shore. The water of this river he found, in a dry season, and when the supplies of its natural springs were not diluted with rains, to be considerably heavier than common water; and many experiments shewed him that it contained ferrugineous, as well as stony particles, in great quantity, whence the petrifactions in it appeared the less wonderful, though many of them of recent date.

Of the cornua ammonis, or Serpent-stones, he there observed more than thirty different species, and doubts not but there are many more yet unobserved. They lie immersed in a bluish fossil stone, of a soft texture, and fatty appearance. They lie in this in prodigious numbers, and of a great variety of sizes, from the larger known sorts, down to such as could not be seen without very accurate inspection, or the assistance of a microscope. Such as lie in the softest of these stones are soft, like their matrix, and easily crumble to pieces; others are harder. In a piece of this stone, of the bigness of a finger, it is common to find thirty, or more, of these fossils; and often they are seen only in form of white specks, too minute to shew their figure, till examined by the microscope. But what is most observable of the cornua ammonis of this place is, that they are often found growing not only to, but into one another, in such a manner, that they cannot be supposed ever to have been inhabited by any living fish, especially the specimen which is pierced by the other. This author is of opinion that they grow, and are formed where they are; and attempts to prove it by affirming, that they have an actual increase in size there in a little time, and that not only if left in their beds, but if taken out, and put into a glass of the water. This is an opinion wholly different from the received one at present in the world, and perhaps will be found erroneous on farther trials. *Act. Erudit.* 1727.

SERPENTS *tongues.* The island of Malta abounds with glossopetræ, or the petrified teeth of sharks, which, from their resemblance to a tongue, are by the vulgar supposed to be the tongues of Serpents turned into stone by some miracle of St. Paul, when he was there. This island abounds not only with these, but with bufonitæ, and vast numbers of other remains of sea productions. These things, notwithstanding their perfect resemblance of the same bodies now found recent in mouths of living fishes, &c. are by some supposed never to have been real parts of fishes, but to have been formed where they now lie by some lusus of nature, or plastic seeds. This, however, is an idle and absurd opinion; and Agustino Scilla, who has written at large on the fossils of this island, gives a very rational account of their being the real remains of animals, which, according to his system, it is no way wonderful to find there. The universal deluge has doubtless been of power to bring all the fossils we find into the places where we now see them buried, even in the midst of quarries of stone, in the middle of inland countries; but in regard to the island of Malta, which so abounds with them at this time, he supposes that, long since the time of the creation, and even without the assistance of the general deluge, it may have been formed out of the sea, and that it appears plainly to have been at first no other than a mass of soft mud, with an immense number of sea shells, teeth of fishes, and other remains of sea animals, mingled among it; and that these, subsiding as low as they could among that thickening matter, have made the island what we now find it, that is, a heap of earth with these things, in vast quantities, buried in it, and that at different depths, but principally not far from the surface.

That this collection of matter was occasioned by a flood of some kind, is highly probable; but it is not necessary to have recourse to Noah's flood for it, though that might as well cause it as any other; but it might also be formed by an irruption of the ocean into the Mediterranean, or by an inundation of the Tuscan sea driven by vehement winds, or any other means, that way: and, when the origin of this island is thus allowed, it is not to be wondered at, that an immensity of the refuse parts of animals, inhabitants of those waters, should be left in the places where they had time to subside. And though there are found among these teeth, &c. in the island of Malta, great quantities of ſhells, of ſuch ſpecies as are not natives of thoſe ſeas, this is no objection to the opinion; ſince it is well known that the winds when violent, as they probably were about the time of the formation of that iſland, will bring ſuch light bodies as ſhells a vaſt way in water.

It is a common obſervation, that the eaſt and ſouth-eaſt winds bring to the coaſt of Calabria great quantities of beautiful ſhells, none of which are found living in the ſeas thereabout. The bufonitæ, or toadſtones of Malta, are plainly the grinder teeth of the lupus and ſargus dentex, as alſo of the aurata, and ſeveral other fiſh, which have ſuch round teeth in the hinder part of their jaws. The ſhells found in this iſland, and other places, are ſo plainly thoſe of once living animals, that the remains of the body of the fiſh is plainly to be diſtinguiſhed in ſome of them: and in others the lamellæ are laid together, and coated over one another, in the very ſame manner as in the recent ſhell fiſh.

It is objected, that theſe ſhells are produced in the places where they lie, becauſe they are found in great cluſters together, all of the ſame kind; but this is no material objection, but is eaſily ſolved upon the common principles: for, if we ſuppoſe a number of diſſimilar bodies, ſeveral of every kind, to be ſuſpended in the ſame quantity of water, and that water be put in motion, we ſhall ſee them all confuſedly blended together, while the motion is violent, but they will, as that becomes more calm, ſeparate themſelves, and thoſe of the ſame nature will, in a great meaſure, get together, and ſubſide in parcels ſeparately from the reſt. Thus, if ſtraws, ſticks, egg-ſhells, pebbles, and common cockle-ſhells, were to be thus ſhook together, the conſequence would be, that in a large tub of water they would naturally each parcel ſubſide together in different parts of the bottom; and, though in the neighbourhood of one another, yet the ſtraws would not be mixed with the pebbles, nor the egg-ſhells with the cockles, any more than it is really found, that the different ſpecies of ſhells are mingled in the earth.

It is alſo to be added, that theſe ſhells have ſubſided, not in water, but in a thicker fluid, compoſed of mud and water, and this has kept them more aſunder than common water alone would have done; and we ſhall find, on examining the bowels of the earth, that, though the ſhells, in the ſame maſs of earth, or ſtone, are generally principally of one kind, yet they are neither always ſo, nor perfectly ſo, but that often they are confuſedly blended among other kinds, and more often have ſome few of other ſpecies blended among them; as a few cockle-ſhells might be among the pebbles, in the familiar inſtance mentioned above, and by ſome particular accidents, even in that caſe, the whole ſet of bodies, excepting the very lighteſt, might happen to be blended together.

The mountains of Sicily afford ſome few gloſſopetræ, or ſnakes-tongues, but they are few in number, and worſe prepared than thoſe of the iſland of Malta; which is probably owing to the high ground of thoſe mountains being leſs likely to receive the refuſe of the ſea, and its ſoil, which is ſandy, being leſs fitted to preſerve them when there, than the marl, of which the iſland of Malta conſiſts.

The echini marini, or ſea eggs, and their ſpecies, which are very frequent among the Serpents-tongues of Malta, all lie upon the ſurface of the ground, or near it; whereas the gloſſopetræ lie deeper, though at no great depth. This is a plain effect of all theſe things having been really animal bodies, and having floated in the mud, of which that iſland was formed; for in this it could not be otherwiſe, but that the gloſſopetræ, or Serpents-tongues, being heavy, would ſubſide in the water, while the light ſhells of theſe other animals would float on, or near the ſurface.

The opinion of theſe bodies growing from ſeminal principles is alſo greatly weakened by the ſituation of them in the earth. If they grew from ſeeds as plants, we ſhould doubtleſs ſee them, like plants, all bending one way, the points of all upwards, and their roots downwards; but on the contrary, both in the iſland of Malta and elſewhere, theſe things are found in the moſt different directions imaginable; ſome with their bottoms upwards, ſome downwards, ſome horizontal, and others in all the intermediate angles. Some have ſuppoſed the gloſſopetræ, in particular, to grow from roots in the earth, becauſe they uſually have roots different from the other parts, and becauſe they ſtick very firmly in the earth at theſe roots, but are very eaſily looſened in any other part. It is certain, indeed, that theſe parts, at the bottom of the gloſſopetræ, are their roots, and that their ſpungy texture was intended for their taking in nouriſhment; but this was their uſe when in the head of the fiſh, not when in the earth; and the reaſon of their adhering more firmly to the earth in this, than in any other part, is only that they are more ſpungy and porous here, and that, in other parts where they are ſmooth and even, the earth can have no hold of them; but, where they are thus rough, as they ſubſided with a moiſt earth like mud about them, they naturally become connected ſtrongly to it in drying, as part of it was received into their pores, and not broken from the reſt, till by forcing them out afterwards. *Philoſ. Tranſ.* N°. 219.

Some affirm that the gloſſopetræ are natural cryſtalliſations of ſalt, and that to this their regular figure is owing; but it is to be anſwered, that their figure is not ſo regular as theſe objectors ſeem to ſuppoſe, but that there are as many different ſhapes of them, as there are of teeth, in the different parts of the jaw of the ſame ſhark, or in the jaws of different ſpecies of ſharks now found living; and, if they were cryſtalliſations of ſalt, the whole cryſtalliſation would be of one and the ſame ſurface and texture; which is not the caſe, ſince the root, as before obſerved, is always very different from the body of the tooth, and the ſubſtance different in even the various parts of the body. Salts are ſalts throughout, and a ruby, a cryſtal, or a diamond, is the ſame in all its parts; but this is not the caſe in the gloſſopetræ, but they are compoſed of a cortical and a medullary part, like the teeth of living ſharks: and it is to be obſerved, that, when any of theſe gloſſopetræ are found broken, as they frequently are, the fracture is found raw and unaltered, which ſhews that it has happened before they came to the place where they are now found, and that they have no growth or vegetation there, to heal or cover it; for, if there were, it would be ſkinned over, as the wounds of plants and animals always are, when in a perfect ſtate and living.

Whenever the gloſſopetræ are taken carefully up out of the earth in Malta, the marl or earth, which ſerved for their bed, is found to contain all their minuteſt traces and lineaments, like wax from a ſeal. This is a proof that the marl was as ſoft as melted wax when they were put into it, and that they were of their full ſize and growth when placed there, not having grown, or had any increaſe, in that place.

The apophyſes, or proceſſes in the gloſſopetræ, are alſo a ſtrong proof of their being no other than real ſharks teeth, ſince they exactly anſwer to thoſe in the teeth of recent ſharks, by which every tooth is received or inſerted into its neighbour in the jaw. Nay, whereas ſharks teeth are mortiſed into one another in ſuch a manner, that a man may eaſily tell which belong to each ſide, which lie near the throat, and which near the front of the mouth; and whereas, in a ſhark's mouth, the teeth on the left ſide will not fit on the right, nor thoſe above ſerve below, but that on ſeeing a recent tooth, a perſon of judgment will be able to ſay what part of the mouth it belonged to; ſo in the foſſil ſhark's teeth, or gloſſopetræ, there is not any one which may not be referred to the particular part of the mouth of the living animal, and could have belonged to no other. *Auguſtino Scilla, de Petrifac.*

SE'RPYLLUM, *mother-of-thyme*, in botany, the name of a genus of plants, whoſe characters are:

It hath trailing branches, which are not ſo woody and hard as thoſe of thyme, but in every other reſpect is the ſame.

There are but two of theſe ſpecies, commonly cultivated in gardens, viz. the lemon-thyme, and that with ſtriped leaves; the firſt for its agreeable ſcent, and the other for the beauty of its variegated leaves. Theſe were formerly planted to edge borders; but as they are very apt to ſpread, and difficult to preſerve in compaſs, they are diſuſed at preſent for that purpoſe. All theſe propagate themſelves very faſt by their trailing branches, which ſtrike out roots from their joints into the earth, and thereby make new plants; ſo that from a root of each there may be ſoon a large ſtock increaſed. They may be tranſplanted either in ſpring or autumn, and love an open ſituation, and a dry undunged ſoil; in which they will thrive and flower exceedingly, and continue ſeveral years.

It may not be improper here to take notice of a common miſtake, which generally prevails concerning this plant; which is, that the ſheep which feed upon this plant, afford the ſweeteſt mutton; whereas it is very certain, that the ſheep will not eat it; nor, ſo far as I have been capable of obſerving, is there any animal that will, it being extremely bitter to the taſte.

SERRA'TULA, *ſaw-wort*, in botany, the name of a genus of plants, whoſe characters are:

It hath a floſculous flower, conſiſting of ſeveral florets, divided into many parts reſting on the embryo, and contained in a ſcaly empalement, like to the greater centaury; from which this differs in having ſmaller heads; and from the knap-weed in having the borders of the leaves cut into ſmall ſharp ſegments, reſembling the teeth of a ſaw.

SE'RUM *aluminoſum*, *alum-whey*, a form of medicine preſcribed in the late London Pharmacopœia, made of a pint of milk boiled to whey with a quarter of an ounce of alum. *Pemberton's Lond. Diſp.*

SE'SAMUM *oily-grain*, in botany, the name of a genus of plants, whoſe characters are:

The flowers are produced from the wings of the leaves, without any foot-ſtalk; the flower-cup conſiſts of one leaf, divided into five long ſlender ſegments: the flower is of one leaf, in ſhape like thoſe of the fox-glove: the pointal, which riſes in the middle of the flower, afterwards becomes an oblong four-cornered pod, divided into four diſtinct cells, which are replete with eſculent ſeeds.

In England, theſe plants are preſerved in botanic gardens as curioſities. Their ſeeds muſt be ſown in the ſpring upon an hot-bed; and, when the plants are come up, they muſt be tranſplanted in a freſh hot-bed, to bring them forward. After they have acquired a tolerable degree of ſtrength, they ſhould be planted into pots filled with rich light ſandy ſoil, and plunged into another hot-bed, managing them as hath been directed for amaranthus's; to which I ſhall refer the reader, to avoid

avoid repetition: for, if these plants are not brought forward thus in the former part of the summer, they will not produce good seeds in this country; though, after they have flowered, if the season is favourable, they may be exposed in a warm situation, with other annual plants. When these plants have perfected their seeds, they decay, and never continue longer than one season.

SE'SELI-*seed*, in the materia medica, the name of the seed of a plant, called also by some libanotis, and growing three or four feet high, with leaves like fennel, but of a paler green. It is a native of warm climates. The seed ought to be chosen moderately large, of a longish shape, heavy, clean, and of a greenish colour, fresh, and of a grateful smell. It affords, by distillation, a very large quantity of an essential oil, and is hot and dry. It incides, opens, and discusses, and is cephalic, neurotic, pectoral, and nephritic. It is good against epilepsies, apoplexies, vertigoes, and all disorders of the head and nerves. *Lemery's Dict. of Drugs.*

SETS, a term used by the farmers to express the young plants of the white thorn, and other shrubs, which they use to raise their quick, or quick-set hedges.

The white thorn is the best, of all trees, for this purpose, and under proper regulations, its Sets seldom fail of answering the farmers utmost expectations.

The first thing to be considered by the person, who is about to plant a quick-set hedge, is what nature the land is of where it is to stand, as whether it is clay, sand, or gravel. It is always proper to take the Sets from a worse land, than that they are to be planted on, otherwise they will never grow well. The Sets are about the thickness of a man's thumb, and cut within four or five inches of the ground. If the quick is intended only for a hedge, without a bank or ditch, let the Sets be planted almost perpendicular in two rows, at about twelve inches distance from each other; and, if there is to be a ditch and a bank, that is to be first provided. The ground is to be marked out with a line, and a ditch dug three feet wide at the top, one foot wide at the bottom, and two feet deep. When the ditch is digging, on that side where the quick is to stand, let the turf be laid evenly on the ground, with the grassy side downwards: upon this some fine mould is to be laid, to bed the quick Sets in, and they are to be laid upon it with their ends inclining upwards, and at about twelve inches asunder. They must be carefully gathered, and such as are straight, smooth, and well rooted, are only to be chosen. At every thirty feet there should be planted with the Sets a young oak, ash, or some other such tree, to grow up along with the hedge. When a complete row of the Sets is thus laid, cover them with a layer of fine mould, and lay over that another layer of the turf; and upon this a third layer of mould, so deep, that its surface may be a foot above the row of Sets: on this bed place another row of the like Sets at the same distances, but placed between the others; cover this as the other, and then make up the bank with the earth dug out of the bottom of the ditch, and on its top set the dry, or dead hedge: this will shade the under plantation, and will be a defence till the Sets are grown up into a live hedge. The stakes for the dead hedge are to be driven into the bank so low as to reach the firm ground, and are to be placed at two feet and a half distance from one another.

Oak-stakes are the best for this purpose, and sallow and black thorn are esteemed next to these. The small bushes cut from them must be laid below, but not too thick, that they may shade the young plantation without smothering it, and defend its young shoots from the biting of cattle: the long bushes are to be laid at top to bind in the stakes by interweaving them. To add a farther strength to the hedge, it may be eddered as the farmers call it: this is binding the tops of the stakes with some small long poles, or sticks on each side. When this is all done, the stakes should be new drove a little, because the making the hedge, and the eddering it, are apt to loosen them a little.

The young plants must be constantly weeded, and great care must be taken to preserve them from the bitings of cattle, especially of sheep. If they have been cropped, or are not found to grow well, it is a good custom among the farmers to cut them down to the ground, or within an inch of it, for after this they usually send out new roots, and shoot very vigorously. *Mortimer's Husbandry.*

SETA'CEUS *Vermis*, in natural history, a name given by Dr. Lister to that long and slender water-worm which so much resembles a horse-hair, that it has been supposed by the vulgar to be an animated hair of that creature.

SETTEE', a vessel, very common in the Mediterranean, with one deck, and a very long and sharp prow. They carry, some two masts, some three, without top-masts. Their yards and sails are like the misen. The least of them are of sixty tons burthen. They serve to transport cannon, and provision for ships of war and the like.

SE'TTING, the term used by sportsmen to express a manner of attacking partridges, in order to the taking them, by means of a dog peculiarly trained to that purpose. The setting-dog generally used is a long land-spaniel, taught by nature to hunt partridges more than any other game, and, in his untaught state, running over the fields in search of them, with an alacrity that is truly wonderful; yet by art this creature is brought under such excellent command, that he will, in the midst of his highest career, attend to the least hem from his master, and stand still to look in his face, and take his orders by the slightest signals; and, when he is so near his game, that it is almost in his mouth, he will stand stock still, or lie down on his belly, till his master arrive, and he receives his directions.

The Setting-dog, being taken to the haunt of the partridges, is to be cast off, and sent to range; but he must be made to keep near the sportsman, and not to run wildly on, but to beat all the ground regularly. On being reproved for ranging too wildly and too far, he will keep close the whole day, and at times look up in his master's face to know if he does right or wrong. If in the dog's ranging he stops of a sudden, the sportsman is to make up to him, and as there is certainly game before him, he must be ordered to advance; if he refuse this, and look back and shake his tail, it is a signal that they are close before him, and the sportsman is then to make a circumference, and look with a careless eye before the dog's nose to see where they are, and how they lie; then going up, and staking down one end of the net, he is to command the dog to lie still, and to draw the net gently over the birds; then making in with a noise, he is to spring them, and they will be entangled and taken, as they rise. It is a rule with fair sportsmen, when they take a covey in this manner, always to let the cock and hen go.

SE'VENTH, *(Dict.)* — In thorough basses the Seventh, whether double, simple, major, or minor, is marked by a figure of 7; but, if it be accidentally flat, or minor, thus, 7♭, or ♭7. If sharp, or major, thus, ♯7, or 7♯. Again, if, when it is naturally minor, it be marked with a flat, it must be diminished.

SE'WEL-*coronde*, a name given by the natives of Ceylon to a species of cinnamon, which, when chewed, is of a mucilaginous nature, like the cassia; this dries well, and is very firm and hard, and has the appearance of a very fine cinnamon, but it has very little taste, and a disagreeable smell. The natives take advantage of the handsome appearance of this kind of cinnamon, and are very apt to mix it with the good kind, to the great detriment of the buyer. *Philos. Trans.* N°. 409.

SEXA'NGLE, in geometry, a figure having six sides, and consequently six angles.

SEXUALI'STÆ, among botanical authors, those who have established the classes of plants upon the differences of the sexes, and parts of fructification in plants, according to the modern method, as Linnæus, &c. See the article *Sexes of* FLOWERS.

SHAD, *alausa*, in zoology, the name of a sea-fish of the herring kind, called also the mother of herrings, and by some authors clupea and trissa, and by the ancients trichis, or trichias.

It is very common in many seas, and in some of our large rivers which lie near the sea. They run up these in great numbers in the months of March and April, and are then very fat; in May they become lean, and then go down to the sea again. They usually swim in large shoals together. *Willughby's Hist. Pisc.*

SHAGGE, in zoology, a name by which we commonly call a water fowl, common on the northern coasts, and called by Mr. Ray corvus aquaticus minor, or the lesser cormorant, being properly a bird of the cormorant kind.

SHA'KER *Pigeon*, a kind of pigeons, of which there are two sorts, the broad-tailed, and the narrow-tailed. The first is the finest, and most valued. It has a beautiful long thin neck, which bends like the neck of a swan, leaning towards the back. It has a full breast, and a very short back, and a tail consisting of a great number of feathers, seldom less than four and twenty, which it spreads in an elegant manner, like the tail of a turkey-cock, and bends it up so, that it meets the head. It is commonly all white, but sometimes is red, yellow, or blue-pied. The longer the neck of this bird is, the more it is valued.

The second, or narrow-tailed Shaker, has a shorter and thicker neck, and a longer back. It is esteemed by many a different species, but seems only a mixed breed with some other pigeon. They are called Shakers, from a tremulous motion which they have in their necks, when courting. *Moore's Columbarium.*

SHA'MBLE, in mining, a term used to express a sort of nich, or landing-place, left at certain distances in the adits of mines. The method of digging the tin mines in Devonshire, and some parts of Cornwall, is this: they sink their way in such a breadth, as is sufficient for them to stand and work, and at every fathom they leave a square place vacant, to which the ore is to be thrown up with shovels, as it is dug. This they do from cast to cast; that is, as far as a man can conveniently throw up the ore with his shovel. Thus the ore, as it is dug by the beelmen, is thrown up by the shovelers, who follow them from Shamble to Shamble, till it comes to the top of the mine. This, however, is but an inconvenient way, and the use of these Shambles is generally supplied by a winder at the opening of the mine, which manages two buckets, the one of which is sent down empty, while the other is sent up full; and one man employed below to load, and another above to empty. *Philos. Trans.* N°. 69.

SHAMBRIE'R, in the manege, is a long thong of leather,

made

made faſt to the end of a cane, in order to animate a horſe, and puniſh him, if he refuſes to obey the rider.

SHA'MMY (*Dict.*) — Beſides the ſoftneſs and warmneſs of the leather, it has the faculty of bearing ſoap without damage, which renders it very uſeful on many accounts.

In France, &c. ſome wear the ſkin raw, without any preparation: it is alſo uſed for the purifying of mercury; which is done by paſſing it through the pores of this ſkin, which is very cloſe.

The true chamoiſe leather is counterfeited with common goat, kid, and even ſheep-ſkin; the practice of which makes a particular profeſſion, called by the French chamoiſure. The laſt, though the leaſt eſteemed, is yet ſo popular, and ſuch vaſt quantities prepared, eſpecially about Orleans, Marſeilles, and Tholouſe, that it may not be amiſs to give the method of preparation.

Manner of SHAMOISING, *or of preparing ſheep, goat, or kid-ſkins in oil, in imitation of* SHAMMY. — The ſkins being waſhed, drained, and ſmeared over with quick-lime on the fleſhy ſide, are folded in two, length-wiſe, the wool outwards, and laid on heaps; and ſo left to ferment eight days; or, if they had been left to dry after fleaing, fifteen days.

Then they are waſhed out, drained, and half dried; laid on a wooden leg, or horſe, the wool ſtripped off with a round ſtaff for the purpoſe, and laid in a weak pit, the lime whereof had been uſed before, and had loſt the greateſt part of its force.

After twenty-four hours they are taken out, and left to drain twenty-four more; then put in another ſtronger pit. This done, they are taken out, drained, and put in again, by turns; which begins to diſpoſe them to take oil: and this practice they continue for ſix weeks in ſummer, or three months in winter; at the end whereof they are waſhed out, laid on the wooden leg, and the ſurface of the ſkin on the wool-ſide peeled off, to render them the ſofter; then, made into parcels, ſteeped a night in the river, in winter more; ſtretched, ſix or ſeven over one another, on the wooden leg; and the knife paſſed ſtrongly on the fleſh-ſide, to take off any thing ſuperfluous, and render the ſkin ſmooth.

Then they are ſtretched, as before, in the river; and the ſame operation repeated on the wool-ſide; then thrown into a tub of water with bran in it, which is brewed among the ſkins till the greateſt part ſtick to them; and then ſeparated into diſtinct tubs, till they ſwell, and riſe of themſelves above the water.

By this means, the remains of the lines are cleared out: they are then wrung out, hung up to dry on ropes, and ſent to the mill, with the quantity of oil neceſſary to ſcour them: the beſt oil is that of ſtock-fiſh.

Here, they are firſt thrown in bundles into the river for twelve hours, then laid in the mill-trough and fulled without oil till they be well ſoftened; then oiled with the hand, one by one, and thus formed into parcels of four ſkins each, which are milled and dried on cords a ſecond time, then a third; then oiled again and dried.

This proceſs is repeated as often as neceſſity requires: when done, if there be any moiſture remaining, they are dried in a ſtove, and made up into parcels wrapped up in wool: after ſome time they are opened to the air, but wrapped up again as before, till ſuch time as the oil ſeems to have loſt all its force, which it ordinarily does in twenty-four hours.

The ſkins are then returned from the mill to the chamoiſer, to be ſcoured; which is done by putting them in a lixivium of wood-aſhes, working and beating them in it with poles, and leaving them to ſteep till the lye have had its effect; then they are wrung out, ſteeped in another lixivium, wrung again, and this repeated till all the greaſe and oil be purged out. When this is done, they are half dried, and paſſed over a ſharp-edged iron inſtrument, placed perpendicular in a block, which opens, ſoftens, and makes them gentle: laſtly, they are thoroughly dried, and paſſed over the ſame inſtrument again, which finiſhes the preparation, and leaves them in form of Shammy.

Kid and goat ſkins are ſhamoiſed in the ſame manner as thoſe of ſheep; excepting that the hair is taken off, without the uſe of any lime; and that, when brought from the mill, they undergo a particular preparation, called ramalling; the moſt delicate and difficult of all the others.

It conſiſts in this, that, as ſoon as brought from the mill, they are ſteeped in a lixivium; taken out, ſtretched on a round wooden leg, and the hair ſcraped off with a knife; this makes them ſmooth, and, in working, caſt a kind of fine nap; the difficulty lies in ſcraping them evenly.

SHANK, or SHANK-*painter*, in a ſhip, is a ſhort chain faſtened under the fore-maſt ſhrouds, by a bolt, to the ſhip's ſides, having at the other end a rope faſtened to it. On this Shank-painter the whole weight of the aft part of the anchor reſts, when it lies by the ſhip's ſide. The rope by which it is haled up, is made faſt about a timber-head.

SHARE, the name of that part of the plough which cuts the ground, and the wood to which it is fixed. The extremity of the iron forwards is called the point of the Share, and the end of the wood behind is called its tail.

The length of the whole Share, from point to tail, ſhould be three feet nine inches; at the top of the iron it has an upright piece called the fin, and, near the iron at the other end, there is an oblong ſquared hollow, called the ſocket; the uſe of which is to receive the bottom of the ſheat. Near the tail there is a thin plate of iron, well riveted to the wood; by means of this plate the tail of the Share is held firmly to the hinder ſheat of the plough by a ſmall iron pin, with a ſkrew at the end, and a nut ſkrewed on it, on the inner or right ſide of the ſheat.

The point of the Share is that part in which it does not run up into the fin: this point is generally made of three inches and a half in length, and ſhould be flat underneath, and round at the top, and the lower part of it muſt be of hard ſteel. The edge of the fin ſhould alſo be well ſteeled, and ſhould make an acute angle with the Share.

The ſocket is a ſort of mortiſe; it ſhould be a foot long, and about two inches deep: the fore-end of it muſt not be perpendicular, but oblique, conformable to the end of the ſheat which enters into it. The upper edge of the fore-part muſt be always made to bear againſt the ſheat; but, if this end of the ſocket ſhould not be quite ſo oblique as the ſheat, it may be helped, by paring off a ſmall part of the wood at the point. *Tull's Huſbandry.* See the article PLOUGH.

SHARK.—We know two different fiſh under the ſame name of Shark, with the addition of their colour, blue and white.

The blue Shark is that ſpecies of ſqualus called glaucus, and galeus glaucus, by authors, and diſtinguiſhed by Artedi by the name of the ſqualus with a triangular dent or furrow in the extremity of the back, and with no foramina about the eyes like the galeus.

The other is the lamia, or canis carcharias of authors, commonly called by us ſimply the Shark. This is diſtinguiſhed by Artedi by the name of ſqualus with a flat back, and with numerous teeth, ſerrated at the edges. See the article SQUALUS.

The white Shark, or lamia, is a very dreadful and voracious fiſh, the largeſt of all the Sharks. They have been ſeen of four thouſand weight, with throats capable of ſwallowing a luſty man whole; nay, men have been found in them whole, when opened. Some have, for this reaſon, imagined this, and not the whale, to have been the fiſh in whoſe belly the prophet Jonah lay.

Its teeth are very ſharp and terrible; they are diſpoſed in ſix rows, and are all triangular, and notched like a ſaw on their edges. Theſe are, in the whole, a hundred and forty-four in number, and are placed in various directions. Their number is not exactly determinate. Its back is ſhort and broad, in compariſon of the other fiſh of this kind, and its tail compoſed of two fins of a cubit in length each. Its ſkin is rough, and its eyes large and round. It is found both in the ocean and Mediterranean, and is of all fiſh the moſt voracious of human fleſh.

SHEA'RING. The beſt time for Shearing of ſheep is about the middle or the latter end of June, becauſe it is good for them to ſweat in the wool before it is cut. They muſt be very well waſhed before the Shearing, for this is a great addition to the price of the wool: after the waſhing, let them go three or four days in a clean dry ground. When they are cut, the ſhearer muſt be very careful not to wound their ſkins, becauſe this gives occaſion to the flies to teaze the poor creature in a terrible manner. Some ſhear their lambs, the firſt year eſpecially, behind; but, before the doing of this, they ought to be carefully tagged, as it is called, that is, their tails and thighs behind ſhould be well cleared of wool, that the dung may not hang there, which would elſe make them ſore, and ſubject them to the flies, which would blow them, and make them full of maggots.

In Glouceſterſhire they houſe their ſheep every night, and litter them with clean ſtraw. Their dung makes this a very good manure for the land, and the wool of the ſheep is rendered ſo much finer by it, that the farmers have a double advantage from the practice.

In Middleſex, and about London, they have Way-hill ſheep: theſe come from Hampſhire, Wiltſhire, &c. and lamb very early, before Chriſtmas. *Mortimer's Huſbandry.*

SHEAT *of a plough*, a word uſed by our farmers to expreſs a part of a plough paſſing through the beam, and faſtened to the ſhare. The Sheat, or, as it is ſometimes called, the fore-Sheat, there being another timber behind it, called the hinder Sheat, ſhould be ſeven inches wide, and is faſtened to the beam by the retch, a piece of iron with two legs, and by a wedge driven, with it, into the hole in the beam.

The angle made by the Sheat, with the beam of the plough, ſhould be forty-two, or forty-three degrees. *Tull's Huſbandry.* See the article PLOUGH.

SHEATS, in a ſhip, are ropes bent to the clews of the ſails, ſerving in the lower ſails to hale aft, or round off the clew of the ſail; but in top-ſails they ſerve to hale home, as the word is, or to hale the clew of the ſail cloſe to the yard-arm.

SHEA'THING, *of a ſhip*, (*Dict.*)— It is very well worth the trying what the new ſtone-pitch will do in this caſe; if it will defend from the worm, as perhaps it may, a ſhip might be paid with it cheaper than with the crown-pitch; and it will not

not crack nor scale off, as that will do, but keeps always soft and smooth. It has been found to continue on thirteen months, and to remain very black and soft all the time.

SHEEP, *ovis*, in zoology, a well known kind of cattle, that is kept at the least expence of any to the farmer, and will thrive upon almost any ground, and for this reason many prefer them before the larger cattle.

The best sort of Sheep for fine wool are those bred in Herefordshire and Worcestershire, but they are small and black-faced, and bear but a small quantity.

Warwick, Leicestershire, Buckingham, and Northamptonshire breed a large-boned Sheep, of the best shape, and deepest wool we have got. The marshes of Lincolnshire breed a very large kind of Sheep, but their wool is not good, unless the breed be mended by bringing in Sheep of other countries among them, which is a scheme of late very profitably followed there.

The northern counties in general breed sheep with long, but hairy wool; and Wales breeds a small hardy kind of Sheep which has the best-tasted flesh, but the worst wool of all.

The farmer should always buy his Sheep from a worse land than his own, and they should be big-boned, and have a long greasy wool, curling close and well. These Sheep always breed the finest wool, and are also the most approved of by the butcher for sale in the market.

For the choice of Sheep to breed, the ram must be young, and his skin of the same colour with his wool, for the lambs will be of the same colour with his skin. He should have a large long body, a broad forehead, round, and well rising, large eyes, and straight and short nostrils. The polled Sheep, that is, those which have no horns, are found to be the best breeders. The ewe should have a broad back, a large bending neck, small, but short; clean and nimble legs, and a thick deep wool covering her all over. To know whether they be sound or not, the farmer should examine the wool, that none of it be wanting, and see that the gums be red, the teeth white and even, and the brisket skin red, the wool firm, the breath sweet, and the feet not hot. Two years old is the best time for beginning to breed, and their first lambs should not be kept too long, to weaken them by suckling, but be sold as soon as conveniently may be. They will breed advantageously, till they are seven years old.

The farmers have a method of knowing the age of a Sheep, as a horse's is known, by the mouth. When a Sheep is one shear, as they express it, it has two broad teeth before; when it is two shear, it will have four; when three, six; when four, eight; after this, their mouths begin to break. The difference of land makes a very great difference in the Sheep. The fat pastures breed straight tall Sheep, and the barren hills and downs breed square short ones; woods and mountains breed tall and slender Sheep, but the best of all are those bred upon new plowed land, and dry grounds. On the contrary, all wet and moist lands are bad for Sheep, especially such as are subject to be overflowed, and to have sand and dirt left on them. The salt marshes are, however, an exception to this general rule, for their saltness makes amends for their moisture; any thing of salt, by reason of it drying quality, being of great advantage to Sheep.

As to the time of putting the rams to the ewes, the farmer must consider at what time of the spring his grass will be fit to maintain them and their lambs, and whether he has turneps to do it till the grass comes; for very often both the ewes and lambs are destroyed by the want of food; or, if this does not happen, if the lambs are only stunted in their growth by it, it is an accident that they never recover. The ewe goes twenty weeks with lamb, and according to this it is easy to calculate the proper time. The best time for them to yean is in April, unless the owner has very forward grass, or turneps, or the Sheep are field Sheep where you have not inclosures to keep them in, then it may be proper they should yean in January, that the lambs may be strong by May-day, and be able to follow the dam over the fallows, and water furrows; but then the lambs, that come so early, must have a great deal of care taken of them, and so indeed should all other lambs at their first falling, else, while they are weak, the crows and magpies will peck their eyes out.

When Sheep are turned into fields of wheat or rye to feed, it must not be too rank first, for, if it be, it generally throws them into scowerings. Ewes that are big should be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They may be well fed indeed, like cows, a fortnight before-hand, to put them in heart. *Mortimer's Husbandry.*

The feeding Sheep with turneps is one great advantage to the farmers, from the crops they raise of them: they soon fatten upon them, but there is some difficulty in getting them to feed on them; the old ones always refuse them at first, and will sometimes fast three or four days, till almost famished; but the young lambs fall to at once.

The common way, in some places, of turning a flock of Sheep at large into a field of turneps, is very disadvantageous, for they will thus destroy as many in a fortnight, as would have kept them a whole winter. There are three other ways of feeding them on this food, all of which have their several advantages.

The first way is to divide the land by hurdles, and allow the Sheep to come upon such a portion only at a time, as they can eat in one day, and so advance the hurdles farther into the ground daily, till all be eaten. This is infinitely better than the former random method, but they never eat them clean even this way, but leave the bottoms and outsides scooped in the ground; the people pull up these indeed with iron crooks, and lay them before the Sheep again, but they are commonly so fouled with the creature's dung and urine, and with the dirt from their feet, that they do not care for them; they eat but little of them, and what they do, does not nourish them like the fresh roots.

The second way is by inclosing the Sheep in hurdles, as in the former; but in this they pull up all the turneps they suppose the Sheep can eat in one day, and daily remove the hurdles over the ground, whence they have pulled up the turneps: by this means there is no waste, and less expence, for a person may in two hours pull up all those turneps; the remaining shells of which would have employed three or four labourers a day to get up with their crooks out of the ground, trodden hard by the feet of the Sheep; and the worst is, that as, in the method of pulling up first, the turneps are eat up clean; in this way, by the hook, they are wasted, the Sheep do not eat any great part of them, and when the ground comes to be tilled afterwards for a crop of corn, the fragments of the turneps are seen in such quantities on the surface, that half the crop at least seems to have been wasted.

The third manner is to pull up the turneps, and remove them in a cart or waggon to some other place, spreading them on a fresh place every day; by this method the Sheep will eat them up clean, both roots and leaves. The great advantage of this method is, when there is a land not far off which wants dung more than that where the turneps grow, which perhaps is also too wet for the Sheep in winter, and then the turneps will, by the too great moisture and dirt of the soil, sometimes spoil the Sheep, and give them the rot. Yet such ground will often bring forth more and larger turneps than dry land, and when they are carried off, and eaten by the Sheep on plowed land in dry weather, and on green sward in wet weather, the Sheep will succeed much the better; and the moist soil, where the turneps grow, not being trodden by the Sheep, will be much fitter for a crop of corn, than if they had been fed with the turneps on it. The expence of hurdles, and the trouble of moving them, is saved in this case, and this will counterbalance at least the expence of pulling the turneps, and carrying them to the places where they are to be eaten. They must always be carried off for oxen. *Tull's Horsehoeing Husbandry.*

The use of salt preserves Sheep from the rot. The animals must be made to take a small handful of it two or three times in a few days, without permitting them to drink any thing for some hours afterwards. *Boyle's Works.*

SHEEP's *dung*.— This is one of the best manures we know. It succeeds better upon cold clayey lands, than any other dung whatever; but, as it is not so conveniently to be collected as the dung of larger animals, it is commonly conveyed to the land it is intended for, by folding the Sheep upon it. The urine, as well as the dung, is thus given to the land, and is of very great advantage; but the farmer always should plow in this sort of manure as soon as he can, for the sun soon robs it of a great part of its virtue.

In Northamptonshire they begin to fold the Sheep upon the lands that they would dung by them, after the month of July, and, the drier the lands are, the later they fold them. In Flanders they make many thousand loads of manure annually from their Sheep: they cover the bottom of the folds considerably deep with some light and spungy earth, and, when this has received the dung and urine of the animals for seven or eight days, they remove it, and lay fresh in its place: the earth, thus impregnated, becomes an excellent improvement to land, and they raise large crops by means of it, in places where very little could be expected without it.

In England we have a contrivance like this, which is the covering the bottoms of the folds deep with sand, and changing it once in a week, or thereabouts: this is a kind of manure finely calculated for clayey lands, both the sand, and this peculiar kind of dung, being appropriated things for it.

SHEEP-*nose-worms*, in natural history, a species of fly-worm, found in the noses of sheep, goats, and stags, and produced there from the egg of a large two-winged fly.

The frontal sinuses above the nose in Sheep, and other animals, are the places where these worms live, and attain their full growth. These sinuses are always full of a soft white matter, which furnishes these worms with a proper nourishment, and are sufficiently large for their habitation; and when they have here acquired their destined growth, and come to the state in which they are fit to undergo their changes for the fly-state, they leave their old habitation, and, falling to the earth, bury themselves there; and, when these are hatched into flies, the female, when she has been impregnated by the male, knows that the nose of a Sheep, or other animal, is the only place for

for her to deposit her eggs, in order to their coming to good. *Reaumur's Hist. Inf.*

SHEERS, aboard a ship, a name the seamen give to two mast's yards, or poles, set up and seized across each other aloft, near the top. This pair of Sheers, as they call it, is placed below on the chain-wales of the shrouds, and lashed fast to the ship's side, to keep them steady aloft. Their use is to set in, or take out a mast; for which end there is fastened, at the place where they cross one another, a strong double block with a strap. They serve also to hoise in or out, of boats that have masts, such goods as are wanted to be taken in or out.

SHEER-*water*, in zoology, an English name for a bird common on our coasts, and not known by any of the common authors, nor honoured with a Latin name. It is nearly of the size of a duck. Its head, which is large, neck and back, are of a brownish black; its throat, breast, and belly, white; its legs are red. Its three fore toes are connected by a membrane, but its hinder one is loose. Its wings are very long, and, when folded, reach to the end of the tail. Its beak is strong and sharp, and is hooked at the end. It flies very swiftly along the surface of the water, whence it has its name. *Ray's Ornithology.*

SHEIK, in the Oriental customs, the person who has the care of the mosques in Egypt; his duty is the same as that of the imams at Constantinople. There are more or fewer of these to every mosque, according to its size or revenues. One of these is head over the rest, and answers to a parish priest with us, and has under him, in large mosques, the readers, and people who cry out to go to prayers; but in small mosques the Sheik is obliged to do all this himself. In such it is their business to open the mosque, to cry to prayers, and to begin their short devotions at the head of the congregation, who stand rank and file in great order, and make all their motions together. Every Friday the Sheik makes an harangue to his congregation. *Pocock's Egypt.*

SHEIK-*bellet*, the name of an officer in the Oriental nations.

In Egypt the Sheik-bellet is the head of a city, and is appointed by the pasha. The business of this officer is to take care that no innovations be made, which may be prejudicial to the port, and that they send no orders which may hurt the liberties of the people. But all his authority depends on his credit and interest, not his office: for the government of Egypt is of such a kind, that often the people of the least power by their posts have the greatest influence; and a caia of the Janizaries, or Arabs, and sometimes one of their meanest officers, an oda-basha, finds means, by his parts and abilities, to govern all things. *Pocock's Egypt.*

SHE'KEL (*Dict.*)—In the Bible, the Shekel is sometimes rendered solidus, and sometimes stater.

The Jewish doctors are in great doubt about the weight of the Shekel: and it is only by conjecture, and by the weight of the modern Shekel, that the ancient one is judged equal to four Attic drachmas.

Father Souciet has described several of these Shekels, in his dissertation on the Hebrew Medals. By the way he observes, that the third and fourth parts of a Shekel, described by Waserus de Ant. Num. Heb. are counterfeits of that author.

The Hebrew Shekel, according to F. Mersenne, weighs 268 grains, and is composed of 20 oboli, each obolus weighing 16 grains of wheat. This, he says, is the just weight, as he found by weighing one in the French king's cabinet. He adds, that such as come short of this weight have been filed or clipped. Bishop Cumberland tells us, he has weighed several, and always found them near the weight of a Roman semuncia, or half-ounce.

Some are of opinion, that the Hebrews had two kinds of Shekels: the common or prophane Shekel, called didrachma; and the Shekel of the sanctuary, which last they will have to be double the former.—By this expedient they think we may get clear of some difficulties occurring in scripture, where things are mentioned as of incredible weight; particularly that passage where it is said, that every time Absalom cut off his hair, the weight whereof used to incommode him, he cut off the weight of 200 Shekels.

But Villalpandus will not hear of such a distinction; nor do bishop Cumberland, M. Morin, &c. take the opinion to have any foundation. The prophane Shekel, or Shekel of four drachmas, they agree, was the same with the sacred Shekel; and it was only called by this last name, in regard the standard thereof was kept, in the sanctuary, by the priests. It is maintained by several, that the Jews had also a gold Shekel, siclus aureus, of the same weight with the silver one, and valued at 1 l. 16 s. 6 d. sterling.

The Shekel is supposed to have been first struck in the desart, on the footing of 100 to the Attic mina, weighing 160 grains of wheat, and current for 10 geratis or oboli. But afterwards they were struck of double that weight.

Some will have the Shekel to be the oldest piece of money in the world, as being in use in Abraham's time; but this was not coined, or stamped; nor had any other value besides its intrinsic worth.

Xenophon mentions Shekels, as current in Arabia: Du Cange speaks of others struck and current in England.

SHELF (*Dict.*)—What the miners mean by this term is, that part of the earth which they find lying even, and in an orderly manner, and evidently having retained its primitive form and situation unmoved by the waters of the general deluge, while the circumjacent and upper strata have plainly been removed, and tossed about.

It is evident to reason, that there must have been a very violent concussion of the superficial part of the earth, in the time of its being covered by the waters of the deluge; and experience as much evinces this as reason. Before this concussion it appears probable that the uppermost surface of mineral veins, or loads, did in most places lie even with the then surface of the earth. The remains of this surface, found at different depths in digging, the miners express by the word Shelf.

In this concussion of the waters covering the whole earth, its natural surface, together with the uppermost surface of those mineral veins, were then in many places loosened, and torn off; and the earth, and with it the mineral nodules, called shoad-stones, were carried down with the descending waters from hills into the adjacent valleys, and sometimes into the streams of rivers; by which they were washed to yet greater distances from their original place.

On this depends the method of training mines. *Philos. Transf.* N°. 69.

SHELLS (*Dict.*)—The world has for a long time wanted a regular method of classing of Shells, which a late author of the French nation has attempted upon a new and very laudable plan. In this, he throws aside the vulgar distinction of Shells into the sea, fresh-water, and land kinds, and very judiciously arranges all under the same class, which have the same general characters.

The Shells are all naturally to be arranged under three principal classes; these will contain all the species, and are afterwards to be divided into a number of families, or genera, and under these the several species regularly recounted; and, at the end of each description, the varieties may be added. The first general class of Shells contains those which are found all of one piece, or have only one Shell, not a pair. These have been called by the Greeks monothyræ, and by the Latin authors univalviæ, univalves.

The second general class contains those Shells which are of two pieces, called bivalves, such as oysters, cockles, and the like.

The third class contains those which are composed of more than two pieces. These are called multivalves; and of this kind are the pholas and balanus.

This method takes in the fresh-water Shells, as well as those of the sea; and, as those hitherto known are all of one or other of the first classes, their several species will be comprised among, or after the sea Shells of each of those classes.

The land Shells are of two kinds, the recent and the fossil; the first kind, as far as hitherto known, are all univalves, and the latter are of all the three classes.

As each of these general classes contains a very great number of species, it may seem difficult to enter on this study, from the multiplicity of the bodies; but method renders all this easy, and it is no way difficult, in the following manner, to find of what class, what family, and what genus, any given Shell is, from a bare inspection.

Bivalve SHELLS.—The former are all the genera of the Shells composed of one piece, and thence called univalves: and, as any given Shell may, by the characters given of each, be easily referred to that to which it belongs, so, in regard to the bivalves, the task is not more arduous, when entered on upon the same principles; and it is the easier in this respect, that the families of this class are much less numerous than those of the other, these being only six.

The first genus or family of the bivalves is that of the oister, ostreæ. The variety of this one genus is almost infinite, and is extremely agreeable. Some are echinated so as to represent the echini; others have excrescences of parts in undulatory, or jagged forms, representing the ears of animals, or the comb of a cock; and others form themselves into very remarkable figures, by adhering and growing to trees, stones, corals, and other substances, either naturally growing in the sea, or such as have accidentally fallen into it. Sometimes, also, the upper Shell in an oister is smaller and flatter than the under one. These, however, are all trifling varieties, and the Shells are still of the oister kind.

When the bivalve Shells, under examination, differ from the oister kind, in being more elevated in the middle, and equally convex, or nearly so, in both Shells, then it belongs to the family, under the name of chamæ. These differ also from oisters, in that they are more smooth on the surface, and they often do not close so evenly and regularly at the mouth, whence some have called them conchylia ore patulo et hianti.

The third family is that of the muscles. These are all of the general shape of the common muscle, and are thence easily known. It is to be observed, however, that some of them are equal at both ends; these are called tellinæ: and some others are extremely long at one end, and broad and short at the other; these are called pinnæ marinæ.

The fourth genus, or family, is the cordiform kind, called in French cœurs. The essential character of this family is, that the

the Shells are of a roundish elevated figure, and that they have no ears, as the pectens have, and they always represent the figure of a heart, in whatever view they are taken; though this is sometimes of a triangular figure. Most of the species of this family, as well as of the following one of the pectens, are striated.

The fifth family of the bivalves is that of the pectens or scallop Shells. Among these, some have two ears at the head of the Shell; others have only one ear; and others have none at all. Some species are deeply furrowed, and others are full of small protuberances. The general character of the pectens is to have the upper Shell plain, and the under one somewhat hollow; and the ears are also a very obvious character in those that have them.

The sixth, and last family of the bivalves, is the solen or rasor-fish, called by the French manche de couteau. These are very easily known by their figure which resembles that of a knife-haft, and therefore need no other mark of distinction.

Multivalve SHELLS. These are not less easily distinguished, than the other two general classes, into their separate families. Of these, also, there are six families. The first is that of the echini marini, called, in English, sea-eggs, and by the French oursins, boutons, and herissons des mer. These carry a very obvious distinction, in their being covered with spines or prickles; and if we meet with them in a state, when these are fallen off, they are still easily known by the marks of their insertion. This, and their general figure which is alike in all, and in all unlike to all other species, is such a distinction, as cannot suffer them to be mistaken.

The second family of these is that of the vermiculi marini particularly charactered in the species called the sea-organ. These are usually of a beautiful red colour, and are of a very elegant structure. These generally are found in very large clusters, and are easily distinguished from all other genera.

The third family of the multivalves consists of the balani marini, called by the French glands de mer. These are all so like one another, that they are easily known from all the other genera, by their all resembling the common balanus, a Shell too well known to need description.

The fourth family is that of the pollicipedes, or, as the French call them, the pousSepieds. These are so easily known by their perfect resemblance to one another, that there needs no other character than referring to their figure in *Plate* XLIII. *fig.* 2.

The fifth family of the multivalves is that of the conchæ anatiferæ. These were once supposed to produce a bird of the goose kind; and these are all so like to one another, that the referring to the figure of the common species, in *Plate* XLIII. *fig.* 3. will shew the characters of all the species.

Finally, the sixth genus of the multivalves is that of the pholas. These Shells are easily distinguished by their figure, which is usually oblong, and their colour, which is simply white in all the species. These Shells are often found inclosed in stone in the sea, and some of them are composed of five valves.

Fossil SHELLS.— The number and variety of sea Shells which are found far from seas buried at great depths in the earth, and often immersed in the hardest stones, is an object of great wonder.

Of these some are found remaining almost entirely in their native state, but others are variously altered by being impregnated with particles of stone, and of other fossils; in the place of others there is found mere stone or spar, or some other native mineral body, expressing all their lineaments in the greatest nicety, as being formed wholly from them, the Shell having been first deposited in some solid matrix, and thence dissolved by very slow degrees, and this matter left in its place, on the cavities of stone and other solid substances, out of which Shells have been dissolved and washed away, being afterwards filled up less slowly with these different substances, whether spar or whatever else: these substances, so filling the cavities, can necessarily be of no other form than that of the Shell, to the absence of which the cavity was owing, though all the nicer lineaments may not be so exactly expressed. Besides these, we have, also, in many places, masses of stone formed within various Shells; and these, having been received into the cavities of the Shells while they were perfectly fluid, and having therefore nicely filled all their cavities, must retain the perfect figures of the internal part of the Shell, when the Shell itself should be worn away, or perished from their outside.

The various species we find of these are, in many genera, as numerous as the known recent ones; and as we have in our own island not only the Shells of our own shores, but those of many other very distant ones; so we have also many species, and those in great numbers, which are, in their recent state, the inhabitants of other yet unknown or unsearched seas and shores. The cockles, muscles, oisters, and the other common bivalves of our own seas are very abundant: but we have also an amazing number of the nautilus kind, particularly of the nautilus Græcorum, which, though a Shell not found living in our own, or any neighbouring seas, yet is found buried in all our clay-pits about London, and elsewhere; and the most frequent of all fossil Shells in some of our counties are the conchæ anomiæ, which yet we know not of in any part of the world in their recent state. Of this sort, also, are the cornua ammonis and the gryphitæ, with several of the echnatæ and others.

The exact similitude of the known Shells recent and fossil, in their several kinds, will by no means suffer us to believe, that these, though not yet known to us in their living state, are, as some have idly thought, a sort of lusus naturæ. It is certain, that, of the many known shores, very few, not even those of our own island, have been yet carefully searched for the Shell-fish that inhabit them; and, as we see in the nautilus Græcorum an instance of Shells being brought from very distant parts of the world to be buried here, we cannot wonder that yet unknown shores, or the unknown bottom of deep seas, should have furnished us with many unknown Shell-fish, which may have been brought with the rest; whether that were at the time of the general deluge, or the effect of any other catastrophe of a like kind, or by whatever other means; to be left in the yet unhardened matter of our stony and clayey strata. *Hill's Hist. of Foss.*

The vast beds of fossil Shells, buried in many parts of the world, are not useless matter, but will serve to one of the greatest purposes of husbandry, the manuring of barren lands. The people of many parts of France, and in some places in our own country, dig up the masses of broken Shells, connected into a sort of strata by marly, or other earths, for this purpose; and, spreading them upon the lands as dung, they soon moulder away, and are found extremely beneficial to the earth. Mr. Reaumur, desirous of knowing in what manner these fragments of Shells fertilised land, at first conjectured that they did the same as the various species of marls, dissolving wholly away in time, and entering into, and fattening the earth; and carried it so far, as to believe that the common marls were a sort of earth, which owed its origin merely to such fragments of Shells more perfectly dissolved; and consequently, that the rain and air, in some sort, converted these Shells into marl upon the earth. But he was soon convinced of the error of this opinion, by the experience of the peasants, from whom he found that there was marl in the same pits whence they dug these Shells, and that they used it also as manure, but to lands of a very different kind; those which received benefit from the marl being always injured by the Shells, and, on the contrary, those which were meliorated by the Shells receiving no benefit from the marl. It might naturally enough be supposed that the salts, contained in these fossil Shells, helped to fertilise the earth, in the same manner with the salts of the common sea-plants, which are used as manure in many places. It is not impossible, but that the salts may indeed have their use in the whole, but the great good these shelly fragments do to the lands they are used on, is to be explained in a much easier manner, when the nature of the lands, on which they are employed, is considered.

These are usually cold clayey lands, on which nothing can grow but heath, and a few useless weeds, the common plants not shooting in any strength or perfection upon them; and they are always very wet upon the surface after any little rain, their texture being so close and compact, that the water cannot penetrate into them, as it does into the spungy texture of the common fertile lands. This sort of manure, which is very light, and is no other than a mass of broken, and, as it were, half calcined Shells, mixing with this earth, breaks its particles, and occasions a multitude of voids and little cavities in it, which reduce it to something like the common state of other earth, and the rain penetrates it as it does other mould.

The effects of this sort of manure are very lasting; a land well strewn with these Shells is manured for twenty years, and the rain no longer wets its surface only, but penetrates its substance, and moistens the roots of plants sown in it. These find also an easier passage, and penetrate to a proper depth; while the plowman finds no less the benefit; his plough now easily turning up an earth, which before it was scarce able to cut. Some have imagined, indeed, that all these effects are owing to the salts in the Shells operating in the manner of those of dung, and by that means breaking the connections of the more minute molecules; but ocular examination will shew the Shells act, in this case, merely as particles of hard matter of that size and hardness, and do no more than fragments of stone of the same size would do; and the peasants are well acquainted with this, as they find it necessary to dung those lands, which they have before manured with Shells, in the same manner as they do any others.

There are in many foreign countries, as well as in our own, lands of such a nature, that they never will become fertile, unless a large quantity of sand is dispersed over them. These lands are all of the same nature with those on which the farmers find their manure of Shells to take effect. The sand, and this manure of Shells, evidently act upon the same principle, in meliorating land, which is only by dividing its parts, when naturally too compact; but the Shells are qualified to do it greatly the better of the two, because they are in themselves so considerably lighter. Somewhat analogous to this sort of manure is that of the throwing pebbles and rough fragments of stone on some earths, which are naturally tough and compact in a great degree. It is the general practice in husbandry to take off all the stones, as far as it can be done, from the lands; but these soils are apt to crack, and burst open in dry seasons, and, the more stones are mixed in them, the less they are observed to crack, and what cracks they have, are always the smaller and the shorter. The earth is, by these stones, divided into so many separate parcels, that no very large and continued cracks can be formed; and always is the more fruitful, the more stones it has upon it, provided that they be not too large.

The manure of Shells, upon these lands, does not produce nearly so great an effect for the two first years, as it does in the succeeding ones; the reason of which is, that it is not then sufficiently mixed, but in succeeding time it breaks itself into a number of very small particles, and these all become intimately blended with the molecules of earth, and produce their effect more perfectly.

It is well known, that the Shells of the common garden snails always become calcined, as it were, in some degree, by lying in the earth; this becomes very friable, and may be mouldered to powder between the fingers: and the case is just the same in regard to these sea-shells; they, by their long abode in the earth, are thus calcined, and, happily for the farmer, are reduced to a sort of coarse powder, the particles of which are just of such a size, as may properly serve for the dividing and breaking the little clods of earth, and forming in the whole certain voids and spaces, just as large as they could be wished, in order to give roots, and moisture to swell them, an easy passage. And as these pieces of Shells are not expected to act as bodies containing active principles, but merely as inert particles of matter, so long as they retain their form, that action will not be impeded; and notwithstanding all the rude shocks they receive from the plough, and other instruments of husbandry, they retain this their form without any great alteration for a long time, and therefore the operation of strewing them on any piece of land needs not to be repeated in twenty, or sometimes in thirty years.

The manner in which the effects of this Shell-manure wear off at length, will be easily seen, if parcels of earth, manured with it at different distances of time, be examined, by washing away the earth with water; the fragments of Shells, left from the washing of earths of different years from the time of their being added to them, will be found growing smaller and smaller every year, till at length they make only a fine powder, mixing every way equally with the earth, and no longer opening its texture, or dividing its molecules; and it is then that these lands require a fresh quantity of it.

This breaking of the particles of the Shells is not to be determined by any regular rule, as to time, but differs from a number of accidents; and, accordingly, the farmer cannot say when he ought to renew the work, till he finds that the fertility it occasioned decreases. The size of the fragments in their original beds makes a great difference, the largest usually, and as might naturally be supposed, lasting the longest; but, besides this, they are more or less durable, as they were more or less calcined in the earth, and even according to the nature of that earth, upon which they are laid.

Mr. Reaumur concludes this useful account of these substances, by observing, that it is much more easy to account for the manner of their acting upon land, than for the manner of their coming where they are found. It has been the favourite system of our Dr. Woodward, that all these Shells were the remains of the universal deluge, which, having overflowed the whole earth, might easily leave them in all places; but Mr. Reaumur has much more rationally accounted for their coming to those parts of France, where they are found at this time in such vast abundance, by carefully tracing the course of the beds of them, so far as known there, and easily proving, that all that extent of country, under which they are found, may have been once overflowed by the sea, without a deluge; it being the very track that a large body of waters, let in at one part of the kingdom, must have taken, in order to getting out at another. *Mem. de l'Acad. Par.* 1720.

Arabian SHELL, a name given by some to a species of porcelain Shell, not because it is found on the coast of Arabia, but because its lines and variegations are supposed to represent the figures of Arabic characters.

Aurora SHELL, in natural history, a very remarkable species of Shell-fish, found in cabinets of the curious. It is of the figure of a bird, having a head, wings, and tail, and is of a flame-colour. It owes much of its beauty, however, to art and accident. The Shell is an oister of a peculiar variation of figure from the common one; the head of the bird is the cardo or hinge; the wings are the body of the Shells; and the tail is a peculiar process, like that of the marteau, only single. It is naturally of a dusky brown on the outside, and pearly within, but, when its rough coat is taken off, it appears of this beautiful flame-colour.

Center SHELL, in natural history, a name given to the balanus marinus, a kind of sea Shell, of the multivalve kind, with an open mouth, frequently found fixed to the bottoms of ships, and other things covered with sea-water.

China-letter SHELL, in natural history, a name given by many to that species of chama, usually called, by authors, the chama Arabica. It is of a pale brownish ground, and is variegated with a great number of black lines, which are as slender as the strokes of a pen, and are of such odd figures, that they represent some of the Arabic, or, as others fancy, Chinese characters.

Guinea SHELL, the English name for a very beautiful variegated species of voluta, called by the French la speculation.

Helmet SHELL, in natural history, the name of a kind of murex, of which there are several species. They all approach somewhat towards a triangular figure, and are free from any long spines.

Leopard SHELL, in natural history, the English name of the pardus, a kind of voluta; so called, from its spots resembling those of a leopard. There are three kinds of this, one spotted with black, another with yellow, and another with red.

Leveret SHELL, in natural history, a name given by many to a species of porcelain, resembling a young hare in colour.

Lightning SHELL, in natural history, a name given by some authors to a species of murex with variegations on its body, resembling the pictures we commonly see of flashes of lightning.

Map SHELL, in natural history, the name given by some to a peculiar species of porcelain Shell, the figures on which represent the lines of a map.

Saddle SHELL, in natural history, the name of a species of oister, which in some degree represents a saddle in its shape.

St. James's SHELL, in natural history, a name given by writers on Shells to a very beautiful species of variegated pecten.

St. Michael's SHELL, in natural history, a name given by authors to a species of pecten, or scallop Shell. It is of a bright yellow colour.

Scorpion SHELL, in natural history, the name of a species of murex, very much approaching to the nature of the spider Shell. This is a common Shell in cabinets. It is of a yellow colour, and very deeply ridged, and full of tubercles; there arise from the lip of the Shell five large spines, or, as they are usually called, fingers, and two others, which are very much bent, the one from the head, the other from the tail: these are very elegantly radiated with white and a fine violet colour on the lips.

Screw SHELL. See the article TURBO.

Small-pox SHELL, in natural history, a name given to a remarkable kind of concha venerea, or porcelain Shell, the protuberances on the surface of which are supposed to represent the pustules of the small-pox. There are two species of this Shell, the one white, with flattish protuberances; the other greenish, with more elevated ones.

Snake-SHELL, in natural history, the name given by many to that beautiful species of porcelain Shell, the spots of which represent those of a snake's skin.

Spider SHELL, the name of a kind of murex.

Strawberry SHELL, in natural history, the name given by collectors of Shells to a very beautiful species of cordiformis, spotted with small round red spots.

Swallow SHELL, in natural history, the name given by authors to a species of oister, which in some degree represents the figure of a small bird flying.

Tiger SHELL, in natural history, the name of a species of porcelain, or concha venerea, supposed to represent the spots on a tiger's skin.

Trumpet SHELL. See the article TRUMPET *Shell*.

Turban SHELL. See TURBAN *Shell*.

Turnep SHELL. This is a species of sea Shell, by others called the radish Shell. It is exactly of the shape of a turnep, and is of the dolium, or concha globosa kind. Those who have called it the radish Shell allude to the great black round-rooted radish, not to our common radish.

SHELL-*apple*, in zoology, an English name for the loxia or crossbill; given from his manner of splitting an apple, and feeding on the kernels, leaving the Shell of the pulp untouched. *Ray's Ornithology*.

SHELL-*drake*, in zoology, a common English name for the tadorna.

SHELL-*fish*. These animals are in general oviparous, very few instances having been found of such as are viviparous. Among the oviparous kinds, anatomists have found that some species are of different sexes in the different individuals of the same species, but others are hermaphrodites, every one being in itself both male and female: in both cases their increase is very numerous, and scarce inferior to that of plants, or of the most fruitful of the insect class. The eggs are very small, and are hung together in a sort of clusters by means of a glutinous humour, which is always placed about them, and is of the nature of the jelly of frogs spawn; by means of this they are not only kept together in the parcel, but the whole cluster is fastened to the rocks, Shells, or other solid substances, and thus they are preserved from being driven on shore by the waves, and left where they cannot succeed. *Langius, Method. Testac.*

SHELL-*gall insect*, an insect of the gall-insect class, somewhat resembling those which are called the boat-fashioned ones, but differing in this, that, as the two ends of that species are not very different in form, in this kind one of the ends is sharp and pointed in comparison with the other. It has its name of Shell-insect, from the resemblance it bears to a muscle Shell; as it is, in its whole form, not unlike one of the two Shells, in which the common sea-muscle is inclosed; but the pointed end of this insect is much more extended in length, than the smaller end of this Shell.

SHETLIE,

SHE'LTIE, the name of a small, but strong kind of horse, found in the Island of Zetland, commonly called Shetland. In the country, the price of one of these horses is about a guinea. *Phil. Transf.* N°. 473.

SHE'RIF, in the Egyptian orders, the relations of Mahomet, the same tribe of persons called emir by the Turks.

SHIELD (*Dict.*)—People have at all times thought this honourable piece of armour the properest place to engrave or figure on the signs of dignity of the possessor of it; and hence, when arms came to be painted for families in after times, the heralds always chose to represent them upon the figure of a Shield, but with several exterior additions and ornaments, as the helmet, supporters, and the rest. *Nisbet's Herald.*

The form of the Shield has not only been found different in various nations, but even the people of the same nation, at different times, have varied its form extremely; and among several people there have been Shields of several forms and sizes in use, at the same period of time, and suited to different occasions. *Baron's Heraldry.*

The most antient and universal form of Shields, in the earlier ages, seems to have been the triangular. This we see instances of in all the monuments and gems of antiquity: our own most early monuments shew it to have been the most antique shape also with us, and the heralds have found it the most convenient for their purposes, when they had any odd number of figures to represent; as if three, then two in the broad bottom part, and one in the narrow upper end, it held them very well; or, if five, they stood as conveniently at three below, and two above. The other form of a Shield, now universally used, is square, rounded and pointed at the bottom: this is taken from the figure of the Samnitic Shield used by the Romans, and since copied very generally by the English, French, and Germans. The Spaniards and Portuguese have the like general form of Shields, but they are round at the bottom without the point; and the Germans, besides the Samnite Shield, have two others pretty much in use: these are, 1. The bulging Shield, distinguished by its swelling or bulging out at the flanks; and, 2. The indented Shield, or Shield chancrée, which has a number of notches and indentings all round its sides. The use of the antient Shield of this form was, that the notches served to rest the lance upon, that it might be firm while it gave the thrust; but, this form being less proper for the receiving armorial figures, the two former have been much more used in the heraldry of that nation.

Besides this different form of the Shields in heraldry, we find them also often distinguished by their different positions, some of them standing erect, and others slanting various ways, and in different degrees. This the heralds express by the word pendant, hanging, they seeming to be hung up not by the center, but by the right or left corner. The French call these ecu pendant, and the common antique triangular ones ecu ancien. The Italians call this scuto pendente, and the reason given for exhibiting the Shield in these figures in heraldry is, that, in the antient tilts and tournaments, they who were to just at these military exercises, were obliged to hang up their Shields, with their armories or coats of arms on them, out at the windows and balconies of the houses near the place; or upon trees, pavilions, or the barriers of the ground, if the exercise was to be performed in the field.

Those who were to fight on foot, according to Columbier, had their Shields hung up by the right corner, and those who were to fight on horseback, had theirs hung up by the left. This position of the Shields, in heraldry, is called couché by some writers, though by the generality pendant. It was very frequent, in all parts of Europe, in arms given between the eleventh and fourteenth centuries. But it is to be observed, that the hanging by the left corner, as it was the token of the owners being to fight on horse-back, so it was esteemed the most honourable and noble situation, and all the pendant Shields of the sons of the royal family of Scotland and England, and of our nobility at that time, are thus hanging from the left corner. The hanging from this corner was a token of the owner's being of noble birth, and having fought in the tournaments before; but no sovereign ever had a Shield pendant any way, but always erect, as they never formally entered the lists of the tournament.

The Italians generally have their Shield of arms of an oval form: this seems to be done in imitation of those of the popes, and other dignified clergy; but their herald, Petro Sancto, seems to regret the use of this figure of the Shield, as an innovation brought in by the painters and engravers, as most convenient for holding the figures, but derogatory to the honour of the possessor, as not representing either antiquity, or honours won in war, but rather the honours of some citizen, or person of learning. Some have carried it so far, as to say that those, who either have no antient title to nobility, or have sullied it by any unworthy action, cannot any longer wear their arms in Shields properly figured, but were obliged to have them painted in an oval, or round Shield. In Flanders, where this author lived, the round and oval Shields are in the disrepute he speaks of; but in Italy, besides the popes and dignified prelates, many of the first families of the laity have them. The secular princes, in many other countries, also retain this form of the Shield, as the most antient, and truly expressive of the Roman clypeus. *Nisbet's and Compe-mille's, Herald.*

SHI'NGLING, in the iron-works in many parts of England, is the operation of hammering the sow, or cast-iron, into blooms. The tongs, used for holding the iron in this operation, are called Shingling-tongs, and the iron to be thus wrought is called a loop. *Ray's English Words.*

SHIP (*Dict.*) It is highly necessary, to the health of seamen, that Ships should be cleared of foul air; for it has been found by frequent experience, that air shut up, and confined in a close place, without a succession and fresh supply of it, becomes unwholesome, and unfit for the use of life. This is more sensibly so, if any stagnating water be pent up with it. But it grows still worse, if such an air as this is made use of in respiration; that is, becomes moister and hotter, by passing and repassing through the lungs. These bad effects in different degrees, according to the different manner in which air is inclosed, are observed in many cases; particularly in deep wells and caverns of the earth; in prisons, or close houses, where people are shut up with heat and nastiness: but most of all in large Ships, in which, with the stench of water in the hold, many men being crouded up in close-quarters, all the mentioned circumstances concur in producing greater mischiefs than would follow from any of them single.

Mr. Sutton did therefore, a few years ago, propose, in order to clear the holds of Ships of the bad air they contain, that the fire-place and ash-place of the copper or boiler should be both closed up with substantial and tight iron doors; and that a copper, or leaden pipe, of sufficient size, should be laid from the hold into the ash-place, for the draught of air to come in that way to feed the fire. And thus, from the natural elasticity of the air, it seems plain, that there will be from the hold a constant discharge of the air therein contained: and consequently, that the air so discharged must be as constantly supplied by fresh air below the hatches, or such other communications as are open into the hold; whereby the same must be continually made free, and its air rendered more wholesome, and fit for respiration. And if into this principal pipe, so laid into the hold, other pipes are let in communicating respectively either with the well, or lower decks, it must follow that part of the air, consumed in feeding the fire, must be respectively drawn out of all such places, to which the communication shall be so made. *Philos. Transf.* N°. 462.

SHIP, in the salt-works, is a large cistern, out of which the salt-pans are supplied for boiling.

This cistern is close built to the saltern, and is made either of wood, brick, or clay; and it ought always to be covered with a shed, that the sea-water, contained in it, may be kept clean from soot and other impurities, and not mixed with fresh water in rains; and it must be always placed so high, that the water will easily run out of it into the pans to supply them for boiling.

SHIP-*building*, the art of designing, constructing, and forming Ships.

Shipwrights, in delineating the models of ships, make use of three planes, which they call the sheer-plane, the floor-plane, and the body.

The sheer-plane is the same with that of elevation, being a section of a Ship supposed to be cut by a plane passing through the middle line of the keel stem and stern-post.—The floor plane is the same with the horizontal, and is that on which the whole frame is erected.—The body is the same with the profile; being a section supposed to cut the Ship through the broadest place, and is perpendicular to the sheer and floor planes.

The length of the keel, extreme breadth, depth in the hold, heighth between decks, and in the waist, and sometimes the heighth of the wing transom, are agreed on by contract in the merchants service, from which dimensions the builder is to form a draught suitable to the trade the ship is designed for. The first thing that is generally done, is to lay down the keel, stem, and post, upon the sheer planes: then to determine the proper station of the mid-ship timber, where a perpendicular is erected: it is generally about ⅓ of the keel before the post. On this line the given depth of the hold is set off from the upper side of the keel; to obtain which point, the thickness of the timber and plank must be added to that agreed on by contract. This, being fixed, will enable us to determine the upper heighth of the extreme breadth at that place, which sometimes is the very point itself. The lower heighth of the breadth must likewise be determined at this place. Then we may form the two main heighths of the breadth lines which nearly unite abaft and afore. Abaft these curves end at the wing transom, or above it; and, afore, they are carried up sometimes as high as the hawse holes. The heighth of the breadth line of the top timber must likewise be formed. This is generally done by a bow, which makes nearly an arch of a circle. It is limited in mid-ships by contract, afore and abaft only by the fancy and judgment of the artists, according to what sheer he designs; we must also form a line for the rising of the floor; for which purpose we must determine the dead rising, which is that of the mid-ship timber. This limits it at that place, and, in the whole moulding, it is pretty near parallel to the lower heighth of the breadth lines. These lines must absolutely be drawn on the sheer

sheer plane, and corresponding to the main and top timber heighths of breadth lines; there must be two half breadth lines formed on the floor plane.

The main half breadth at the mid-ship timber is agreed on by contract, only observing that the thickness of the timber and plank must be deducted out of it, because it is the extreme breadth from outside to outside of the plank that is contracted for. Those in the draughts are called moulded half breadths. Then the breadth at the wing transom, if a square stern, is limited; it is generally about two thirds of the extreme breadth, but this is just as the artist shall think proper. He also fixes the breadth of the top timber, and then describes the two half breadth lines. In the due formation of these curves on the sheer and floor planes, the whole art of drawing chiefly consists; which must be acquired by practice, so that it will be scarce possible for one, that is not very well acquainted with drawing, to form them, without having recourse to some other draughts. After these are formed, the stations of the timbers are fixed; if the room and space, and the breadth of the mid-ship timber, are agreed on by contract, this will determine the station of all the timbers; observing that the timbers abaft the mid-ships must be set off from the foreside of the midship timber; and the timbers before the midship from the aft side of it. At every third or fourth timber there must be perpendiculars drawn on the sheer and floor planes, to the line that represents the lower edge of the keel, which is the common section of these two planes; though sometimes the half breadth lines are described on the sheer plane, when there is not space to produce the perpendiculars till they be of sufficient length to contain the heighth of the breadth and half breadth.

After the timbers are stationed, and the perpendiculars for the frames drawn on the sheer and floor planes; we proceed to the body plane, and draw a line equal in length to the whole breadth moulded. This line may be called the base of the body plane. A perpendicular is erected at each end of it, and one in the middle, which may be produced at pleasure. The next thing to be done, is to form the midship frame: the limits of it are had from the sheer and floor planes; the lower, upper, and top timber heights of the breadth are taken from the sheer plane at the perpendicular, representing the midship frame, and set off on the middle line of the body plane from the base. Through these points, lines are drawn parallel to the base, and the respective half breadths, corresponding to each, are set off on these lines from the middle line in the body plane. The lower and upper main half breadths are limited by the perpendiculars already drawn at each end of the base. The half breadth of the top timber is had from the floor plane on the perpendiculars representing the midship frame. The heighth of the dead rising is likewise taken from the sheer plane, and set up from the base upon the middle line in the body plane, through which point a line parallel to the base must be drawn, and upon this line the half breadth of the floor is set off from the middle line; at which point a perpendicular is erected. The center of the floor sweep is in this line, from which a circle must be described that shall just touch the rising line. A proper radius for the under breadth sweep is next to be found: the center of it is in the lower breadth line, from which it is described to pass through the point which limits the half breadth. After which the radius, and center of a reconciling sweep to join the floor and under breadth sweeps, is found, and the circle described; and, to compleat the frame below the breadth, the half breadth of the keel is set off from the middle line on the base; from which point, a straight line is drawn to touch the back of the floor sweep.

By this way of forming the frame, it is plain the centers and radii of the sweeps are arbitrary, but they must be determined before any of the other timbers can be formed; if by no other means, by repeated trials, till they are made to please the fancy and judgment of the artist. But there are various other ways of forming this frame; so that, though several ships may be of the same breadth, depth in the hold, and dead rising, they may all differ in the form of their timbers. After this midship timber is formed, a pattern or mould is made to fit exactly to the curve, and the dead rising line. By this, and a hollow mould, all the timbers are formed, so far as the rising line and lower heighth of the breadth line are parallel to one another in the sheer plane.

Having explained what the Ship-wrights call whole moulding, we shall proceed to shew the method of forming the body by sweeps.

In Ships of war the general dimensions are established by the authority of those appointed by the government for that purpose. The sheer and floor planes are laid down in this, exactly in the same manner as in that of the whole moulding. We may have a sufficient number of points from the dimensions settled by authority to determine the heighths of the breadth and half breadth lines. A rising of the floor line must likewise be formed on the sheer draught. We may then go to the body plane, and form the midship bend or frame timber; the limits of which we have from the sheer and floor planes, and it must be formed in the same manner as before directed in whole moulding, either by two, three, or more sweeps, as the artists shall think most suitable to the service the ship is designed for. The lower, upper, and top timber heighths of breadth, and risings of the floor are set up on the middle line in the body plane, as in whole moulding, and lines drawn through these points parallel to the base upon which the half breadths are set off. A mould may then be made for the midship frame as before, and laid upon the several risings in the same manner as in whole moulding, with this difference, that here an under breadth sweep is described to pass through the point which limits the half breadth of the timber; the center of which will be in the breadth line of that timber. The proper centers for all the frames being found, and the arches described, the bend mould must be so placed on the rising line of the floor, that the back of it may touch the back of the under breadth sweep. But the general practice is to describe all the floor sweeps with compasses as well as the under-breadth sweeps, and to reconcile these two by a mould which is an arch of a circle; its radius being the same with that of the reconciling sweep, by which the midship frame was formed. It is usual for all the floor sweeps to be of one radius; and, in order to find their centers, a line is formed on the floor plane for the half breadth of the floor: this, as was before observed, is only an imaginary one; for it cannot be described on the surface of the ship: instead of it some make use of a diagonal in the body plane, to limit the half breadth of the floor upon every rising line, and erect perpendiculars at the several intersections in the same manner as for the midship frame, as in the draught; where it is very plain the floor sweep constitutes no part of the after timbers abaft the square body. After the sweeps are all described, we must have recourse to moulds, or some such contrivance, to form the hollow of the timbers, much in the same manner, as in whole moulding; and, when we have thus formed all the timbers, they must be proved by ribband and water-lines, as before directed; and altered, if needful, to make these lines fair: hence it is obvious, that the form of the ribband lines must be determined, before we can with certainty have the true form of the timbers. But there will be a necessity of determining, at least, the form of three timbers, viz. the midship, foremast, and aftermost, before we can form a ribband line. These will give three points, through which the curve of each ribband must pass. The points in the intermediate timbers may be found by forming timbers as before directed; but by repeated trials, altering them till they make fair ribbands; for it is by them that the whole structure is regulated, when every frame is erected into its proper place.

The ingenious Mr. Mungo Murray has invented a new sector, by which the difficulties attending laying down ships is greatly facilitated, the construction of which the reader will find under the article SHIP WRIGHT'S SECTOR. Its uses are as follows:

The general dimensions being determined, and a scale adapted to the draught, take the half breadth with a pair of compasses, and placing one foot in the proper point for the half breadth of ⊕, which will be found in number V. open the sector till the other foot reaches to the same point in the corresponding line on the other leg.

The sector being thus set, it will be indifferent whether we begin with the body or sheer plane: let it then be the sheer.

First, draw the line X Z (*Plate* XLI. *fig.* 4.) to represent the upper edge of the keel, and length of the gun-deck; but it may be produced to the aft side of the wing transom, and fore part of the stem.

Secondly, erect a perpendicular to the line X Z, upon which set up the heights of the wing transom to W; taken from N°. IV. on the sector.

Thirdly, take the rake of the post from number VII. on the sector, and set it forward from the perpendicular of the wing transom to the point 7, where a perpendicular must be erected, which will be the station of that timber.

Fourthly, take the distance of the frames from number III. on the sector, and set it off from 7 to 8; and erect a perpendicular at that point for timber 8. Draw also a line from 8 to the wing transom, to represent the fore-part of the post.

Fifthly, take the heighth and rake of both counters, also the rake of the stern timber, from number II. The heighth of the stern timber is on number I, and by these form the counters, and upright of the stern.

Sixthly, station the timbers, by taking the distance between the perpendiculars at 7 and 8; which at eight times will reach to ⊕; and erect perpendiculars at 5, 3, and ⊕. Then, for stationing the timbers in the forebody, we must turn the sector, and take the distance of the frames from number III, which, set eight times from ⊕, will reach to H. Erect perpendiculars at C, E, G, and H; and from G set off the distance of the gun-deck before G. It is in number I. on the sector, which will reach to Z; at which point erect a perpendicular, and set off the height of the gun-deck, taken from the sector; and from the gun-deck set up the height of the head of the stem, also its distance before G; both taken from number I. We may then form the stem. The center of the sweep is in the perpendicular of timber F, and the radius of the sweep is upon the sector between numbers III. and IV, which, set up from the point F, will give the center: so the sweep will just touch the upper edge of the keel in the point F. And, as the sweep will not reach to the gun-deck, we must make use of a mould to break in fair with the back of the sweep.

Seventhly,

Seventhly, fet up the heighths of the lower, upper, and top timber breadth lines upon the perpendiculars erected for the ftations of the feveral timbers. The points, correfponding to each, are on their proper lines on the fector.

Having thus finifhed the fheer plane, we may then go to the floor plane; and, producing all the perpendiculars for the timbers, we may upon them fet off the main and top timber half breadths. The points correfponding to each are on their proper lines upon the fector; which muft be fet off from the line W K, reprefenting the lower fide of the keel, and may be produced both ways, as far as fhall be needful. We muft in the next place form all the ribband lines, which are the dotted ones in the draught; beginning with the fourth ribband. But it will be more expeditious, firft, to draw all the diagonals in the body plane.

Let A B be the whole breadth, on the middle of which erect the perpendicular K O; fo fhall A K, or K B, be the half breadth. Upon the line K O, fet up the feveral heighths of the breadth lines, taken from the fheer plane, and draw lines parallel to the bafe, as has been already directed; and likewife fet off the half breadths correfponding to each, taken from the floor plane. We may alfo fet off the heighth and half breadth of the wing tranfom; all which may be done without the fector; but we muft have recourfe to it for the dead rifing. This is in number III, in the after body, and muft be fet off upon the line K O, from the lower heighth of breadth to *i*. Through *i* draw the line *r i s*, parallel to the bafe, and fet off the one half breadth of the floor from *i* to *r*, and from *i* to *s*: it is upon number VII. on the fector. Then, taking *r i*, fet it up from *i* upon the line K O, to which point draw the dotted diagonal marked R 1ft. This regulates all the other diagonals: for, if one line be drawn from the point of this interfection, with the middle line, to the half breadth of the wing tranfom; and another from the point *r*, its interfecting with the rifing line, to the point ⊕, at the lower heighth of breadth; each of thefe may be divided into four equal parts by the dotted diagonals 2^d R^d, 3^d R^d, 4^{th} R^d.

Note, the lines from the ends of the firft diagonal to the lower heighth of breadth, and to the wing tranfom, were drawn only with a black lead pencil, and wiped out after the diagonals were drawn. The diagonals being thus drawn, we may form the midfhip frame, for which purpofe we muft find a point in each diagonal, through which the curve of the timber muft pafs. Thefe points we have from the fector; which muft be fet off from the interfections of the diagonals with the line K O. That in the firft diagonal is in number I. The point in the fecond diagonal is in number VI. The point in the third diagonal is in number V. And the point in the fourth diagonal is between numbers I and II. This laft muft be doubled, becaufe the fector will not contain the whole length. The midfhip frame being formed, we muft in the next place form the after and foremoft timber; which the fector does, by giving the diftance on every diagonal between thefe timbers, and the midfhip frame now formed: fo that we fhall have a point in each diagonal, through which the curve of the timber muft pafs. To find the point in the firft diagonal for the after timber, extend 1ft, from ⊕ R in number V, to the correfponding point on the other leg. Set off this diftance from ⊕ on the firft diagonal: do the fame upon the fecond, third, and fourth diagonals. The point on the fecond diagonal is in number IV. That on the third in number VI. And that on the fourth in number VII. The curve muft pafs through thefe points, and likewife through the point for the half breadth, which was before fet off from the fheer and floor planes; by which means we have determined the form of the after timber; and the foremoft timber is to be formed by the fame method. Thefe two timbers being formed, we may find points in the diagonals for all the intermediate timbers. Thus, to find the point for timber 3 in the firft diagonal, extend from the point 3 in the inner part of the line number V. to its correfponding point on the other leg. Set off this in the firft diagonal from the after timber, already formed; which will give the point through which timber 3 muft pafs; and, to find the point in the fecond diagonal, we muft extend from 3 in the inner part of the line number IV, and fet off this diftance in the fecond diagonal from the after timber. The fame method muft be ufed to find the points in the third and fourth diagonals. In like manner we may find a point in each diagonal for the timbers 5 and 7, which will be fufficient for the after body: and the fame procefs muft be ufed to find points in each diagonal for the timbers in the fore body.

Having now found the points, before we form the timbers, it may be proper, by them, to form the ribbands: for now we may take the diftance of each point in the diagonal, from its interfection with the middle line K O, and transfer it to the floor plane upon the perpendiculars that reprefent the planes of the timbers, as before directed. In order to limit the ends of the ribband lines on the floor plane, we muft fet off half the thicknefs of the poft, on one fide of the middle line K O, and half the thicknefs of the ftem on the other fide of it, on the body plane; firft deducting the depth of the rabbet out of it. We muft likewife determine the inner part of the rabbet on the ftem, and upon the poft in the fheer plane. In the ftem, it is generally in the middle between the lines that reprefent the outfide of the rabbet. It may be alfo fo on the poft, from the wing to the lower tranfom; and from thence the line may be continued fair to interfect the line that reprefents the after fide of the rabbet, at the upper edge of the keel; for there the rabbet is cut fquare into the poft.

Now, it is obvious that, when the plane of any diagonal ribband is in its proper place and pofition, the line W K will be in the fheer plane, parallel to the upper fide of the keel; and its heighth will be the fame with that of the point where the diagonal interfects the middle line in the body plane. But by reafon of its inclination, and of the half thicknefs of the ftem and poft, the heighth of the plane of the ribband upon the poft and ftem will be in the point where the diagonal interfects the line that reprefents the rabbet in the body plane. This then muft be transferred from the body to the fheer plane, and fet up from the upper edge of the keel upon a perpendicular that will interfect the line that reprefents the infide of the rabbet at that heighth. This perpendicular may be produced into the floor plane; and, if that part of the diagonal intercepted between the middle line, and the line that reprefents the infide of the rabbet, in the body plane, be fet off upon the perpendicular, it will give the proper point for the end of the ribband line, as may be feen in the plate; where all the ribbands are dotted lines, and they are marked 1ft D R, 2d D R, &c.

Note, the fcale in the plate is fo fmall, that we have taken the outfide of the rabbet to limit the end of the ribband.

The ribbands being thus formed, we may from them form all the timbers below the breadth.

The next thing to be done, is to form the top timbers. We have the heighth and half breadth of each from the fheer and floor planes; and the timbers below the breadth are carried up by a fweep, which forms the lower part of the top timber. The center of this fweep is in the upper heighth of the breadth line of the timber, and may be taken from the fector: it is on number III. after body. The midfhip top timber has generally a hollow, which is left intirely to the artift; for fome, efpecially fmall Ships, have none. The general practice is to make a mould for this hollow, either by a fweep, or fome other contrivance, and produce it confiderably above the heighth of the top timber in a ftraight line, or very near one. The midfhip timber is formed by this mould, and fo placed, that it breaks in fair with the back of the upper breadth fweep. All the other timbers are likewife formed by the fame mould; obferving to place it fo that the ftraight part of it may be parallel to the ftraight part of the midfhip timber; and moved up or down in that direction till it juft touches the back of the upper breadth fweep. Some begin at the after timber after the mould is made for the midfhip one, becaufe they think it eafier keeping the ftraight part of the mould parallel this, than to the midfhip timber; and by this means the top fide is kept from winding. Others again make a mark upon the mould where the breadth line of the midfhip timber croffes it, and with the fame mould they form the after timber. This will occafion the mark that was made on the mould, when in midfhips, to fall below the breadth line of the after timber; and fo another mark is made at the heighth of the breadth of the after timber.

The next thing to be done, is to lay the ftraight part of the mould obliquely acrofs the breadth lines of the top timbers in fuch a manner that it may interfect the breadth line of the midfhip timber at one of thefe marks, and the breadth line of the after timber at the other mark. Then the feveral interfections of the breadth lines of the timbers are marked upon the mould. The mould, being thus marked, muft be fo placed in forming each timber, that the proper mark may be applied to its proper breadth; and the mould be turned about fo as juft to fweep the upper breadth fweep. Any of thefe methods may make a fair fide; but it may be eafily proved by forming another half breadth line.

Hitherto, we have confidered the timbers, as having their planes perpendicular both to the fheer and floor planes. Thefe are called fquare timbers; and, when they are all formed, we may from them form as many ribband and water lines as fhall be neceffary to form the cant timbers. Their planes are inclined to the fheer, but perpendicular to the floor planes. The reafon of canting thefe timbers is that they may nearly be equally fpaced at the breadth ribband: for, if the poft has a confiderable rake, and the timbers all fquare, there will be a great fpace at the breadth ribband, between timber 8 and the wing tranfom: befides, the timber may be fo canted, that it may be fquare to fome of the ribbands; whereas, if they were perpendicular to the fheer plane, they would interfect the ribband lines fo as to form very oblique angles; which would occafion very great bevelling. Another advantage that attends canting the timbers, is that they will not require fuch compafs timber.

It is ufual to begin the cant timbers from the aftermoft floor timber, and fpace them near equally on the breadth line to the wing tranfom: and, in order to fpace them upon the keel, the cant of the fafhion piece muft be determined. Now, if we fuppofe the plane of the fafhion piece to interfect the fheer and floor planes in the point F, it muft interfect the floor plane in the line F P, becaufe the point P is fuppofed to be the end of the wing tranfom. So the angle *s* F P will be its inclination to the ſheer plane. It will interſect the ſheer plane in a perpendicular erected from the point F; and, if the ſpace between the point F and the foremoſt cant timber upon the keel, be divided into the ſame number of equal parts, that the ſpace between the ſame timber, and the wing tranſom upon the breadth line, is divided into; this will determine the cant of all the timbers only by drawing lines from all points in the line W K, to the correſponding points in the breadth line, in the ſame manner as the line F P determines the cant of the faſhion piece.

It would be needleſs to draw all theſe lines in the plate, the only intent of drawing them being to ſhew how to form the timbers by them: and as one method ſerves for all the cant timbers, which are ſuppoſed perpendicular to the floor plane, it will be ſufficient to ſhew the formation of the faſhion piece.

Before any of the cant timbers can be formed, there muſt be a ſufficient number of water lines, or diagonal and horizontal ribband lines, formed from the ſquare timbers; and, when theſe are abſolutely determined, we may, with certainty form all the cant timbers, either by water, or ribband lines.

If we make uſe of the diagonal ribbands, which are diſtinguiſhed by the dotted curves in the floor plane, we muſt form an horizontal ribband correſponding to each. We have only laid down one of theſe horizontals in the plate, viz. that correſponding to the third diagonal: it is marked 3ᵈ H R. To form this ribband, fix one foot of the compaſſes in the point where the third diagonal interſects the midſhip frame in the body plane; and extend the other foot to touch the middle line K O; ſo that, if a line were drawn from one foot of the compaſſes to the other, it would be perpendicular to the line K O: this diſtance ſet off from the line W K, upon the perpendicular that repreſents ⊕ in the floor plane, will give the point thro' which the curve muſt paſs at that place. The ſame method muſt be uſed for finding the points on all the other timbers.

Now, though the diagonal and horizontal ribbands ſeem to be quite different curves in the plates, they will make but one line upon the timbers; for the one interſects them in a direction perpendicular to the ſheer plane, and the other is ſo inclined as to interſect the timbers in the very ſame points. The horizontal one is too ſhort upon the plate, but the true length of it might eaſily be had by transferring to the ſheer plane the ſeveral heighths at which the diagonal interſects the timbers in the body plane. By theſe we might form a heighth of breadth line to correſpond to this horizontal ribband, which is only a half breadth line; and the length of this heighth of breadth line may be taken by a penning batten, and all the timbers marked upon it. Now, when the batten is applied to a ſtraight line, and all the timbers transferred to this line from the batten, we may erect perpendiculars at each, and ſet off the ſame half breadths as before; by which means we may have the true length of the horizontal ribband: but, as this will be of no manner of ſervice, we ſhall omit forming it. We only mention it, becauſe ſeveral imagine theſe two curves to be as different on the ſurface of the Ship as they are upon the draught. The horizontal ribband correſponding to the firſt diagonal one is formed to timber 7, and marked 1ſt H R; but the horizontals for the ſecond and fourth diagonals were formed by a black-lead pencil, and only the point in which they interſect the line F P, is in the plate; which is ſufficient for our purpoſe.

There are likewiſe five water lines formed, four of which are repreſented by level lines in the body plane, and by lines parallel to the keel in the ſheer plane: three of them repreſent the planes of the tranſoms in the ſheer plane, viz. Dᵏ. 1ſt, 2ᵈ: but the plane of the third tranſom is perpendicular to the poſt. The lower water line is drawn parallel to the keel from the ſtem to the poſt, and produced into the body plane, as in the plate, where it is marked M N: the plane of the third tranſom interſects the timbers at different heighths, which are transferred from the ſheer to the body plane, where it forms a curve.

The water lines being now drawn in the ſheer and body plane, our next buſineſs is to form them in the floor plane, where they will be curves. The points through which the curve of the lower water line is to paſs, are had by transferring the ſeveral portions of the level line, intercepted between the line K O, and the curve of each timber, from the body plane to the correſponding perpendiculars in the floor plane, where it is marked *Watʳ* L. It muſt be obſerved that the line K O, in the body plane, repreſents the ſeveral perpendiculars that are drawn in the ſheer plane to repreſent the planes of the timbers: for the ſpaces in the body plane, contained between the line K O and the curves of each timber, are ſo many different planes; and, when in their proper places, they will be parallel to one another, if perpendicular to the ſheer and floor planes. Thus the plane contained between the line K O, and the curve of timber ⊕ is (when in its proper place) ſuppoſed to be erected perpendicular to the ſheer plane, in the line which repreſents the plane of ⊕; and the like may be ſaid of all the reſt.

The planes of the cant timbers will not be parallel to one another, becauſe they are differently inclined to the ſheer plane; but, as they are perpendicular to the floor plane, they will interſect the ſheer plane in a line perpendicular to the keel: ſo the plane of the faſhion piece interſects the ſheer plane in the dotted perpendicular, erected from the point F, which is the ſame with the line K O, in the body plane. We thought it neceſſary to take notice of this, becauſe ſome who are learning to draw, miſtake the line K O; for they imagine it only repreſents the poſt or ſtem.

Another error which they frequently fall into, is about forming the water lines when their planes are not parallel to the keel. They imagine that the half breadths muſt be ſet off from the line W K which repreſents the lower edge of the keel; whereas it is indifferent what ſtraight line they are ſet off from, ſo the timbers be exactly ſpaced, and perpendiculars drawn to repreſent their planes. Now, when the water lines are ſuppoſed parallel to the keel, the timbers are properly ſpaced, and the perpendiculars ready drawn to the line W K; which is the reaſon it is uſed in ſuch caſes: Though, when the plane is in its true place, the line W K will be in the line M N. But the caſe will be quite different when the water lines are not parallel to the keel; for then their planes will interſect the ſheer plane in a ſtraight line, forming oblique angles with the planes of the timbers; this is the caſe in the plane of the third tranſom. The diſtances between the timbers will be more in this line than in the line W K; ſo the half breadths cannot be ſet off from the line W K, upon the perpendiculars that repreſent the planes of the timbers, unleſs they be properly ſpaced at the ſame diſtance they are upon the line that repreſents the plane of the third tranſom in the ſheer plane; upon which account we have made uſe of that line to ſet off the half breadths from, and drawn the dotted perpendiculars at the points where it interſects the planes of the timbers 8, 7, and at the point where it interſects the lower heighth of breadth line. The heighths of the points of interſection are transferred from the ſheer to the body plane; and the half breadths, at theſe heighths, transferred from the body plane to the dotted perpendiculars before drawn: the half breadth to be ſet off upon the perpendicular where it interſects the lower height of breadth line, is had from the floor plane, and the dotted perpendicular *a a* will ſhew the place where the half breadth muſt be taken: this perpendicular, if produced, will interſect the plane of the third tranſom in the lower height of breadth.

Having now formed four diagonal ribbands with their correſponding horizontals, and alſo two water lines; we may, by theſe, form the faſhion piece, either upon the body plane or ſheer plane; but, as the plane of the faſhion piece is parallel to neither of theſe, it will require two operations.

Now the line F P will interſect all the ribband and water lines; but, becauſe the diagonal ribbands are not in their proper poſition, the line F P will not interſect them in the point where the plane of the faſhion piece interſects them. The firſt thing then to be done, is to find the true place of the faſhion piece on each diagonal ribband: and firſt, to find its place upon the fourth diagonal ribband, from the point *t*, where the fourth horizontal ribband interſects the line F P, let fall a perpendicular to the point *s*, and produce it to interſect the diagonal ribband in *r*; ſo ſhall *r* be the true place of the faſhion piece upon that ribband; that part of the perpendicular between *t* and *s* is not drawn in the plate to avoid the confuſion of too many lines. The reaſon of this will be very evident, if we ſuppoſe the whole plane of the ribband to be turned round upon the axis W K; for then the point *r* will always be right over ſome point of the perpendicular *r t s*; and, when the ribband is in its proper inclination, a perpendicular from *r* will fall into the point *t*, and the plane of the faſhion piece will interſect the floor plane in the line *t* F, and the plane of the diagonal ribband in a ſtraight line drawn from *r* to F: for it muſt be obſerved that, when the ribband is in its proper place, the line W K will be in the ſheer plane, in a line parallel to the keel; the height of which may be had from the body plane. In this caſe it will be the diſtance between K and *r*, but it will be needleſs to draw this line in the plate.

Having now found the place of the faſhion piece on the fourth diagonal ribband, we muſt by the ſame method find its place on the other diagonals, as in the plate, where lines perpendicular to W K are drawn to the points *o*, *o*, *o*, in the diagonal ribbands, from the points where the line F P interſects the correſponding horizontal ribbands.

Theſe points being now found, we may take the neareſt diſtance of each point to the line W K, and ſet off thoſe diſtances on the proper diagonals in the body plane. Thus, for the fourth ribband, place one foot of the compaſſes in the point *r*, and the other in the point *s* in the floor plane; and ſet off that diſtance from *r* to S, on the fourth diagonal in the body plane: do the ſame by all the reſt of the diagonals; and a curve interſecting the diagonals in theſe points would be the projection of the faſhion piece in the body plane, but we have not drawn this in the plate; for, as the plane of the faſhion piece is not parallel to that of the body plane, its projection will be leſs than the original: however this may be found by the following method:

Firſt, draw a perpendicular to the line K O, in the body plane, to paſs through the point S to F.

Second, take the diſtance from *r* to F, in the floor plane, and ſet it off from *r* to F, in the body plane. In like manner draw perpendiculars to the line K O, in the body plane, through the points before found on the diagonals, as in the plate, where only

only that part of the perpendicular is drawn which lies without the diagonal; and take the several distances between the points *o* and F, in the floor plane, and set them off from the intersections of their corresponding diagonals, with the line K O, to the points *o*, *o*, in the body plane: so we have the points *o*, *o*, F, through which the curve must pass.

Thirdly, to find the point P in the body plane, through which the curve must pass, transfer the point P in the floor plane, to the point P, in the sheer plane, by a perpendicular to the line W K, to intersect the height of breadth line in the point P; and set off this height upon the line K O, in the body plane, which will be a little above W, the height of the wing transom: draw a perpendicular at this point, to the line K O; take the line F P, in the floor plane, and set it off upon this perpendicular, from the line K O, to the point P: so shall the curve P F *o o* be the form of the fashion piece.

These points may all be found without the diagonal ribbands, by half breadth lines and water lines, formed on the floor plane; as, for instance, to find the point F, place one foot of the compasses in *t*, the point where the horizontal ribband intersects the plane of the fashion piece, and the other in *s*; *t s* being perpendicular to W K: with that extent, move the compasses with one point in the line K O, and the other point perpendicular to it, till it intersect the fourth diagonal, in the point S; through which draw the perpendicular *t* F. Then take the distance from *t* to F, in the floor plane, which set off from *t* to F, in the body plane; so shall F be the point required, as before: in like manner the points *o*, *o*, may be found: but this, as well as the other method, requires two operations; whereas, if several water lines were formed, with their planes parallel to the keel, we might find the points by one operation. Thus, suppose it was required to find a point in the level line, that represents the plane of the water line formed in the floor plane, which is marked *Wat.^r* L, fix one foot of the compasses in the point *f*, where the line F P intersects the water line in the floor plane, and the other foot in the point F. Set off this upon the level line in the body plane, from the line K O to *f*, which will be the point required. All the other cant timbers, both in the fore and after body, are formed after the same manner as the fashion piece. We have formed but one more in the plate, which is abaft the fashion piece, to assist us in forming the transoms.

The transoms are fastened to the stern post, in the same manner that the floor timbers are to the keel; and, as the floor timbers have a rising, so likewise have the transoms, which is called the flight; and besides this flight, the wing transom has a round aft, and a round up, both which are arbitrary: the deck transom has a round up, the same with that of the beams: but, in forming the transoms, there is no regard had to the round up; for that may be done by the beam mould, after the transom is properly hewed the moulding way.

In forming the transoms, the first thing to be done, is to assign each its proper place upon the post, and then to determine the position of their planes with respect to the floor plane; for their planes are always perpendicular to the sheer plane. In the plate there are five transoms: their upper sides upon the post are in the points W, D^k, 1^st, 2^d, and 3^d: the planes of the wing, deck, first and second transoms, are supposed parallel to the floor plane, and represented in the sheer plane by lines drawn parallel to the keel from the post, till they intersect the lower height of breadth line; and the plane of the third is represented by a line perpendicular to the post, as in the plate. So it will not be parallel to the floor plane.

The height and position of the transoms being determined, we have no more to do, but to form water lines for each. That for the third we have already formed: the rest, being supposed parallel to the floor plane, may be formed in the same manner as the water line there laid down: the only difficulty will be to find a sufficient number of points to determine their forms; because, in the deck and first transoms, their planes intersect the breadth; so that we could only have a point in timber 8, if the fashion piece and a timber abaft it had not been formed by the ribbands; but, now they are formed, we may have likewise a point in each of their planes, through which the curves of the water lines shall pass.

We shall begin with the wing transom. First, determine the round aft which suppose the line W T, in the floor plane: take its height from the sheer plane, and set it up in the body plane from K to W, and draw the line W T: then take this line W T, and set it off on the floor plane, on the line F P, which will reach to the point *n*. A curve drawn through the point *n*, to break in fair with the breadth line, as in the plate, will intersect the line W T in T; so shall W T *n* be the aft side of the wing transom. Next, for the deck transom, draw a level line in the body plane at the point D^k to timber 8. Set off this distance upon timber 8, in the floor plane, from the line W K; which will give us a point through which the curve must pass: then take the distance in the level line, between the line K O and the curve of the fashion piece; which set off from the point F, upon the line F P, in the floor plane; and this will give another point through which the curve must pass: again, take the distance in the same level line, between the line K O and the curve of the timber abaft the fashion piece; which set off from the point G upon the line G *g*, in the floor plane; and we shall have a third point through which the curve must pass. Lastly, let fall a perpendicular to the line W K, from the point D^k upon the post, and produce it into the floor plane, upon which set off half the thickness of the post, allowing for the rabbet, which will limit the end of the water line that forms the deck transom. After the same manner are the first and second transoms formed, by drawing level lines in the body plane, at their heights upon the line K O.

Now some are apt to mistake these level lines for the lengths of the transoms: the reason, as was before observed, is because they imagine the line K O to be the stern post; whereas it is the perpendicular in which the plane of the fashion piece intersects the sheer plane; and so these lines are drawn upon the plane of the fashion piece.

All that now remains, is to determine the length of each transom; and this is done by the line F P, in the floor plane, which intersects the wing, deck, first and second transoms, to their proper lengths. But, before we can find the length of the third, the plane of the fashion piece must be projected upon the sheer plane: thus, take the nearest distance between any perpendicular in the floor plane, and the point where the line F P intersects the water line; and set that off from the same perpendicular upon the line that represents the same water line in the sheer plane. Now the curve P F will be found to be the projection of the aft side of the fashion piece upon the sheer plane: for the distance between the perpendicular of timber 8, and the point *f*, where the line F P intersects the lower water line in the floor plane, is equal to the distance between the same perpendicular and the curve P F, taken in the line M N. The distance between the perpendicular of timber 8, and the point where the line F P intersects the second water line in the floor plane, is equal to the distance between the same perpendicular and the curve P F, taken in the line that represents the second transom in the sheer plane. And by the same method, we find points in the lines that represent the deck and first transoms. The point P is transferred from the half breadth line in the floor plane, to the height of breadth line in the sheer plane. The curve, being thus drawn, will intersect the line that represents the plane of the third transom, in the point *z*: from which point draw the perpendicular *z* F, to the curve of the dotted water line; so shall 3^d *z*, F, be the true form of the third transom; and a line drawn from F to P will be the plane of the fashion piece. It must be observed that the ends of the transoms are let into the fashion piece; for which there must be a proper allowance left without the lengths found by the line F P. We have in the plate only laid down the half of each transom. Those who incline to lay down the whole transoms, may easily transfer the halfs already described to the other side of the line W F.

Having now formed all the timbers, both square and cant, in the after body; we shall proceed to the fore body. The cant timbers are laid down in the same manner as those in the after body, by the diagonal and horizontal ribbands; where the dotted line K T represents the plane of the knuckle timber, canted upon the floor plane; from whence it is transferred to the body plane, and represented by the dotted curve between timber H and G.

The hawse pieces are seldom laid down in the loft; it being the general practice to make moulds for them after the other timbers are put up, and the harpins are brought about.

As the harpins are leveled across, they will be formed by the section of a plane perpendicular to the sheer plane: but there is no necessity for these sections to be parallel to the keel. In the plate we have drawn only a straight line to represent the plane of the harpin above the wale. It is drawn from the stem to timber E, and marked harpin. Now, in order to form the curve of this harpin, it would be proper to form timber F, in the body plane: also to draw perpendiculars to the several points where the plane of the harpin intersects the planes of the timbers E, F, G, and H, in the sheer plane; and upon these to set off the half breadths corresponding to each, taken from the body plane. This would give us the points through which the curve must pass, which would be a water line. But, as this is performed exactly in the same manner as the water line that represents the third transom, we judge it unnecessary to form it in the plate.

The rails of the head are projected on the sheer plane, according to their true hangings; and, in order to find their true lengths, draw the dotted line S T, parallel to the keel at the height of the rails, upon the head. We must then determine the station of the cat-head upon the floor plane; and likewise the thickness of the head at the rail; and let fall a perpendicular from the point T, where the line S T intersects the cat-head in the sheer plane, to the point T in the floor plane; and likewise a perpendicular from S in the sheer, to S in the floor plane; and draw the line T S: S S, in the floor plane, being half the thickness of the head of the figure at the rail; so shall T S, in the floor plane, be the true length of the rail. Let the line T S, in the sheer plane, be divided into any

any number of equal parts: ſuppoſe into the points *x*, *y*, *z*; from which points draw perpendiculars to the line T S, to be limitted by the rail. Divide the line T S, in the floor plane, into the ſame number of equal parts, in the points *x*, *y*, *z*. Draw perpendiculars to theſe points, and make them equal to the correſponding ones in the ſheer plane; ſo we ſhall have the points through which the curve of the rail muſt paſs.

We have now ſhewn different ways of forming all the timbers; where it muſt be obſerved that we have always ſuppoſed every timber to be one intire piece of wood from the keel to the top of the ſide; whereas, in reality, they are in ſeveral different pieces; the head of the lower piece being cut ſquare to join to the heel of the next above it: and, in order to ſupport theſe joinings, another ſet of pieces are cut, and joined together in ſuch a manner, that, if both the ſets were faſtened together, the joinings in one ſet would be nearly againſt the middle of the pieces in the other ſet. In this manner are all the frames faſtened and erected, as if each was one piece of wood. The pieces laid acroſs the keel, to which they are faſtened, are called floor timbers: the other pieces are called futtocks, except that which goes to the top of the ſide, which is called a top timber. Hence it is plain that the mould which ſerves for the floor timber, will ſerve for the lower part of the correſponding futtock. The mould for the upper part of the firſt futtock will be the ſame with that for the lower part of the ſecond; and the mould for the lower part of the top timber will be the ſame with that of the upper part of the correſponding futtock. It is alſo of great importance, in building, to give proper ſcarph to the timbers. *Murray on Ship-building.*

SHIPWRIGHT'*s ſector*, the name of an inſtrument, invented by Mr. Mungo Murray, for forming the plane of a ſhip called the body.

This ſector has ſeven lines on each leg, meeting at the center of the joint, numbered I, II, III, IV, &c. ſo that every line upon one leg has a correſponding one upon the other, both divided and numbered alike. The after body is upon one ſide, and the fore body on the other.

The lines for the after body are as follows. See *Plate* XLII. *fig.* 7.

I. Has five diviſions, viz. ⊕, 4, 1ſt dl, 8, ſt[n]; and marked at the end H B T[r], denoting the heighth of the top timber breadth line at four timbers; ſt[n] is the ſtern timber, and 1ſt dl, the firſt diagonal in the body plane.

II. Has eight diviſions, viz. $\frac{L^r C,}{U, A,}$ $\frac{U^r C^r,}{A, U,}$ St[n], 8, 4, ⊕, and marked at the end ½ B T[r], denoting the half breadth of the top timber at three timbers. L[r] C[r] ſignifies the lower counter, and U[r] C[r] the upper counter; U denotes the heighth, and A the rake of the counters, both taken from the wing tranſom; St[n] is the rake of the ſtern timber, which is likewiſe taken from the wing tranſom at the heighth of the ſheer rail.

III. Has eight diviſions, viz. *d*[n], u[r] S. R *i s*, ⊕, 3, 5, 7, 8: it is marked at the end L H B, for the heighth of the lower breadth line for five timbers: *d*[n] is for the diſtance between the frames, and R *i s*, for the diſtance between the lower breadth line, and the dead riſing in the body plane: u[r] S. is the radius of the upper breadth ſweep.

IV. Is in two parts. The innermoſt has four diviſions, viz. 7, 5, 3, ⊕, expreſſing the points where theſe timbers interſect the ſecond diagonal in the body plane: it is marked at the end 2 R for the ſecond ribband.

The outermoſt part has ſix diviſions, viz. ⊕, 3, 5, 7, 8, W T, and marked at the end U H B for the heighth of the upper breadth line at five timbers, and at the wing tranſom denoted by W T.

V. Is likewiſe in two parts. The innermoſt has four diviſions, viz. 7, 5, 3, ⊕, expreſſing the points where theſe timbers interſect the firſt diagonal: it is marked 1[ſt] R for the firſt ribband.

The outermoſt part has eight diviſions, viz. T, 8, 7, 5, 3, ⊕, *k l*, and then marked M ½ B[th], for the main half breadth of five timbers; T for that at the wing tranſom, and *k l* for the half breadth of the keel in midſhips; without which, there is another diviſion marked 3[d] dl for the third diagonal.

VI. Has four diviſions, viz. 7, 5, 3, ⊕, for the points where thoſe timbers interſect the third diagonal: it is marked 3d R, denoting the third ribband; without which, there is another diviſion marked 2d dl, for the ſecond diagonal.

VII. Has five diviſions, viz. 7, ½ B F l, 5, 3, ⊕. ½ B F l, denotes the half breadth of the floor: the other four are for the points where thoſe timbers interſect the fourth diagonal: it is marked 4[th] R, denoting the fourth ribband; without which there is another diviſion for the rake of the poſt marked R[k] P.

The heighth of the gun-deck is between N°. IV and V. G D ⊕ for that in midſhips, and G D *a* for that at the poſt. There is likewiſe another diviſion between N°. I and II for the fourth diagonal: it is marked ½ 4[th] dl, which muſt be doubled, becauſe the length of the ſector will not contain the whole.

Index to the After Body.

		N°.
Heighth of breadth	lower	III
	upper	IV
	top timber	I
	riſing	III
Half breadth	main	V
	top timber	II
	floor	VII
Counter and ſtern timber, heighth and rake		II
Rake of the poſt		VII
Upper breadth ſweep		III

		N°.
Ribbands	1	V
	2	IV
	3	VI
	4	VII
Diagonals	1	I
	2	VI
	3	V
	4 between I and	II
Diſtance between the frames		III

The Lines for the Fore Body are.

I. Has three diviſions, viz. H[t] ſtem, $\frac{G^d,\ H^d}{\text{rake } ſ^t\ G}$ denoting the heighth of the ſtem; and its rake from timber G at the gun-deck and head.

II. Has four diviſions, viz. *d*, *b*, and theſe marked H[r], T[r], for the heighth of the top timber line at theſe timbers; and again *d*, *b*, for the ½ breadth of thoſe timbers; and the line marked ½ B T[r].

III. Has four diviſions, viz. d[n] F for the diſtance between the frames, and *c*, *e*, *g*; it is marked L H B, denoting the heighth of the lower breadth line at theſe timbers.

IV. Is in two parts. The innermoſt has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the ſecond diagonal: it is marked 2[d] R for the ſecond ribband.

The outermoſt part has three diviſions, viz. *c*, *e*, *g*: it is marked U H B, denoting the heighth of the upper breadth line at theſe timbers.

V. Is in two parts. The innermoſt has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the firſt diagonal: it is marked 1[ſt] R for the firſt ribband.

The outermoſt part has four diviſions, viz. *g*, *e*, *c*, ⊕: it is marked M ½ B[th] for the main half breadth at theſe timbers.

VI. Has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the third diagonal: it is mark- 3[d] R for the third ribband.

VII. Has four diviſions, viz. *g*, *e*, *c*, ⊕, for the points of interſection of theſe timbers with the fourth diagonal: it is marked 4[th] R for the fourth ribband. The ſweep of the ſtem is between N°. III and IV; and the heighth of the gun deck between IV and V.

Index to the Fore Body.

		N°.
Heighth of breadth	lower	III
	upper	IV
	top timber	II
Half breadth	main	V
	top timber	II
Stem heighth and rake		I

		N°.
Ribbands	1	V
	2	IV
	3	VI
	4	VII
Diſtance of frames		III
Sweep of the ſtern between III and		V

The uſe of this inſtrument we have already given under the preceding article. *Murray's Treatiſe on Ship-building.*

SHIVERY *Salt*, a name given by the ſalt-workers to a ſort of ſalt very little different from the common brine ſalt. See SALT.

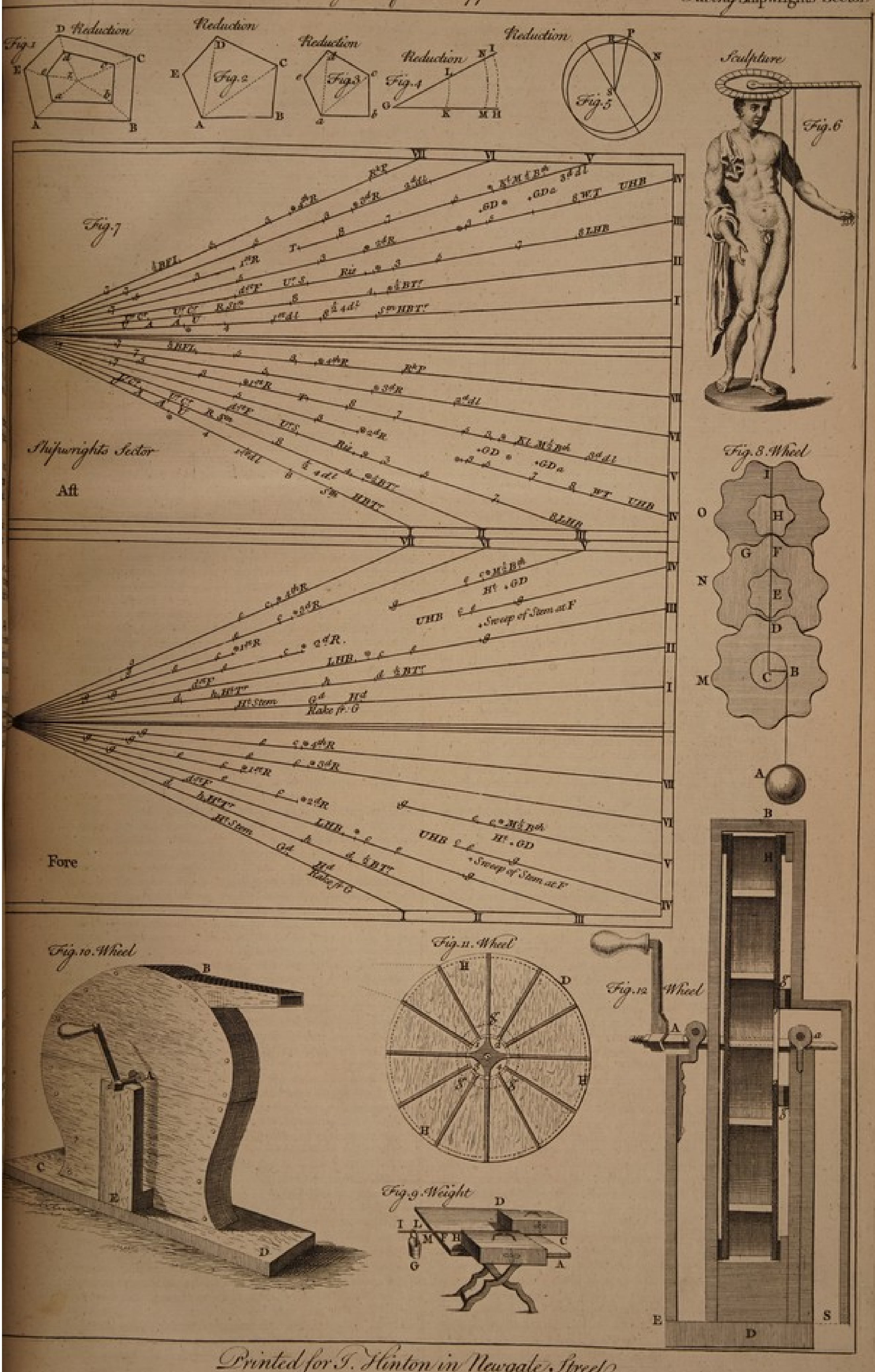
SHOAD, in mining, a term for a train of metalline ſtones mixed with earth, ſometimes lying near the ſurface, ſometimes at conſiderable depths; but always ſerving to the miners as a proof, that the load or vein of the metal is thereabouts. The deeper the Shoad lies, the nearer uſually the vein is. *Ray's Words.*

SHOAD-*ſtones*, a term uſed by the miners of Cornwall, and other parts of this kingdom, to expreſs ſuch looſe maſſes of ſtone as are uſually found about the entrances into mines, ſometimes running in a ſtraight courſe, from the load or vein of ore, to the ſurface of the earth.

SHOT (*Dict.*)— *Plate* XXXV, *fig.* 13, is that ſpecies of Shot called chain Shot; its chief uſe is to deſtroy the rigging of the enemy. *Fig.* 18. repreſents a pile of Shot, in the manner they are placed in magazines, &c.

SICYO'NIUM *ſimplex*, the name of a medicine thus prepared: take of the root of wild cucumber two ounces, and put them into an Italian ſextary, or pint of oil, and boil the ſame in a double veſſel.

SIDERI'TIS, *iron-wort*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of one leaf, and is of the labiated kind. The upper lip is erect,



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erect, the lower divided into ſeveral ſegments. The piſtil ariſes from the cup, and is fixed in the manner of a nail into the hinder part of the flower, and ſurrounded by four embryo's, which afterwards become ſo many ſeeds ripening in an open capſule, which was the cup of the flower. To theſe marks it may be added, that in all the Siderites the flowers grow in circles round the ſtalks, at the joinings of the leaves.

SI'GATI-*guſh*, in zoology, the name of a Perſian animal, of the lynx kind, and no way differing from the lynx itſelf, but in that it has no ſpots. Its ears have the fine velvety black pencil of hairs at their top, which are the diſtinguiſhing character of the lynx; and theſe creatures differ ſo much in the variations and different diſpoſitions of their ſpots, that probably this is no other than an accidental variety of the ſame ſpecies. *Ray's Syn. Quad.*

SIGMOI'DES, a word uſed by medicinal writers to expreſs any thing that is in the ſhape of the letter ſigma. The valves of the heart have this epithet applied to them; the coracoide proceſs of the ſcapula is alſo expreſſed by the ſame word; the ſemicircular cavity of the cubit, at the articulation of the forearm with the humerus, is ſometimes alſo called the ſigmoidal cavity; and the cartilages of the ſigmoide circles of the aſpera arteria, or wind-pipe, have their denomination from the ſame occaſions.

SI'GNAL (*Dict.*)— Signals have been in uſe in all ages. The ancients who had no regular couriers or poſts, made uſe thereof to convey intelligence of what paſſed at a great diſtance. For which purpoſe they placed centinels on the eminences, from ſpace to ſpace; ſome mention whereof we find made by Homer himſelf, Iliad. σ. v. 553, &c. Odyſſ. ξ. v. 261. Thoſe people, thus diſpoſed, lighted fires, or flambeaux, in the night-time. In the Agamemnon of Æſchylus, that prince, at his departure for Troy, promiſes Clytemneſtra, that, the very day the city ſhould be taken, he would apprize her of his victory by fires lighted expreſs. He keeps his word, and tidings are brought the princeſs, that Troy is taken, and that Agamemnon's Signals are ſeen. Frontinus obſerves, they were in uſe among the Arabs; and Bonaventura Vulcanius, in his Scholia on Ariſtotle's book de Mundo, adds, that while the Moors were maſters of the greateſt part of Spain, they built, on the tops of the mountains, an infinity of turrets, or watch-houſes, called, in the Arabic, atalayas, a word the Spaniards ſtill retain; whence, by fires, they could immediately alarm the whole kingdom. Indeed the cuſtom was much more ancient than the Moors in Spain. Q. Curtius obſerves, it was very frequent among the Aſiatics, in the time of Alexander. Livy and Cæſar both mention it as uſed among the Romans. Polydore Virgil ſhews it of great antiquity in England; and Bœthius adds, that, in ſeveral places in England, there are the remains of huge poles that have ſerved for this purpoſe.

SIGNALS *at ſea*, are ſigns made by the admiral or commander in chief of a ſquadron of ſhips, either in the day or by night, whether for ſailing, for fighting, or for the better ſecurity of the merchant ſhips under their convoy.

Theſe Signals are very numerous and important; being all appointed and determined by order of the lord high admiral, or lords of the admiralty; and communicated in the inſtructions ſent to the commander of every ſhip of the fleet or ſquadron before their putting out to ſea.

SIGNALS *by day.*— When the commander in chief would have them prepare for ſailing, he firſt looſes his fore-top-ſail, and then the whole fleet are to do the ſame. When he would have them unmoor, he looſes his main-top-ſail, and fires a gun, which in the royal navy is to be anſwered by every flag-ſhip. When he would have them weigh, he looſes his fore-top-ſail, and fires a gun, and ſometimes hawls home his ſheats: the gun is to be anſwered by every flag-ſhip, and every ſhip to get to ſail as ſoon as it can. If with the leeward-ſide, the ſtern-moſt ſhip is to weigh firſt. When he would have the weather-moſt and head-moſt ſhips to tack firſt, he hoiſts the union-flag at the fore-top-maſt-head, and fires a gun, which each flag-ſhip anſwers; but, if he would have the ſtern-moſt and leeward-moſt ſhips to tack firſt, he hoiſts the union-flag at the mizen top-maſt-head, and fires a gun; and, when he would have all the whole fleet tack, he hoiſts an union, both on the fore and mizen-top-maſt-heads, and fires a gun. When, in bad weather, he would have them wear, and bring to the other tack, he hoiſts a pendant on the enſign-ſtaff, and fires a gun: and then the leeward-moſt and ſtern-moſt ſhips are to wear firſt, and bring on the other tack, and lie by, or go on with an eaſy ſail, till he comes a-head: every flag is to anſwer with the ſame Signal. If they are lying by, or ſailing by a wind, and the admiral would have them bear up and ſail before the wind, he hoiſts his enſign and fires a gun, which the flags are to anſwer: and then the leeward-moſt ſhips are to bear up firſt, and to give room for the weather-moſt to wear, and ſail before the wind with an eaſy ſail, till the admiral comes a-head. But if it ſhould happen, when the admiral hath occaſion to wear and ſail before the wind, that both jack and enſign be abroad, he will hawl down the jack, before he fires the gun to wear, and keep it down till the fleet is before the wind. When they are ſailing before the wind, and he would have them bring to, with the ſtar-board tacks abroad, he hoiſts a red flag at the flag-ſtaff, on the mizen-top-maſt-head, and fires a gun. But if they are to bring to, with the lar-board tack, he hoiſts a blue flag at the ſame place, and fires a gun, and every ſhip to anſwer the gun. When any ſhip diſcovers land, he is to hoiſt his jack and enſign, and keep it abroad, till the admiral or commander in chief anſwers him, by hoiſting his; on ſight of which, he is to hawl down his enſign. If any diſcovers danger, he is to tack and bear up from it, and to hang his jack abroad from the main-top-maſt croſs-trees, and fire two guns: but, if he ſhould ſtrike or ſtick faſt, then, beſides the ſame Signal with his jack, he is to keep firing, till he ſees all the fleet obſerve him, and endeavour to avoid the danger. When any ſees a ſhip or ſhips more than the fleet, he is to put abroad his enſign, and there keep it, till the admiral's is out, and then to lower it, as often as he ſees ſhips, and ſtand in with them, that ſo the admiral may know which way they are, and how many; but if he be at ſuch a diſtance, that the enſign cannot well be diſcovered, he is then to lay his head towards the ſhip or ſhips ſo deſcried, and to brail up his low ſails, and continue hoiſting and lowering his top-ſails, and making a waſt with his top-gallant ſails, till he is perceived by the admiral. When the admiral would have the vice-admiral, or he that commands in the ſecond poſt of the fleet, to ſend out ſhips to chace, he hoiſts a flag, ſtriped white and red on the flag-ſtaff, at the fore-top-maſt head, and fires a gun. But, if he would have the rear-admiral do ſo, he then hoiſts the ſame Signal on the flag-ſtaff, at the mizen-top-maſt-head, and fires a gun. When the admiral would have any ſhip to chace to windward, he makes a Signal for ſpeaking with the captain, and he hoiſts a red flag in the mizen-ſhrowds, and fires a gun: but, if to chace to leeward, a blue flag; and the ſame Signal is made by the flag, in whoſe diviſion that ſhip is. When he would have them give over chace, he hoiſts a white flag on his flag-ſtaff at the fore-top-maſt-head, and fires a gun: which Signal is to be made alſo by that flag-ſhip which is neareſt the ſhip that gives chace, till the chacing ſhip ſees the Signal. In caſe of ſpringing a leak, or any other diſaſter, that diſables their ſhip from keeping company, they are to hawl up their courſes, and fire two guns. When any ſhip would ſpeak with the admiral, he muſt ſpread an Engliſh enſign, from the head of his main, or fore-top-maſt, downwards on the ſhrowds, lowering his main, or fore-top-ſail, and firing guns, till the admiral obſerve him; and if any ſhip perceive this, and judgeth the admiral doth not, that ſhip muſt make the ſame Signal, and make the beſt of his way to acquaint the admiral therewith, who will anſwer by firing one gun. When the admiral would have the fleet to prepare to anchor, he hoiſts an enſign, ſtriped red, blue, and white on the enſign-ſtaff, and fires a gun, and every flag-ſhip makes the ſame Signal. If he would have the fleet moor, he hoiſts his mizen-top-ſail, with the clew-lines hawled up, and fires a gun. If he would have the fleet cut or ſlip, he looſes both his top-ſails, and fires two guns; and then the leeward ſhips are to cut or ſlip firſt, to give room to the weathermoſt to come to ſail. So if he would have any particular ſhip to cut or ſlip, and to chace to windward, he makes the Signal for ſpeaking with that ſhip, hoiſts a red flag in the mizen ſhrowds, and fires a gun: but, if the ſhip is to chace to leeward, he hoiſts a blue flag as before. If he would have the fleet exerciſe their ſmall arms, he hoiſts a red flag on the enſign-ſtaff, and fires a gun; but, if the great guns, then he puts up a pendant over the red flag.

SIGNALS *by night.*— To be obſerved at an anchor, weighing anchor, and ſailing, are as follow. When the admiral would have the fleet to unmoor, and ride ſhort, he hangs out three lights, one over another in the main-top-maſt ſhrowds, over the conſtant light in the main-top, and fires two guns, which are to be anſwered by flag-ſhips; and each private ſhip hangs out a light in the mizen-ſhrowds. Note, That all guns, fired for Signals in the night, muſt be fired on the ſame ſide, that they may make no alteration in the ſound. When he would have them weigh, he hangs a light in the main-top-maſt ſhrowds, and fires a gun, which is to be anſwered by all the flags, and every private ſhip muſt hang out a light in his mizen-ſhrowd. When he would have them tack, he hoiſts two flags on the enſign-ſtaff, one over another, above the conſtant light in his poop, and fires a gun, which is to be anſwered by all the flags; and every private ſhip is to hang out a light extraordinary, which is not be taken in, till the admiral takes in his. After the Signal is made, the leeward-moſt and ſtern-moſt ſhips muſt tack as faſt as they can, and the ſtern-moſt flag-ſhip, after he is about on the other tack, is to lead the fleet, and him they are to follow, to avoid running foul of one another in the dark. When he is upon a wind, and would have the fleet veer, and bring to on the other tack, he hoiſts up one light at the mizen-peek, and fires three guns, which is to be anſwered by the flag-ſhips, and every private ſhip muſt anſwer, with one light at the mizen-peek. The ſtern-moſt and leeward-moſt ſhips are to bear up as ſoon as the Signal is made. When he would have them, in blowing weather, to lie a try, ſhort, or a hull, or with the head-ſails braced to the maſt, he will form lights of equal height, and fire five guns, which are to be anſwered

by

by the flag-ships, and then every private ship must shew four lights: and after this, if he would have them to make sail, he then fires ten guns, which are to be answered by all the flags, and then the head-most and weather-most ships are to make sail first. When the fleet is sailing large, or before the wind, and the admiral would have them bring to, and lie by with their star-board tacks aboard, he puts out four lights in the fore-shrowds, and fires six guns; but if with the lar-board tacks aboard, he fires eight guns, which are to be answered by the flag-ships; and every private ship must shew four lights. The wind-most ships must bring to first. Whenever the admiral alters his course, he fires one gun, without altering his lights, which is to be answered by all the flag-ships. If any ship hath occasion to lie short, or by, after the fleet hath made sail, he is to fire one gun, and shew three lights in his mizen-shrowds. When any one first discovers land, or danger, he is to shew as many signs as he can, to fire one gun, and to tack, or bear away, from it: and, if any one happen to spring a leak, or any be disabled from keeping company with the fleet, he hangs out two lights of equal height, and fires guns till he is relieved by some ship of the fleet. If any one discovers a fleet, he is to fire guns, make false fires, put one light out on the main-top, three on the poop, to steer after them, and to continue firing of guns, unless the admiral call him off, by steering another course, and fire two or three guns; for then he must follow the admiral. When the admiral anchors, he fires two guns, a small space of time one from the other, which are to be answered by the flag-ships; and every private ship must shew two lights. When the admiral would have the fleet to moor, he puts a light on each top-mast-head, and fires a gun, which is to be answered by the flag-ships, and every private ship is to shew one light. If he would have them lower their yards and top-masts, he hoists one light upon his ensign-staff, and fires one gun; which is to be answered by the flag-ships, and every private ship must shew one light. And when he would have them hoist their yards and top-masts, he puts out two lights, one under the other, in the mizen-top-mast-shrowds, and fires one gun; which is to be answered by the flag-ships, and each private ship must shew one light in the mizen-shrowds. If any strange ship be discovered coming into the fleet, the next ship is to endeavour to speak with her, and bring her to an anchor, and not suffer her to pass through the fleet. And if any one discovers a fleet, and it blow so hard that he cannot come to give the admiral notice timely, he is to hang out a great number of lights, and to continue firing gun after gun, till the admiral answers him with one. When the admiral would have the fleet to cut or slip, he hangs out four lights, one at each main-yard-arm, and at each fore-yard-arm, and fires two guns, which are to be answered by the flag-ships, and every private ship is to shew one light.

SIGNALS *used, when a fleet sails in a fog.*—If the admiral would have them weigh, he fires ten guns; which every flag-ship is to answer. To make them tack, he fires four guns, which are to be answered by the flag-ships; and then the lee-ward-most and stern-most ships must tack first, and, after they are about, to go with the same sail they tacked with, and not to lie by, expecting the admiral to come a-head: and this is to avoid the danger of running foul of one another in thick weather.

When the admiral brings to, and lies with his head-sails to the mast; if with the star-board tack abroad, he fires six guns; but, if with the lar-board tack, he fires eight guns, which the flag-ships are to answer. And after this, if he makes sail, he fires ten guns, which the flag-ships must answer, and then the head-most and weather-most ships are to make sail first. If it grow thick and foggy weather, the admiral will continue sailing, with the same sail set that he had before it grew foggy, and will fire a gun every hour, which the flag-ships must answer, and the private ships must answer, by firing of muskets, beating of drums, and ringing of bells. But if he be forced to make either more or less sail than he had, when the fog began, he will fire a gun every half-hour, that the fleet may discern, whether they come up with the admiral, or fall a-stern of him; and the flags and private ships are to answer as before. If any one discovers danger, which he can avoid, by tacking and standing from it, he is to make the Signal for tacking in a fog; but if he should chance to strike and stick fast, he is to fire gun after gun, till he thinks the rest have avoided the danger. When the admiral would have the fleet to anchor, he fires two guns, which the flags are to answer; and after he hath been half an hour at an anchor, he will fire two guns more, to be answered by the flags, as before; that all the fleet may know it.

SIGNALS *for calling officers on board the admiral.*—When the admiral puts aboard an union-flag in the mizen-shrowds, and fires a gun, all the captains are to come aboard him: and if, with the same Signal, there be also a waft made with the ensign, then the lieutenant of each ship is to come on board. If an ensign be put aboard in the same place, all the masters of the ships of war are to come on board the admiral. If a standard on the flag-staff be hoisted at the mizen-top-mast-head, and a gun fired, then all the flag-officers are to come aboard the admiral. If the English flags only, then a standard in the mizen-shrowds, and fire a gun: if the flags and land general officers, then the admiral puts aboard a standard at mizen-top-mast-head, and a pendant at mizen-peek, and fires a gun. If a red flag be hoisted in the mizen-shrowds, and a gun fired; then the captains of his own squadron are to come aboard the admiral; and if, with the same Signal, there be also a waft with the ensign, the lieutenant of each ship must come aboard. If he hoists a white flag, as before, then the vice-admiral, or he that commands in the second post, and all the captains of his squadron, are to go on board the admiral: if a blue flag, &c. then the rear-admiral, and the captains of his squadron, must come on board; and if a waft, as before, the lieutenants. When a standard is hoisted on the ensign staff, and gun fired, the vice and rear-admirals must come on board the admiral's ship. When the admiral would speak with the captains of his own division, he will hoist a pendant on the mizen-peek, and fire a gun; and if with the lieutenants, a waft is made with the ensign, and the same Signal: for whenever he would speak with the lieutenants of any particular ship, he makes the Signal for the captain, and a waft also with the ensign. When the admiral would have all the tenders in the fleet come under his stern, and speak with him; he hoists a flag, yellow and white, at the mizen-peek, and fires a gun. But if he would speak with any particular ship's tender, he makes a Signal for speaking with the captain she tends upon, and a waft with the jack. If all the pinnaces and barges are to come on board, manned and armed, the Signal is a pendant on the flag-staff, hoisted on the fore-top-mast-head, and a gun fired; and if he would have them chace any ship, vessel, or boat, in view, he hoists the pendant, and fires two guns. The Signal for the long-boats to come on board him, manned and armed, is the pendant hoisted on the flag staff, and the mizen-top-mast-head, and a gun fired; and if he would have them chace any ship, vessel, or boat, in open view, without coming on board him, he hoists the pendant, as aforesaid, and fires two guns. When the admiral would have all the boats in the fleet come on board him, manned and armed, he hoists a pendant on the flag-staff, both on the fore-top-mast, and mizen-top-mast-head, and fires one gun; but if he would have them chace, he hoists his pendants, as before, and fires two guns. When the admiral would speak with the victualler, or his agent, he puts an English ensign in the mizen-top-mast-shrowds; and when with him that hath the charge of the gunner's stores, he will spread an ensign at his main-top-sail-yard-arm.

SIGNALS *for managing a sea-fight.*—When the admiral would have the fleet form a line of battle, one ship a-head of another, he hoists an union-flag at the mizen-peek, and fires a gun; and every flag-ship does the like. But when they are to form a line of battle, one a-breast of another, he hoists a pendant with the union-flag, &c. When he would have the admiral of the white, or he that commands in the second post, to tack, and endeavour to gain the wind of the enemy, he spreads a white flag under the flag at the main-top-mast-head, and fires a gun; and when he would have the vice-admiral of the blue do so, he doth the same with the blue flag. If he would have the vice-admiral of the red do so, he spreads a red flag from the cap, on the fore-top-mast-head, downward on the back-stay; if the vice-admiral of the blue, he spreads a blue flag, &c. and fires a gun. If he would have the rear-admiral of the red do so, he hoists a red flag at the flag-staff, at the mizen-top-mast-head; if the rear-admiral of the white, a white flag; if the rear-admiral of the blue, a blue flag, and under it a pendant of the same colour, with a gun. If he be to leeward of the fleet, or any part of it, and he would have them bear down into his wake or track, he hoists a blue flag at the mizen-peek, and fires a gun. If he would be to leeward of the enemy and his fleet, or any part of it to be to leeward of him; in order to bring these ships into the line, he bears down with a blue flag at the mizen-peek, under the union-flag, which is the Signal for battle, and fires a gun; and then those ships, that are to leeward of him, must endeavour to get into his wake or track, according to their station in the line of battle. When the fleet is sailing before the wind, and he would have him, who commands in the second post, and the ship of the star-board quarter to clap by the wind, and come to the star board tack, he hoists a red flag at the mizen-top-mast-head: but a blue one, if he would have ships of the lar-board quarter come to the lar-board tack, with a gun. If the van are to tack first, he spreads the union-flag at the flag-staff, on the fore-top-mast-head, and fires a gun, if the red flag be not abroad; but if it be, then he lowers the fore-top-sails a little; and the union-flag is spread from the cap of the fore-top-mast downwards; and every flag-ship doth the same. If the rear be to tack first, he hoists the union-flag on the flag-staff, at the mizen-top-mast-head, and fires a gun; which all the flag-ships are to answer. If all the flag-ships are to come into his wake or track, he hoists a red flag at his mizen-peek, and fires a gun; and all the flag-ships must do the same. If he would have him that commands in the second post of his squadron to make more sail, though he himſelf ſhorten ſail, he hoiſts a white flag on the enſign-ſtaff. But, if he that commands in the third poſt be to do ſo, he hoiſts a blue flag, and fires a gun, and all the flag-ſhips muſt have the ſame Signal. Whenever he hoiſts a red flag on the flag-ſtaff at the fore-top-maſt-head, and fires a gun; every ſhip in the fleet muſt uſe their utmoſt endeavour to engage the enemy, in the order preſcribed them. When he hoiſts a white flag at his mizen-peek, and fires a gun; then all the ſmall frigates of his ſquadron, that are not of the line of battle, are to come under the ſtern. If the fleet be failing by a wind in the line of battle, and the admiral would have them brace their head ſails to the maſt, he hoiſts up a yellow flag, on the flag-ſtaff, at the mizen-top-maſt-head, and fires a gun; which the flag-ſhips are to anſwer: and then the ſhips in the rear muſt brace firſt. After this, if he would have them fall their head-ſails, and ſtand on, he hoiſts a yellow flag on the flag-ſtaff of the fore-top-maſt-head, and fires a gun, which the flag-ſhips muſt anſwer, and then the ſhips in the van muſt fall firſt, and ſtand on. If, when this Signal is made, the red flag at the fore-top-maſt-head be abroad, he ſpreads the yellow flag under the red. If the fleets being near one another, the admiral would have all the ſhips to tack together, the ſooner to lie in a poſture to engage the enemy; he hoiſts an union-flag on the flag-ſtaves at the fore and mizen-top-maſt-heads, and fires a gun; and all the flag-ſhips are to do the ſame. The fleet being in a line of battle, if he would have the ſhip that leads the van, hoiſt, lower, ſet, or hawl up any of the ſails, he ſpreads a yellow flag, under that at his main-top-maſt-head, and fires a gun, which Signal the flag-ſhips are to anſwer; and then the admiral will hoiſt, lower, ſet, or hawl up the ſail, which he would have the ſhip that leads the van, do; which is to be anſwered by the flag-ſhips of the fleet. When the enemies run, and he would have the whole fleet follow them, he makes all the ſail he can after them himſelf, takes down the Signal for the line of battle, and fires two guns out of his fore-chaſe, which the flag-ſhips anſwer; and then every ſhip is to endeavour to come up with, and board the enemy. When he would have the chace given over, he hoiſts a white flag at the fore-top-maſt-head, and fires a gun. If he would have the red ſquadron drawn into a line of battle, one a-breaſt of another, he puts abroad a flag, ſtriped red and white, on the flag-ſtaff at the main-top-maſt-head, with a pendant under it, and fires a gun: if the white or ſecond ſquadron is to do ſo, the flag is ſtriped red, white, and blue: if the blue or third ſquadron is to do ſo, the flag is a Genoeſe enſign and pendant: but if they are to draw into a line of battle, one a-head of another, the ſame Signals are made without a pendant. If they are to draw into the line of battle one a-ſtern of another, with a large wind, and he would have the leaders go with the ſtar-board tacks, a-board by the wind; he hoiſts a red and white flag at the mizen-peek, and fires a gun: but if they ſhould go with the lar-board tacks aboard, by the wind, he hoiſts a Genoeſe flag at the ſame place; which Signals, like others, muſt be anſwered by the flag-ſhips.

SI'LEX, *flint*, in natural hiſtory, the name of a genus of ſemipellucid ſtones, the matter of which is a cryſtal, debaſed by an admixture of a peculiar and appropriated earth, which is of a blackiſh grey; always free from veins, but, according to the different quantity and diſpoſition of the earth in its compoſition, ſubject to clouds of a darker or paler colour, and naturally inveſted with a thin whitiſh cruſt.

Naturaliſts, in general, have accounted various ſpecies of flint, but erroneouſly; nature has eſtabliſhed it into a genus of itſelf, and allowed no other ſpecies than one, which is ever compoſed of the ſame matter, and differs only in the proportions of its admixture. When cryſtalline matter is debaſed by earths of other colours, or clouded and veined, it ceaſes to be flint, and becomes the pebble, the agate, or the onyx; and the not attending to this diſtinction has made many deſcribe theſe variouſly-coloured bodies twice over: one under the name of coloured flints, and a ſecond time under that of Engliſh agates, &c.

The characters of genuine flint are, that it is a ſtone of an extremely fine and even texture; of a very uncertain ſurface, ſometimes rough, ſometimes ſmooth; of a colour always, in ſome degree, between blackiſh and whitiſh, unleſs accidentally tinged, as all other foſſils are ſubject to be; very readily giving fire with ſteel; not fermenting with acids. *Hill's Hiſt. of Foſſils.*

SI'LIQUA, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the apetalous kind, being compoſed only of a number of ſtamina, which ariſe from the ſegments of the cup, the middle of which is occupied by a piſtil, which finally becomes a flatted pod of a fleſhy ſubſtance, and containing flat and roundiſh ſeeds.

SILIQUA'STRUM, *judas-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower is of the papilionaceous kind; the wings, however, ſtand over the vexillum, and the carina is compoſed of two leaves. The piſtil ariſes from the cup, and is ſurrounded by ſtamina; this finally becomes a flat membranaceous pod, filled with ſeeds of a kidney-like form. To this it is to be added, that the leaves ſtand alternately.

SILK-*worm*, *bombyx*. This inſect conſiſts of eleven rings, and each of theſe of a great number of other ſmaller ones, joined to each other; and the head, which terminates theſe rings, is furniſhed with two jaws, which work and cut the food, not by a perpendicular, but a lateral action. The humours, found in the body of this creature, all ſeem approaching to the nature of the Silk which it ſpins, for on being rubbed in the hands, they leave a hard or ſolid cruſt behind them. Under the ſkin there is always found a muſcous roſy-coloured membrane, enveloping the animal, and ſuppoſed to be the new ſkin in which it is to appear, on throwing off the old one. The heart of this creature reaches from the head to the tail, running the whole length of the body: it is indeed rather a ſeries of many hearts connected together, than one. The motion of ſyſtole and diaſtole is very evident in this whole chain of hearts; and it is an elegant ſight to obſerve the manner of the vital fluids paſſing from one of them to the other. The ſtomach of this animal is as long as the heart, reaching, like it, from one end of the body to the other. This large receptacle for food, and the ſudden paſſage of it through the animal, are very good reaſons for its great voracity.

In the ſides of the belly, all about the ventricle, there are depoſited a vaſt number of veſſels, which contain the ſilky juice; theſe run with various windings and meanders to the mouth, and are ſo diſpoſed, that the creatures can diſcharge their contents at pleaſure at the mouth; and according to the nature of the juices, that they are ſupplied with, furniſh different ſorts of ſilk from them, all the fluid contents of theſe veſſels hardening in the air into that ſort of thread, that we find the web of balls of this creature conſiſt of.

Theſe creatures never are offended at any ſtench of whatever kind, but they always feel a ſouthern wind, and an extremely hot air always makes them ſick. *Malpighi de Bombyce.*

SI'LVERING.—To ſilver braſs: fine ſilver is diſſolved in aqua-fortis in a broad-bottomed veſſel of glaſs, or glazed earth, and the aqua-fortis being afterwards evaporated, and the operation repeated as often as there is occaſion; the fire being increaſed towards the latter end, ſo as to leave a perfectly dry and white calx, which will be thus tolerably freed from the aqua-fortis. Of this calx take one part, and an equal meaſure, not weight, of common ſalt, and of the cryſtals of tartar, and mix them together into a fine powder; then, having firſt plunged the ſcowered braſs into fair water, rub ſome of the powder upon it with your wet fingers, till the cavities of its ſurface be ſufficiently filled therewith. Laſtly, waſh the metal well in water, and give it a gloſs by rubbing it hard with a dry cloth.

This waſhing, Mr. Boyle obſerves, is expeditious, cheap, requires no quick-ſilver, and may be made to laſt ſome years, and is eaſily renewable, when it begins to wear. *See his Works Abr. Vol. Iſt.*

SINA'PI, *muſtard*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is compoſed of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a long pod, divided by an intermediate membrane into two cells, and containing roundiſh ſeeds; the pod alſo uſually terminates in a fungoſe horn, which has ſome ſeeds in it. To this it is to be added, that theſe plants have all a hot, acrid, and biting taſte.

SI'REN (*Dict.*)—Artedi ſuppoſes it to conſtitute a peculiar genus of the plagiuri, or cetaceous fiſhes. The characters he gives of it are theſe: it has no pinnated tail; the head, neck, and breaſt, down to the navel, repreſent thoſe of the human ſpecies; there are only two fins on the whole body, and thoſe ſtand on the breaſt. Bartholine, in his hiſtory of Curioſities, deſcribes ſuch a fiſh as this, under the name of Syrene, and Barchewitz under the name of homo marinus. This author ſays that he ſaw one at ſea, and that it is wholly different from the manati, and from all other fiſhes. The Philoſophical Tranſactions alſo contain an account of a ſea-man ſeen in the American ſeas, and ſeveral other writers of credit give countenance to the ſtory. Their deſcriptions tell us, that from the navel to the tail it is one ſhapeleſs maſs of fleſh, without any appearance of finny tail, or any other part of the ſtructure of a fiſh. The pectoral fins reſemble hands, and are compoſed of five bones, or fingers, joined by a membrane. With theſe it ſwims. It were much to be wiſhed, that ſome accurate ichthyologiſt might have an opportunity of ſeeing and examining this creature, if it really exiſts different from the other animals of the ſea. Artedi ſeems to doubt the truth of the accounts, but thinks it better not to judge of a thing not yet ſeen, than to pronounce any thing raſhly againſt the accounts of creditable authors. *Artedi, Geſner. Piſc.*

SKIN, in commerce. The Indians in Carolina and Virginia dreſs buck and doe ſkins in this manner: the felt being taken off, they ſtrain them with lines, or otherwiſe, much like the clothiers racks, in order only to dry them. When the hunting time is over, the women dreſs the ſkins, by putting them in a pond, or hole of water, to ſoak them well; then with an old knife, fixed in a cleft ſtick, they force off the hair, whilſt they remain wet. This done, they put them into a kettle, or earthen-pot, and a proportion of deers brains, dried and preserved for this purpose, is put in along with them; this vessel is set on the fire till they are more than blood-warm, which will make them lather and scour clean; after this, with small sticks, they wrest and twist each skin, as long as they find any wet to drop from them, letting them remain so wrested for some hours; and then they untwist and stretch each of them in a sort of a rack, so that every part is extended: and, as the skin dries, they take a dull hatchet, or some such instrument, and rub them well over to force all the water and grease out of them, till they become perfectly dry, and then their work is done.

In this manner one woman (for the men never employ themselves in this work) will dress eight or ten skins in a day, that is, begin and finish them. *Phil. Transf.* N°. 194.

SKI'NUS *cnide*, a name given by the antient naturalists to the lentisk-tree, and also to a peculiar species of the squill, or scilla, which was not nauseous and emetic as the common squill, but esculent and pleasant to the taste.

SKY-*colour*. To give this colour to glass, set in the furnace a pot of pure metal of frit from rochetta, or barillia, but the rochetta frit does best; as soon as the metal is well purified, take for a pot of twenty pounds of metal six ounces of brass calcined by itself, put it by degrees, at two or three times, into the metal, stirring and mixing it well every time, and diligently scumming the metal with a ladle: at the end of two hours the whole will be well mixed, and a proof may be taken; if the colour be found right, let the whole stand twenty-four hours longer in the furnace, and it will then be fit to work, and will prove of a most beautiful sky-colour. *Neri's Art of Glass.*

SLABS *of tin*, the lesser masses, which the workers at the tin mines cast the metal into: these are run into moulds made of stone. *Ray's English Words.*

SLA'CKEN, in metallurgy, a term used by the miners to express a spungy and semivitrified substance, which they use to mix with the ores of metals, to prevent their fusion. It is the scoriæ or scum, separated from the surface of the former fusions of metals. To this they frequently add lime-stone, and sometimes a kind of coarse iron ore, in the running of the poorer golden ores.

SLAU'GHTER-*skins*, a term used by our curriers and leather-dressers for the skins of oxen, or other beasts, when fresh, and covered with the hair: such as they receive them from the Slaughter-houses where the butchers flea the carcase.

SLEDGE, in the mechanic arts, is a large smith's hammer, to be used with both hands: of this there are two sorts, the uphand-sledge, which is used by under workmen, when the work is not of the largest sort; it is used with both the hands before, and they seldom raise it higher than their head. But the other which is called the about-sledge, and which is used for battering or drawing out the largest work, is held with both the hands, and swung round over their heads, at their arms end, to strike as hard a blow as they can. *Moxon's Mechanic Exercises.*

SLEE'PERS, in natural history, a name given to some animals which sleep all the winter: such are bears, marmotes, dormice, bats, hedge-hogs, swallows, &c. These do not feed in winter; have no sensible evacuations, breathe little, or not at all, and most of the viscera cease from their functions. Some of these creatures seem to be dead, and others to return to a state like unto that of the fœtus before birth. In this condition they continue, till by length of time maturating the process, or by new heat, the fluids are attenuated, the solids stimulated, and the functions begin where they left off. See *Dr. Stevenson in Med. Ess. Edinb.* Vol. V. *Art.* 77.

Sleepers, in the glass trade, are the large iron bars crossing the smaller ones, and hindering the passage of the coals, but leaving room for the ashes. *Neri's Art of Glass, Appendix.*

Sleepers, in a ship, timbers lying before and aft in the bottom of a ship, as the rung-heads do; the lowermost of them is bolted to the rung-heads, and the uppermost to the futtocks, in order to strengthen and fasten the futtocks and rungs.

SLICH, in metallurgy, the ore of any metal, particularly of gold, when it has been pounded, and prepared for farther working.

SLOTH, in natural history, the name of an animal remarkable for its slow motion. This creature is so very tedious in all its motions, that it will be three or four days in climbing up and coming down a tree, and does not go the length of fifty paces upon even ground in a day.

SLOE-*worm*, in natural history, the name of an insect found on the leaves of the Sloe, or black-thorn, and sometimes on those of the garden-plum.

SLOW-*worm*, the English name of the cæcilia, called also the blind-worm, and by some the deaf adder: it is very venomous, and its bite often fatal.

SLUDS, a term used by the miners in Cornwal for half-roasted ores.

SMALL-*stones*, among jewellers, denote diamonds under the weight of a carrat. *Jeffreys on Diamonds.*

Small-*work*, among jewellers, is used to denote the star and shell-facets of diamonds. *Jefferys on Diamonds.*

SMALT (*Dict.*)— Some cobalt yields Smalt before roasting, even better than it would afterwards; this is a peculiar kind of cobalt, that is so like the rest, that it cannot be distinguished by the eye, but experiment alone shews this property in it. Though cobalt in general requires roasting, in order to fit it for yielding the Smalt, yet its different kinds require some more, and some less roasting; and the degree can never be judged of by the inspection of the mineral, but is only known by the experienced artist in the process. Hence it is, that expert and intelligent persons are necessary in the Smalt-works more than in almost any other branch in this sort of business. The addition of a small quantity of arsenic, or of the arsenical flowers, during the time that the Smalt is in fusion, adds greatly to the beauty of the colour: this is a practice kept secret by the workmen of some places; and by this means their Smalt is always rendered better than that of their neighbours. It is easy to see from this, that the roasting of the cobalt is the necessary beginning of the Smalt-work, not the divesting it of its arsenic, which only happens accidentally in that process; and it would be much better if it did not happen, since we find the arsenic added afterwards exalts the colour. From hence it is evident, that those cobalts which will make Smalt without previous roasting, must, as they are found to do, make the very finest Smalt, because their arsenic is yet left in them in great part: and from this also appears the necessity of having expert workmen for the Smalt-making; since the knowing the degree of fire necessary to the ore is a most essential article, and, after the roasting has been carried to a sufficient degree, every moment's heat, divesting it of more of its arsenic than was necessary, makes the colour of the Smalt to be made afterwards so much the worse. From this also appears the reason why the blue, made by precipitation from a solution of cobalt, is so much superior to the common Smalt made by fire; because in this the arsenic is all preserved, whereas, in the common way of preparing it by fire, it is driven off. *Philos. Transf.* N°. 396.

SME'CTIS, in natural history, a name used by several authors for the common fuller's earth, more commonly called cimolia purpurascens.

SMELL, is used as the name of a particular sort of wine, of which there are two species; the one sort is very fragrant, muscatelline, and aromatic; this is called simply the Smell-wine; but the other, which is very rank and offensive to the nose, is called by the Germans Smel-bruntzer. Many have been the conjectures about the occasion of the rank Smell of this wine, it not being owing to the grape it is made from, those of the same vineyard often affording the aromatic, and often the rank wine: some have imputed the strange difference to the vessel, others to the vine, and others to the earth it grows in; but the first of these is too trifling a cause for such an effect, and the others are confuted by experience of the same vine, in the same place, yielding both. The opinion of Portzius is, that the rankness of the Smell of some of this wine is owing to some irregularities in the working; this is certain, that it never is perceived before the working. The Smell is truly urinous, and is that of a volatile alkali; which not being embodied in, or subdued by the acid of the grape, in this imperfect fermentation, shews itself in this rank manner. It is evident that the Smell is of a volatile nature, for it is often lost in the drawing the wine several times out of one vessel into another, evaporating during the time of the drawing it out. *Portzius, de Vin. Rhen.*

SMELT, *aqua phalerica*, in ichthyology, the name of a well known fish.

These fish will live almost any where, but they are very apt to degenerate. They are common in the rivers of New-England, and are as large as with us, often weighing two ounces and a half; but, a pail-full of these being taken from one of their rivers, and put into an adjoining pond, they all degenerated in such a manner, that they were afterwards found so small, that the largest did not weigh more than five penny-weights. Though thus small, however, they are much valued, and are better tasted than the others. They are very transparent, and of a beautiful shining pearl colour. *Philos. Transf.* N°. 374.

SME'LTING-*house*, a house where they run and smelt the ore into lead: one of these will run a ton in ten or twelve hours; a fodder is their usual day's work, that is, twenty-two hundred and an half weight. *Houghton's Compl. Min. in the Explan. of the Terms.*

SMI'LAX, in botany, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, being composed of several petals arrayed in a circular form. The pistil finally becomes a soft roundish berry, containing a roundish or oval seed.

SMUT, in husbandry, a disease in corn, in which the grains, instead of being filled with flower, are full of a black stinking powder.

Many things have been suspected as the causes of this distemperature in corn; but Mr. Tull seems convinced by experiment, that it is caused only by too much moisture, the several plants of corn, which he had taken up by the roots and planted in troughs of very moist earth, all bringing forth smutty ears,

ears, while very few such were found in the corn of the field from whence these plants were taken. It is observable, also, that those ears, the grains of which are to be smutty, never send up any flowers at all.

The two things, recommended by writers of husbandry as remedies or preventions of this disease are brining and changing the seed. The first of these methods was accidentally discovered about a century ago: a ship loaded with wheat was, about autumn, sunk near Bristol, afterwards the wheat was taken up at the ebbs at several times, after being thoroughly soaked in sea-water. When the wheat was all taken up, it was found unfit to make bread of; but a farmer, trying some of it for sowing, found it answer very well, and himself, and the neighbouring farmers, bought it all up at a small price; the country all about was sown out of this cargo. It happened that smuttiness in the wheat-corn was a reigning distemper in all parts of the kingdom at that time, but it was remarkable, that all the fields sown with this salt wheat were absolutely free from the mischief: this easily introduced the practice of soaking wheat, before sowing, in a brine of salt and water, to prevent it in other places, and it has succeeded well. Mr. Tull gives an instance of the certainty of its effect, in the case of two farmers whom he personally knew, and whose farms lay intermixed: these men bought the same seed between them from a very good change of land, and parted every land between them in the field; the oldest farmer believed the brining to be a fancy, and sowed his seed unbrined; the other brined all his seed, and the consequence was, that the old farmer had a great deal of Smut in his corn, while the other had not one smutty ear.

When wheat is intended for drilling, it must be soaked in no other brine than that of pure salt and water; for, if there be any grease among it, it will never be dry enough for this manner of sowing. If seed wheat be soaked in urine, it will not grow; and, if it be only sprinkled, it will most of it die, unless it be planted presently. The most expeditious way of brining wheat for drilling, is to lay it in a heap, and wash it with a strong brine sprinkled on it, stirring it up with a shovel, that it may be all equally brined or wetted with it: after this, sift on some fine lime all over the surface, and stir it up, still sifting on more in the same manner till the whole is dusted with the lime; it will then be soon dry enough to be drilled without farther trouble. It must be quick-lime, in its full strength, that is used on this occasion.

Bad years will cause Smut in corn, and good years will prevent it: it is, however, observable, that the crops in which there is smutty corn, will, if used for seed, be liable to produce smutty corn again, rather than other seed. The brining is a defence against bad years, and against the mischiefs attending the sowing corn among which there has been Smut.

The other method of changing the seed is by many held effectual, to prevent smuttiness in the crop; several, who have tried this with due care, have found perfect success from it; and it is to be observed, as to the great success of the drowned wheat at Bristol, that it was a change of seed to the lands on which it was sown, as well as brined seed.

Seed-wheat should be brought from the crop on a strong clay land, whatever kind of land it is to be sowed upon. A white clay is a good change for a red clay, and a red clay for a white; but whatever the land be, from which the seed is taken, it may be infected, if that be not changed there the preceding year; and then there may be danger, though it be had from ever so proper a land. It is a rule among the farmers, never to buy seed-wheet from a sandy soil; they express their dislike of this by the coarse rhime, Sand is a change for no land.

A crop of wheat, very early planted, is not so apt to be smutty, as one planted less early; and the farmers have observed, that the largest and plumpest ground fat wheat is more liable to be smutty than the small ground wheat. *Tull's Horse-hoeing Husbandry.*

SMY'RNIUM, *Alexanders*, in botany, the name of a genus of the umbelliferous plants, the characters of which are these: the flower is of the rosaceous kind, consisting of several petals, arranged in a circular order on a cup, which afterwards becomes a fruit of a sort of globular figure, composed of two thick, and, in some degree, lunated seeds, being gibbose and striated on one side, and flat and smooth on the other.

SNAILS, are great destroyers of fruit in our gardens, especially of the bitter sorts of wall-fruit. Lime and ashes, sprinkled on the ground where they most resort, will drive them away, and destroy the young brood of them. It is a common practice to pull off the fruit they have bitten; but this should never be done, for they will eat no other till they have wholly eat up this, if it be left for them.

The Romans were fond of Snails, and had them fed on purpose for their tables. Their taste is not delicious, but rather disagreeable; but this they disguised by means of good sauces, and had other reasons for the receiving them into the lists of foods.

They used them as provocatives or inciters to venery, and with this intent they eat only the necks, as the part in which the parts of generation of the creature were placed; and they had the greater opinion of the efficacy of these, as the parts of generation were double in each individual, that is, the male and female parts both situated in the neck of every Snail.

Aristotle, and the old Greeks, had no idea of the generation of these insects, in the manner of other animals, but supposed them produced spontaneously; but the Romans shew, by many passages in their writings, that they had got over this error, and even seem, by the preference they give to the neck of this animal, in this intention, to have understood the hermaphrodite structure of this insect, which much later ages have pretended to make a new discovery.

The eastern nations at present run much into the opinions of the Romans of old, as to provocatives; they use, as the others did, every thing that serves to the purposes of generation in other animals, and every thing that has but the resemblance of the external figure of the parts subservient to it. The orchis roots, which resemble the testicles of animals in shape, and contain a white and slimy, or viscous liquor, have introduced themselves into use on this plan, and so of many other things. *Phil. Trans.* N°. 50.

Oat SNAIL, a name given by Dr. Lister, in the Philosophical Transactions, to a small Snail, which he observed under the loose bark of old willows, elms, and other trees, and which is of a very singular structure; the shell resembling an oat-corn, whence the name and its volutæ, or wreaths, running contrary to the direction of them in other Snails, that is, east and west, as the philosophers express it, referring it to the motion of the sun; but these shells, to use that language, have the turns west and east, or, more plainly, they have the turns running from the right-hand to the left, not from the left to the right as other Snails. *Phil. Trans.* N°. 250.

SNAKE, *anguis*, in natural history, the name of a well-known reptile, of the serpent kind.

SNAKE with two heads, a kind of Snake in Brazil, having a swelling at his tail, which, at a distance, has the appearance of a head.

The Portuguese call it Snake with two heads; their fear of this creature, for the bite of which they pretend there is no remedy, having prevented their examining into the truth. They also pretend that it is dangerous to meddle with these Snakes after they are dead, and that barely touching them will give the itch. Mr. Couplet was, notwithstanding, bold enough to flea several of them, but found himself, after having performed this operation on two or three, all covered with pustules filled with a reddish water. These remained on him a considerable time, and he was not quite well in three months.

The country of Brazil abounds with large Snakes, the bite of which is venomous, but the natives and blacks make no scruple of eating them. *Mem. de l'Acad. des Sciences*, 1700.

SNA'PDRAGON, *antirrhinum*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf of a tubular form, personated, and having two lips, the upper of which is bifid, and the lower trifid. The pistil arises from the cup, and is fixed, in the manner of a nail, in the hinder part of the flower; and afterwards becomes a seed-vessel, of the shape of the head of a hog, divided into two cells, and usually filled with small seeds fixed to a placenta.

Many of the species of this plant are very beautiful, and much esteemed in gardens, and are all easily propagated from seeds, which must be sown in a dry soil, not too rich, in April or May. In July the plants may be planted out into large borders, where they will flower the spring following; or they may be sown early in the spring, and they will then flower in the next autumn; but then they are not so likely to stand the winter, and, if the autumn proves not kindly, they will hardly produce a perfect thin seed. They all grow very well on old walls, where they have happened to sow themselves. *Miller's Gard. Dict.*

SNATCH-*block*, in a ship, is a great block with a shiver in it, having a notch cut through one of its cheeks, for the more ready receiving in of any rope; for by this notch the middle part of a rope may be reeved into this block, without passing it in endways. This ready block is commonly fastened with a strap about the main-mast, close to the upper deck, and is chiefly used for the fall of the winding tackle, which is reeved into this block, and then brought to the capstan.

SNIPE, in zoology.— These birds are easily taken, by means of lime-twigs, in this manner: take fifty or sixty birchen twigs, and lime them all very well together; take these out into places where there are Snipes, and, having found the places which they most frequent, which may be seen by their dung, set the twigs in these places, at about a yard distance one from another. Other places are those where the water lies open in hard frosty and snowy weather: in these places also, and wherever they are suspected to come to feed, let more lime-twigs be placed in the same manner. The twigs are not to be placed perpendicularly in the ground, but sloping, some one way and some another; the sportsman is then to retire to a distance, and watch the coming of the birds to these places. When they fly to them, they naturally take a sweep round the earth, and by this means they will almost always be caught by one or other of the twigs. When a first Snipe is taken, the sportsman is not to run to take it up, for it it will feed with the twig under its wings, and this will be a means of bringing down more of them to the place. When three or four are taken, they may be taken up, only leaving one faſt to entice others; and thus the ſport may be continued, as long as there are any birds of this kind about the place. It may be very proper, when the twigs are planted, to go about, and beat all the open and watery places near, that they may be raiſed from thence, and fly to thoſe places where the twigs are placed to receive them.

SNOW-*drop-tree*, a very beautiful American tree, which bears the cold of our climate in the open air; but it is very difficult to encreaſe, the layers being two years before they take root, nor will they ever take root at all, except the branches are very young, and are ſlit in the joint, as in the laying carnations. When thoroughly rooted, they may be tranſplanted into ſmall quarters of flowering-ſhrubs, where, among thoſe of a middling growth, they add much to the variety. *Miller's Gard. Dict.*

SNOW-*ſtone*, in natural hiſtory, a name given by ſome to a very beautiful ſtone found in America; of which the Spaniards are very fond, making it into tables, and other ornaments in their houſes. Alonſo Barba, who had ſeen much of it, tells us, that it is found in the province of Atocama, and is uſually found in pieces of four feet long, and four or five inches broad; ſo that it is forced to be joined in the working. Its general thickneſs is about two inches. It has a great variety of colours, which form clouds and variegations of a very beautiful kind. The principal colours are, red, yellow, green, black, and white. The white is generally formed into ſpots on the very blackeſt parts of the maſs, and is ſo beautifully diſpoſed, that it repreſents Snow falling in all its whiteneſs upon a jetty ſurface. *Alonſo Barba, of Metals.*

SOAL, in ichthyology, the Engliſh name of the fiſh, called by the generality of authors the buglofſus, by ſome ſolea.

It is, according to the new ſyſtem of Artedi, a ſpecies of the pleuronectes, and is of that kind which have the eyes placed on the left ſide. Some authors call it the linguacula.

Almond SOAP, *amygdalinus*, a new form of medicince got much into uſe of late in nephritic caſes, and made to ſupply the place of the common hard Soap for internal uſes, in a more determinate manner for the phyſician, and a more cleanly one for the patient.

It is thus made:—Take any quantity of freſh oil of almonds, and thrice its quantity of Soap lees; digeſt them together in ſuch a heat as will make them but juſt boil; within a few hours the oil and lees will be united, and the liquor will ſoon after become ropy, and ſomething tranſparent, and will cool into the conſiſtence of a jelly; then throw in ſea-ſalt till the boiling liquor has loſt its ropineſs; continue the boiling till, drops of the liquor being received upon a tile, the water is ſeen to ſeparate freely from the coagulated Soap; then take away the fire, and the Soap will riſe to the top of the water, and is to be taken off for uſe. *Pemberton's College Diſp.*

SOAP-*earth* (*Dict.*)— The people of Duraclea make Soap with this earth in the following manner: they mix three-fourths of this earth with one fourth of lime, and then poor boiling water upon the mixture; they ſtir this with a ſtick, and there ariſes to the top a thick browniſh ſubſtance, which they ſcum off; they ſave this in veſſels by itſelf. They uſe both this and the clear liquor in making Soap, but this is much ſtronger than the liquor. They put fifty kintals of oil into a large copper furnace, and, kindling a large fire under it, they let the oil boil a little, and then throw in, by little and little, firſt the ſcum of the ley, and afterwards the liquor itſelf; though ſometimes they uſe only the one, or only the other. They continue adding more and more of theſe till the oil acquires the conſiſtence of Soap, which is often ſeveral days. The fire muſt be all this time kept up very ſtrong. The ſcum of the lye, and the ſtronger part of the ley itſelf, mix with the oil in the boiling, and the weaker part, unmixing itſelf, ſinks to the bottom, and is let out by a cock prepared for that purpoſe. This is not thrown away, but is let run upon freſh lime and earth, to make a ley for future uſe; and, when the Soap is perfectly made, it is ladled out, and put upon a brick or lime floor to harden.

The common proportion, in the making the Soap, is two loads of earth of five kintals each, to fifty kintals of oil, and the produce is between ſeventy and eighty kintals of Soap. The earth is bought at a dollar a load, and the Soap at ſix-pence half-penny a kintal. There are employed annually, in making Soap at Smyrna, at leaſt ten thouſand kintals of oil. The bringing the Soap earth to Smyrna employs a thouſand or fifteen hundred camels, for eight months of the year, the four ſummer months being too hot for camels to travel in. A common Soap-houſe produces, at a medium, a thouſand dollars a year clear profit. *Phil. Tranſ.* N°. 220.

There is great reaſon to believe that, when we know the proper manner of working, this will, one way or other, make a great ingredient in our porcelain manufactures.

The Chineſe have of late diſcovered a ſort of earth which they call hoache. They ſay that this is hard, ſmooth, and ſoft to the touch, like Soap; theſe, and its other qualities, ſeem to prove it to be the ſame with our Soap-rock, and this, with them, makes a ſort of porcelain, ſuperior to the common kind in beauty, and in the compactneſs of its texture, but it is more apt to crack. They uſe it ſeveral ways, ſometimes alone, ſometimes with the petunſe, which is a ſtone; and ſometimes they make a varniſh, by diſſolving this in water, with which they coat over the common China, covering it finally with the other varniſh. All theſe ways of uſing it produce very beautiful wares, and it will be extremely worth our while to try them all round, before we give up the uſe of ſo valuable a thing. *Obſerv. ſur les Coutumes de l'Aſie.*

SOIL (*Dict.*)— The land of England, as conſidered by the farmer, is reduced into nine ſorts of Soils; the ſandy, the gravelly, the chalky, the ſtony, the rocky, the hazely, the black earth, the marſh, and the clay land. Of this kind there are four varieties, diſtinguiſhed by their colours; the black, the blue, the yellow, and the red. In many places theſe Soils are mixed and blended together, and where it is ſo, it is much better than where they are ſeparate or ſingle; eſpecially where the mixtures happen to be of a right kind, as thoſe of the hot and dry Soils blended with the cold and the moiſt. Nature does this often, and art may imitate it. All ſands are hot, and all clays are cold; and therefore the laying clay upon ſandy lands, or ſand upon clayey lands, is the beſt of all manure: this alters and changes for the better the very nature of the land itſelf, whereas dung only improves it for a time, and after that leaves it as bad as it was before. Mixed Soils, that tend to the clayey kind, are the beſt of all others for corn. It is not only the natural Soil we are to conſider, but the depth of it, and what Soil is underneath; for the richeſt Soil, if it be only eight or ten inches deep, and lies upon a cold clay, or upon ſtones, will not be ſo fruitful to the farmer as the leaner Soils that lie upon better under-ſtrata. Gravel or ſand are the beſt under-ſtrata, of all others, to make the land above prolific.

Cold and wet clays are much more fruitful in the ſouthern parts of England, than in the north. The climates, therefore, are to be conſidered, and the quantities or proportions of the different kinds in the mixed Soils. The natural produce of the land, as to weeds or graſs, is alſo to be greatly regarded by the perſon who intends to improve upon it.

What is the effect of plowing is next to be enquired into, and experiment muſt ſhew what kind of corn agrees beſt with it.

All land that moulders into duſt with froſt, with all ſorts of warm lands, black mould, yellow clays, if not too ſpewy when wet, and all that turn black after rain, are in general good lands for corn. Land that produces large trees, as alſo ſuch as produces black-thorn, weeds, thiſtles, rank graſs, and the like, and that lies in bottoms open to the eaſt or ſouth, being well ſheltered from the other winds, may be always eſteemed to bid fair for good land. Thyme, ſtrawberries, betony, and wild ſage, direct to the places where wood will thrive beſt; and camomile is always an indication of a land being diſpoſed to bear corn in large crops.

All land that binds after froſt and rain, all that turns white, and is full of worms, or is very moiſt and cold, or that is too hot and dry, and that lies open to the north on the ſides of hills, expoſed to cold winds and froſts in winter, and to the ſun's ſcorching heat in ſummer; and all that bears naturally holly, box, ivy, juniper, fern or brakes, furzes, broom, and heath; and lands that bear moſſes, ruſhes, yarrow, and wild tanzy, with flags, and other ſuch weeds, which betoken a cold and damp ground; are leſs fit for corn, though other things may ſucceed on it. Where plants appear blaſted, ſhrubby, and curled, theſe are diſtempers in them occaſioned by ſudden changes of wet and cold, and a dry heat. All theſe lands are, by their natural produce, to be judged leſs fruitful than the others. Blackiſh, dun, or yellow land, and very hot ſtony gravel, are generally eſteemed very unfruitful. Chalky lands are naturally cold, and therefore they require warm compoſts; and this is the reaſon why chalk itſelf is ſo good a manure for hot and dry land. Sandy land, well manured with marl, will bear turneps, or white or blue peaſe, to great advantage. *Mortimer's Huſbandry.*

The ſupply of freſh vegetable matter, in the place of that which was drained away by the ſucceſſive growths of plants, is done by ſeveral ways, but by none ſo well, as by letting it lie fallow for ſome time; in this caſe the rain falling upon it, the vegetable earth, which this water contains, is depoſited in ſufficient quantity, and this is alone ſufficient to give nutriment to new crops; and it is proved by this, that the rain water, as well as other water, does contain ſuch earth as is neceſſary to vegetation. The other means of giving a ſupply to the exhauſted earth are the manures laid on it by the farmer, and theſe are, all of them, ſome animal or vegetable remains, and their uſe is to drain into the earth thoſe particles from themſelves, which may be again received into the bodies of new productions of the ſame kinds. Blood, urine, the excrements of animals, with their ſeveral parts, as horns, hoofs, hair, feathers, calcined ſhells, and vegetable bodies in an altered ſtate, ſuch as lees of wine and beer, aſhes of burnt vegetables, leaves, ſtraw, roots, ſtubble, and the like, when in a decaying ſtate, turned

under

under the earth again by plowing, there become disunited into their component parts, and these again are carried up into other new plants.

If we take off our thoughts from the fields, and look among the gardens, we there meet with farther confirmations of the same thing: the trees, shrubs, and herbs cultivated in these, after they have continued in one station, till they have derived thence the greater part of the matter fitted for their increase and nourishment, will either decay, or degenerate, unless they have a new supply of manure added to the earth about their roots, or are themselves translated into other earth, not so drained of that particular matter out of which they are to be fed.

The older trees have some more supplies of fit matter than the younger, by means of the length of their roots, which, when they have drained one spot of ground, usually are carried much farther into another, and reach a very great way; but at last they can reach no farther, and all fails, unless such a supply of manure, or the being removed into fresh earth, supply that nourishment they can no longer have where they stand. The gardeners, when they transplant trees, cut off these long roots; but, though they only do this to prevent the trouble of opening a larger hole than necessary for their reception, yet there is in nature this good reason for it, that they have, when brought to a fresh Soil, no occasion for those long roots to draw nourishment from afar off, when there is enough of it every-where about them. What is to be learned from the whole of this, is, that the modern system is erroneous, which says that water is the only thing that gives nourishment and increase to plants; since, if this was the case, there could be no need of manures, nor any need of altering the crop, in order to its succeeding, or of transplanting trees to make them thrive. It is plain that some sort of terrestrial matter, taken from among the Soil, is what gives increase and bulk to plants; for, where it is only water, the rain falling in all places alike, all would alike be at all times suited to produce all plants; and, if the earth, according to Lord Bacon's system, served to no other purpose to plants and trees, but to keep their roots firm, and to defend them from these uses as another, and the same earth would do as well for over-heat, and over-cold, one earth would do as well for the same plant as a different earth. *Phil. Transf.* N°. 253.

Brickish SOIL, a term used by our farmers to express a kind of hazely earth or land, with a reddish cast. It is frequent in Essex, and some other counties, and approaches to the nature of a loam. It has no stones in it, and does not bind after wet as clay does, but lets all the water in that comes, and has no slates in it; whereas all clays hold the water till the sun exhales, and, after rain, with a frost, moulder into dust.

These loams are an excellent mixture for other earths, being a happy medium between two extremes, uniting what is too loose, cooling what is too hot, and entertaining a moderate share of moisture.

The best produce of the brick earth is rye; if well dunged, it will bear white oats, turneps, barley, wheat, buckwheat, and pease. The natural produce, in weeds, is broom, fern, quick-grass, and the like. If it be well dunged, it will produce large crops of clover, but it soon wears out of it, and should therefore be sowed mixed with rye-grass. The best manure for these lands is chalk, mixed with coal-ashes: marl makes a great improvement in them, and there is a stiff yellow kind of clay, that moulders with the frost, that answers the same purpose. Whatever amendment is bestowed upon this sort of land by dung, and other enriching things, that do not absolutely alter the nature of the earth, lasts but a little while. These lands bind very much after rain, and turn whiter; no frost will dissolve the clod, and if they are newly plowed up, and never so much rain comes on them, people may walk or ride over them almost as firm as over gravel. If they are not frequently plowed, they are very subject to worms, which destroy the winter corn. They yield but poor crops in wet years; the weeds are generally very rank, and the wheat runs all into straw. Plowing is a great improvement of them, they always grow well the year after it. These lands are to be ordered for corn in the same manner with the clay land, only as they are rank, and carry the crop much into straw, it is best to dung them on the etch crop, and to sow them with barley, and never to dung the fallows. Where the farmer has not a mind to plow them, but keep them for grass, they should be mowed one year, and then kept short fed with sheep, which will in time sweeten them very much.

The red sandy lands in Northamptonshire are of this kind; they will not hold manure, so they plow but once for the year's crop, which is just before the sowing-time, and manure just before they plow it; for if they plow it oftener, and manure it sooner, they find a great quantity of the best mould washed away below the surface, and out of the reach of the roots of the corn.

In Oxfordshire they have a sort of red land, which they begin fallowing as soon in the year as they can, before the sun is too high: if it is moderately moist, when fallowed, they esteem it the better, but it should not be too wet. They seldom give it a second stirring, and they reckon that, if it is too fine and light, it runs to weeds. *Mortimer's Husbandry.*

SOLA'NUM, *night-shade*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of a rotated form, and divided into several segments. The pistil arises from the cup, and is fixed in the manner of a nail to the middle part of the flower, and finally changes into a roundish or oval berry, or soft succulent fruit, which contains many seeds, usually of a flatted form.

SOLDANE'LLA, *sea bind-weed*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, formed into the shape of a bell, and jagged or fimbriated at the edges in most species; from the cup of this flower rises a pistil, which perforates the bottom of the flower, and is fixed like a nail to its hinder part; this afterwards ripens into a cylindric fruit, which opens at the top and is filled with seeds fixed to a placenta.

SOLU'TION (*Dict.*)— No phænomenon in nature is more universally known, than the Solution of salts in common water; but the world has not yet attended to all that might be learned from the observations on it.

Mr. Lemery, who examined into this point with great assiduity, has observed, 1. That the first effect of water upon a salt is the reducing it into an inexpressibly fine powder. 2. That it is merely the consequence of this pulverisation carried greatly farther, that every particle of salt which, while in larger moleculæ, subsided to the bottom of the water, according to the known laws of hydrostatics, becomes capable of being elevated and suspended in the water, though in itself greatly heavier than that fluid; that, while in a proper state of separation in this manner, they remain imperceptible in all the water, and when by certain accidents they again approach one another, they form concretions like their original ones, and again subside in that fluid, in which they floated while in form of this imperceptible powder.

In the Solutions of salts, the same author observes, that all the particles of water do not serve to the same purpose; some officiating only in the keeping the saline particles suspended, others in the keeping them asunder, and, as barriers, preventing their reunion.

The quantity of water, necessary to sustain the particles of all salts in Solution, is the same; but the quantity, required to keep those particles from joining again, is different, in regard to every salt. Hence though a quantity of water, equal to the weight of the salt, be sufficient to the suspension of its particles, yet every salt requires its own appropriated quantity of water to keep it in a state of solution, that is, to keep its particles from cohering together again. In such salts, the particles of which are not subject to form hard concretions, such as the fixed salt of tartar, and the like, there requires no more water for a Solution than is necessary to suspend the particles of the salt; but in those which readily form solid concretions, such as common salt, nitre, borax, and the rest, there requires a large quantity besides to act as a barrier.

The more the particles of any salt are disposed to re-unite, the more water they require to keep them in a state of Solution; and hence follows a very remarkable phænomenon, which is the Solution of several salts successively in the same water: this is known to be possible, and the reason of the whole is this, that when a given salt, requiring a large quantity of water for its Solution, is dissolved in that water; the greater part of that water, which in this Solution serves only to the second purpose of keeping the particles of the salt asunder, is still at full liberty to act as water upon another salt that shall be thrown into it.

This, however, can be only the case in regard to salts which do not naturally ferment with one another, because the whole process is disturbed by such a fermentation, and, in consequence of it, there is a third salt formed, which is not the same with either of the two; and the consequence of the formation of this salt is the precipitation of the metallic or earthy matter, which was the base of one of the other salts. Thus an alkaline salt, added to a Solution of alum, or saccharum saturni, takes up the acid of either of these salts, and becomes, by its mixture with that acid, a new concrete salt, and at the same time throws down, in precipitation, the terrestrial base of the alum, and the metallic one of the salt of lead.

To return to those salts which excite no fermentation with one another. In regard to these, when a quantity of water has dissolved as much as it can retain of one, it will readily take in and dissolve a second; and the particles of this, not fermenting with those of the salt first dissolved, will remain suspended, and the water which dissolves them, and which in the first Solution served only as an intermedium to keep the particles of that salt asunder, serve as well to that purpose, now they are impregnated with this new salt, as they did before.

It is well known that salt of tartar does not ferment with saltpetre, nor does it take any thing from this salt, or at all alter by being mixed with it, which is quite different from the effect on mixing it, as before obſerved, with alum, or ſaccharum ſaturni; on this principle, and on the known property of ſalt of tartar being diſſolved in a ſmaller quantity of water than any other ſalt; or, in other words, of water's diſſolving more ſalt of tartar than any other ſalt, Mr. Lemery reſolved on the trial, whether water, which had already diſſolved as much nitre as it could contain, would not, on the addition of ſalt of tartar, diſſolve a larger quantity of freſh nitre, than on the addition of ſal armoniac, or any other ſalt: but what appeared very ſtrange was, that after two days ſtanding of a Solution of nitre, with about a fourth part of the quantity of ſalt of tartar added, there was found a white powder at the bottom. The liquor, being examined on this, was found to be a lixivium of ſalt of tartar, and the powder, at the bottom, ſalt-petre.

On adding freſh quantities of ſalt of tartar, new precipitations were afterwards formed, and, in fine, all the ſalt-petre which had been diſſolved was ſeparated. The ſalt-petre being examined, by all trials proved true ſalt-petre, as pure and unmixed as when put in; and the liquor being evaporated, the ſalt of tartar was found equally pure. Salt of tartar tried afterwards in the ſame manner with Solutions of other ſalts, with which it does not raiſe any fermentation, was found to have the ſame effect, precipitating all equally out of the Solution.

In the common precipitations of ſalts, ſuch as alum and ſugar of lead, by means of an alkali, the alkali ſeizes upon the acid of thoſe ſalts, and by that means effects the thing, and therefore itſelf becomes changed into another ſalt, and the precipitate, robbed of that acid, is no longer the ſalt it was, but merely its baſe: but here the ſalts, both alkali and neutral, remain the ſame they were before, both pure and unmixed, and the whole proceſs ſeems only one of them taking the place of the other.

The ſalts which are capable of ſucceſſive Solutions in the ſame water, and of remaining ſuſpended together in it, muſt be all of the neutral kind; that is, they muſt be ſalts compoſed of acids, engaged in ſuch manner in the pores of their baſes, as to fill the whole, and leave no void ſpaces for the penetration of other acids. But this is by no means the caſe with ſalt of tartar, which, being wholly ſpunge-like in its ſtructure, readily admits all ſorts of acids, and ferments with them; and therefore is very capable of diveſting other ſalts of that, on the preſence of which their natural ſtate, as ſalts of a particular kind, depends.

Every alkali ſalt is, as it were, an eſſential ſalt, in part decompounded; that is, it is the earthy part of ſuch ſalt, the acid parts of which have been driven off by fire, and when there is only ſo much left, as may give the whole a ſaline form; for, if all the acids were to be driven off, the remainder would not be an alkali, nor yet a ſalt, but a mere ſimple earth; as is the caſe in the caput mortuum of ſpirit of nitre diſtilled by a retort, the reſiduum from this diſtillation being a mere dead earth, indiſſoluble in water, and altogether different from the fixed alkali produced by burning the ſame nitre with charcoal. What proves, alſo, that theſe alkalies are only the matrix of the compound ſalts diveſted of their acids, is, that if ſpirit of nitre be poured upon the alkali ſalt of nitre made with charcoal, true nitre is regenerated. *Mem. Acad. Par.* 1724.

SO'NCHUS, *ſowthiſtle*. Theſe are moſt of them weeds in England, and are not planted in gardens; for if their ſeeds are once permitted to ſcatter upon the ground, they will ſoon ſtock it with plants; for which reaſon, they ſhould always be extirpated; not only thoſe in the garden, but alſo thoſe in the parts near it; becauſe their ſeeds being furniſhed with down, are wafted in the air to a conſiderable diſtance, where falling on the ground, they ſoon come up, and prove troubleſome.

SO'PHIST (*Dict.*)—The term Sophiſt, which is now reproachful, was anciently honourable; and carried a very innocent idea. St. Auguſtin obſerves, it ſignified a rhetor, or profeſſor of eloquence: ſuch as were Lucian, Athenæus, Libanius, &c.

Suidas, and after him, Olar, Celſius, in an expreſs diſſertation on the Greek Sophiſts, tells us, that the appellation was applied indifferently to all who excelled in any art or ſcience; whether divines, lawyers, phyſicians, poets, orators, or muſicians.— But this ſeems to be ſtretching the ſenſe of the word without all meaſure: it is poſſible a rhetor might have made verſes, &c. but that it was on account of his poetical talent, that he was denominated Sophiſt, is what we ſee no reaſon to apprehend.— However, Solon is the firſt who appears to have ever bore the appellation; which is given him by Iſocrates: afterwards, it was ſcarce ever given, but to philoſophers and declaimers.

The title ſophiſta was in great credit among the Latins in the XIIth century, and in the time of St. Bernard; but it began to loſe ground in Greece, as early as Plato's time, on account of Protagoras and Gorgias, who made a ſordid traffic thereof, by ſelling eloquence for money.—Hence Seneca calls the Sophiſts, quacks or empirics.

Cicero ſays, that the title ſophiſta was given to ſuch as profeſſed philoſophy with too much oſtentation, in order to make a trade of it, by running from town to town, to retail their deceitful ſcience. — A Sophiſt, therefore, was then, as now, a rhetor, or logician, who makes it his buſineſs to enſnare and perplex people, by frivolous diſtinctions, vain reaſonings, and captious diſcourſes.

Nothing has conduced more to the increaſing of the number of Sophiſts, than the contentious ſchool philoſophy: people are there taught to puzzle and obſcure truth, by barbarous, unintelligible terms; as antipredicaments, great and little logicals, quiddities, &c.

SO'RBUS, *the ſervice-tree*, in botany, the name of a genus of trees, the characters of which are theſe: the flower and fruit reſemble thoſe of the cratægus, but differing, in that the leaves are winged as thoſe of the aſh.

SORE, among ſportſmen, denotes a buck of the fourth year.

SO'REX, in zoology, the name of a ſpecies of wild or field mouſe, called the dormouſe, or ſleeper. There are two kinds of this creature, a larger and a ſmaller.

The larger dormouſe is nearly of the ſize of the common rat. Its colour is a browniſh grey, like that of the common mouſe, but variegated with ſomewhat of a reddiſh caſt on the ſides, and on the head. The ears are large and ſmooth; the belly is white; and the inner part of the legs, and the lower part of the tail, eſpecially towards the extremity, are of the ſame colour. The noſtrils and the feet are red; the tail is all over hairy, and is terminated by a thick tuft of white fur. The eyes are large and prominent, and of a fine jetty ſhining black. The beard is partly white, and partly black. Round about the eyes, and round the ears, there is a fine blackneſs; the upper part of the tail is alſo black. The ſmell of this creature is the ſame with that of the mouſe, and its dung is of the ſame kind. It lives in caverns under-ground, and ſleeps all the winter, as ſome affirm. It feeds on vegetables, and is particularly fond of hazel nuts, which it uſually hoards up, when ripe, for a ſcarcer ſeaſon.

The ſmaller kind is much more common than the larger one: this is of the ſize of the common mouſe, and in different countries varies much in colour. In Italy, Mr. Ray obſerved it all over of a reddiſh tawny on the upper part, except the end of the tail, and all its under part white, the tail only excepted; the tail covered with long and thick-ſet hairs, and looking ſomewhat like a ſquirrel's. The eyes are very black and prominent. Thoſe which the ſame author obſerved in England were leſs of the reddiſh hue on the back, and were not white under the belly, but only on the throat; neither had they the white tip at the end of the tail. Poſſibly the Italian and Engliſh may be really diſtinct ſpecies. This creature feeds on nuts and other ſuch fruits. It retires into caves in winter, and ſleeps much; but not through the whole winter, as has been ſuppoſed, for it lays up its winter-proviſion in its hole in autumn, and feeds on it at that time. *Ray's Syn. Quad.*

SO'RRANCE-*water*, a name given by our farmers to a ſolution of vitriol and ſome other ingredients in vinegar, a medicine much eſteemed in many of the diſeaſes of horſes: it is prepared in the following manner:

Take Roman vitriol and roach alum, of each an ounce and half, verdigreaſe an ounce, copperas two ounces; reduce all theſe to powder together, and put them into a two-quart bottle, into which pour a quart of the ſtrongeſt and beſt wine-vinegar; this is to be ſet in balneo mariæ. The ſhort way of doing which by the farrier is this: he puts a wiſp of hay into the bottom of a kettle, and then tying ſome pieces of lead or iron about the neck of the bottle, to make it heavy enough to ſink in water, it is ſet upon the hay ſo as to ſtand very upright; then three notches are cut length-wiſe in the cork to give paſſage to ſome of the vapours when the bottle is heated, that it may not burſt. When every thing is thus prepared, ſo much cold water is to be put into the kettle, that the neck of the bottle may ſtand two or three inches above it; the kettle is then to be ſet over the fire, and the water is to be made to boil, and kept boiling about half an hour, the bottle being at times taken out, and thoroughly ſhaken. When the ſalts are thus thoroughly diſſolved in the vinegar, the whole is to be kept for uſe.

The method in which they uſe it is this: take an earthen pan, which will hold about twelve quarts; let this be filled with urine that has been made by ſound, healthy, and young perſons; the ſtaler the urine is, the better it is for uſe, and indeed it ought always to ſtand, at leaſt, three weeks before it is uſed. It is proper for the farrier, therefore, always to keep a quantity of this ready, and, when the water is to be uſed, half a pint of it is to be mixed with a quart of the urine, or, if it be required ſtronger, more of the water is to be added: theſe are to be thoroughly mixed together, and the legs, or other affected part of the horſe, bathed with it with ſoft rags twice a day.

The virtues of this water are highly extolled; it is ſaid to cure the glanders in two, or three times dreſſing; it is alſo a ſovereign remedy for the mange, either dry or wet, and for the rat-tails, ſcratches, gourded or ſwelled legs and heels; and it alſo cures horſes, when the greaſe is fallen into their heels, as the farriers expreſs it. The fancy is alſo ſaid to be often cured by a long continuance in the uſe of it, purging the horſe two or three times, at different diſtances of time, during the time

of

of his being under cure by the water. They alfo find it a good cleanfer and healer of foul ulcers, and that it prevents the breeding of proud-flefh and worms in wounds, and drives away a flux of humours that were falling upon any part. They ufe it alfo in clefts and cracks of the heels, and in wind-galls, efpecially in the prevention of the laft by its repellent qualities.

The green water alone is an excellent remedy for fiftulas, cankers, and the galled backs of horfes; difpofing fuch Sorrances, as they are called, not to fefter, rot, and grow worfe, as all greafy and oily medicines do, but cleanfing them, and laying the way to a very found and ftanding cure.

SO'RREL, *acetofa*, the name of a genus of plants, the characters of which are thefe: the flower is of the ftamineous kind, being compofed of a number of ftamina arifing from a fix-leaved cup. The piftil, which is furrounded by thefe, finally becomes a triangular feed, wrapped round in a cup: this is compofed of three of the fix leaves of the cup, the other three withering away.

SORREL-*feeds*, are found to contain a vaftly larger proportion of the active principles this plant abounds with, than either the leaves or the roots. They are efteemed aftringent, and good in diarrhœas, dyfenteries, and hæmorrhages.

We much neglect this plant, becaufe it is common; yet, this plant alone has very often proved a remedy for the fcurvy. Mr. Morin of the Academy of Paris, who in the Hôtel Dieu had many hundred fcorbutic patients, cured the greater part of them only by Sorrel boiled and eaten with eggs.

Wood-SORREL, *lujula*, in medicine, is a very grateful acid; in fevers it quenches thirft, and takes off the heat of the ftomach. It is recommended in fevers of all kinds, and the fcurvy; alfo in obftructions of the liver and of the vifcera. It is fometimes given in decoction in fevers, and the expreffed juice is mixed with the juices of the other antifcorbutic plants againft the fcurvy. Externally, it is extolled againft inflammatory eruptions of all kinds in decoction, which is to be ufed by way of fomentation. There ufed to be a fyrup, but, at prefent, only a conferve of this plant is retained in the fhops.

SOUHG, *otherwife called an adit*, in minerology, is a paffage like a vault cut out under the earth, to drain the water from the mines.

SOUL (*Dict.*) — The philofophers are not at all agreed, as to the manner wherein the foul refides in the body. Some hold it equally diffufed throughout every part thereof. Others fay it influences and acts on every part of the body, though it has its principal refidence in fome particular part, called the fenfory. This principal part, Des Cartes maintains, is the pineal gland of the brain, where all the nerves terminate, &c.

Borri, a Milanefe phyfician, in a letter to Bartholine, de Ortu Cerebri & Ufu medico, afferts, that in the brain is found a certain, very fubtile, fragrant juice, which is the principal feat or refidence of the reafonable Soul; and adds, that the fubtility and finenefs of the Soul depends on the temperature of this liquor, rather than on the ftructure of the brain, to which it is ufually afcribed. This liquor, we conceive, muft be the fame with what is ufually called the nervous juice, or animal fpirits. The conftitution whereof is, doubtlefs, of great importance, with regard to the faculties of the Soul.

Mr. Locke diftinguifhes two principal faculties or powers of the rational or human Soul, viz. perception and willing.

To thefe, other philofophers add others, as fenfation, liberty memory, imagination, and habit.

The myftic divines diftinguifh two principal parts in the Soul: the fuperior part, which comprehends the underftanding and the will; and the inferior part, which comprehends imagination and fenfation. Thus, fay they, Jefus Chrift was happy on the crofs in his upper part, and fuffered in his lower part. The lower part did not communicate to the upper either its troubles, or its failings; nor the upper to the lower its peace or beatitude. From this diftinction, the Quietifts take in hand to maintain, that whatever paffes contrary to good morals, in the lower part of the Soul, is not contrary to the purity of the upper part, inafmuch as the will has no fhare therein.

As to the Soul of brutes, the Cartefians, and fome others, deny its exiftence, in the common fenfe of the word Soul; that is, they ftrip it of all the properties or faculties of the human Soul: and the Peripatetics, on the contrary, inveft it with the greateft part of them.

In man, a particular agitation of the fibres of the brain is accompanied with a fenfation of heat; and a certain flux of animal fpirits towards the heart, and vifcera, is followed by love or hatred.

Now, the Peripatetics maintain, that brutes feel the fame heat, and the fame paffions, on the fame occafions: that they have the fame averfion for what incommodes them, and, in the general, are capable of all the paffions, and all the fenfations we feel.

The Cartefians deny they have any perceptions or notices at all; that they feel any pain or pleafure; or love or hate any thing. The ground of their opinion is, that they allow of nothing in brutes, but what is material, and that they deny fenfations and paffions to be any properties of matter. Some of the Peripatetics, on the other hand, maintain matter, when fubtilifed, framed, ranged, and moved in a certain manner, to be capable of fenfation and paffion; that beafts may feel and perceive, by means of the animal fpirits, which are matter thus modified; and that the human Soul itfelf only becomes capable of fenfation and paffion, by means of the fame animal fpirits.

But we muft own it very difficult to reconcile the idea we have of matter with what we have of thought; to conceive that matter figured in any manner, whether in a fquare, a fphere, or an oval, fhould be pleafure, pain, heat, colour or fmell; or to conceive that matter, however agitated, whether in a circle, a fpiral, parabola or ellipfis, fhould be love, hatred, or joy,—furpaffes our endeavours.

The maintainers of the contrary opinion urge that appearance of fenfe, of fear, caution, love for their young, admirable fagacity, both for their own prefervation and that of their fpecies, vifible through the whole brute creation. And, it is true, all the actions of beafts plainly exprefs an underftanding; for every thing that is regular, expreffes it; even a machine or watch expreffes it: and a plant much more; the radicle of the feed turning downwards, and the ftem upwards, whatever fituation the feed is fown in: the young plant, knitting from fpace to fpace, to ftrengthen it; its putting forth prickles, &c. to defend it, &c. mark a great underftanding. All the motions of plants and brutes plainly difcover an intelligence; but the intelligence does not refide in the matter thereof: it is as diftinct from the beaft or plant, as that which ranged the wheels of the watch, is diftinct from the watch itfelf.

For, in effect, this intelligence appears infinitely great, infinitely wife, infinitely powerful; and the fame which formed us in our mother's womb, which gave us our growth, &c. Thus, in brutes, there is not either underftanding or Soul, in the fenfe we generally ufe the word: they eat without pleafure, cry without pain, grow without knowing it. They fear nothing; know nothing; and, if they act in fuch manner, as fhews underftanding, it is becaufe God, having made them, to preferve them, has formed their bodies fo as to avoid whatever might hurt them, mechanically.

Otherwife it might be faid, that there is more underftanding in the vileft infect, nay, in the fmalleft grain, than in the moft knowing of men; for it is evident, either of them contains more parts, and produces more regular motions and actions, than we are capable of underftanding. Thus does the great F. Malebranche argue againft the Souls of brutes. *Recherche de la Verite, liv.* 6.

SOUR *Land*, in agriculture, a term ufed by the farmers to exprefs a cold and fomewhat wet clayey foil.

This muft have its tilth according to its ftate and condition, when they fet about it. If it have a ftrong fwarth upon it, then they give it a fallow, by turning it up, when the fun is in Cancer; this they call a fcalding fallow, and efteem it of great ufe, becaufe it kills the grafs roots, and makes the land fine; but, if it be light, and have but a thin fwarth, they leave it for a cooler tillage, and plow it early in the year, when their clay is fallowed. Pigeon's dung and malt-duft are the moft proper manures for this foil. The malt-duft is to be fown with the winter-corn, and plowed in with it, for then it lies warm at the roots of the corn all winter. *Plot's Oxfordfhire.*

SOW, in the iron-works, the name of the block, or lump of metal, they work at once in the iron-furnace. The fize of thefe Sows of iron is very different, even from the fame workmen, and the fame furnace. Thefe furnaces having fandftone for their hearths and fides, up to the height of a yard, and the reft being made of brick, the hearth, by the force of the fire, is continually growing wider; fo that, if it at firft contains as much metal as will make a Sow of fix or feven hundred weight, at laft it will contain as much as will make a Sow of two thoufand weight.

SO'WING. One very great article, in Sowing to advantage, is to know exactly at what depth the feed may be planted, without danger of burying it. Seed is faid to be buried, when it is laid at a depth below what it is able to come up at. Different forts of feeds come up at different depths, fome fix inches, or more; and others will not bear to be buried at more than half an inch. The way to come at an accurate knowledge of the depth, at which every feed will come up beft from the Sowing, is by making gages in the following manner: faw off twelve fticks of about three inches diameter, bore a hole in the end of each ftick, and drive into each a taper peg; let the peg in the firft ftick be half an inch long, the next an inch, and fo on, every peg being half an inch longer than the other, till the laft is fix inches long: then in that fort of ground, in which you intend to plant, make a row of twenty holes with the half-inch gage, put therein twenty good feeds, cover them up, and then ftick the gage at the end of that row. Proceed in the fame manner with the eleven other gages, making the holes in the fame row all with the fame gage, and fticking it at the end of the row: when the feeds begin to appear, it will be eafy to fee at what depth they come up beft, by obferving the moft flourifhing row, and taking up the gage at the end, and feeing what is its length.

By this means we not only know what is the depth in that fort of ground, at which this fort of feed will come up beft, but alfo we are able to judge of the nature of the feed; for by obferving how many of the twenty feeds that were fown come

up

up, and how many fail, it is eafy to calculate how much bad feed there is among any given quantity, and to allow properly for it in the Sowing, that the field may be neither overftocked with plants, nor too bare of them. The farmer often fuftains great loffes by Sowing bad feed, or by burying good feed, and both might be effectually prevented, by making thefe eafy trials. One caution is to be obferved in this, that it is not proper to fow the feeds of all plants at the greateft depths at which they will come up, becaufe in wheat, and fome other grain, a moift ground will rot the roots at this depth. Experience alone, added to thefe rules, can perfectly inftruct the farmer in the certain way of fucceeding; the nature of the land, the manner how it is laid, either flat or in ridges, and the feafon of planting, muft all be confidered.

The quantity of feed is to be different alfo, according to the manner of the Sowing. The proper quantity, to be drilled into an acre, is much lefs than muft be fown in the common way; not becaufe the hoeing will not maintain as many plants as the other way, for, on the contrary, it will maintain many more; but the difference is upon many other accounts, as that it is impoffible to fow it fo evenly by hand as the drill will do. For let the hand fpread it never fo exactly, which yet is difficult enough to do with fome feeds in windy weather, yet the unevennefs of the ground will alter the fituation of the feeds, the greateft part of them rebounding in the holes, and the loweft places, or elfe the harrows, in covering, drawing them down thither; fo that thefe low places may have ten times too much feed, and the higheft may have much too little, or even none of it; and this inequality leffens in effect the quantity of the feed, becaufe fifty feeds, in the room of one, will not produce fo much as one will do; and where they are too thick, without being in thefe clufters, they cannot well be nourifhed, their roots not fpreading to near their natural extent, for want of hoeing to open the earth, and give them way. In the common way of Sowing, fome of the feeds are buried out of all hope of ever coming up again, and fome others are left naked upon the furface, where they become the food of birds, and of vermin: as fo many muft, therefore, perifh in the common way of Sowing, and fo few can be loft in the way by drilling, there is plain reafon why the feed, neceffary to fow any given quantity of ground, fhould be much lefs for the drill-way, than for the other. The farmers, in general, know nothing of the proper depth at which they fhould fow their feed, nor of the difference in quantity that is to be obferved in different circumftances; they allow the fame quantity to an acre of rough ground, as they do to an acre of fine, and forget that what is too little for one, may yet be too much for the other; it is all mere chance-work, and they put their confidence in good ground, and a large quantity of dung to cover their errors.

The farmers in Wiltfhire allow more corn for the Sowing, than in any other part of England; they ufe fometimes eight bufhels of barley to an acre, fo that, if it produce four quarters for an acre, there is but four grains for one increafe. This is fown on land plowed once, and double dunged, the feed only harrowed into the hard and ftale ground, fo that it is very probable that not fo much as two bufhels out of the eight take place, or come to any thing. Sometimes, in a very dry feafon, an acre fcarce produces four bufhels at the harveft.

Inftead of all this uncertainty and lofs in the common way, in drilling all the feed lies juft at the fame depth, not one grain of it being placed deeper or fhallower than the reft. As none of the feeds, therefore, can be loft by being buried, or by being expofed on the furface to vermin, no allowance is to be made for thefe accidents; all that is to be allowed for in the Sowing, is the mifchief that may happen from the worm, the froft, or the like unavoidable accidents, common to all feeds.

When a man has (by the ufe of the gages, and the growth of the feeds planted in the rows marked by them) proved the goodnefs of the feed, and found the depth it is to be planted at, he is to calculate what number of feeds a bufhel, or any other weight or meafure, contains; for one bufhel, or one pound of fmall feed, may contain double the number of feeds of a bufhel, or a pound of large feed of the fame fpecies. This calculation is made by weighing an ounce, and then calculating the number of feeds this ounce is compofed of; then weighing a bufhel, and multiplying the number of feeds in an ounce by the number of ounces in the bufhel, and the product will give the number of feeds in the bufhel with fufficient exactnefs. When this is known, the feeds are to be proportioned by the rule of three to the fquare feet in an acre; or elfe it may be done, by dividing the feeds of the bufhel by the fquare feet in an acre, and the quotient will give the number of feeds for every foot. Then the farmer is to confider how near he intends to plant the rows, and whether fingle, double, treble, or quadruple; for, the more numerous the rows are, the more feed will be required. The narrow fpaces between double, triple, or quadruple rows, fuppofe feven inches; the double having one, the treble two, and the quadruple three, are called partitions. The wide fpace, fuppofe of five feet, between any two of thefe double, treble, or quadruple rows, is called an interval.

Examine next what is the produce of one middle-fized plant of the annual, but the produce of the beft and largeft of the perennial fort, becaufe that, by hoeing, will be brought to its utmoft perfection; proportion the feed of both to the reafonable product, and, when it is worth while, adjuft the plants to their competent number with the hand-hoe after they are up, and plant perennials generally in fingle rows. Laftly, plant fome rows of the annual thicker than others, which will foon give experience, preferable to all the rules in the world, for the quantity of feed neceffary for the drilling.

The diftances of the rows is one extremely material point in the obtaining a good crop; but as a much larger diftance is to be allowed in thefe, than common practice has been ufed to, it is very difficult to perfuade the farmer to venture a trial at fuch diftances as he may have experience from. There is a method of planting the rows by the drill at very near diftances, and in this work one horfe may draw a drill with eleven fhares, making the rows at three inches and a half diftance from each other, and at the fame time Sowing in them three different forts of feeds, which do not mix, and thefe at different depths. Thus the barley-rows may be feven inches afunder; and the barley four inches deep; a little more than three inches above that, in the fame channels, clover-feed; and, between every two of thefe rows, a row of faintfoin feed covered half an inch deep.

Mr. Tull, who tried this method, obtained the firft year a very good crop of barley; the next year, two crops of broad clover, where that was fown; and where the hop-clover was fown, a mixture of that and faintfoin, and every year afterwards a crop of faintfoin. But the fame gentleman was afterwards fo fully convinced of the folly of thefe, or any other mixed crops, and of Sowing with thefe narrow, that he never practifed it afterwards.

Every row of vegetables, to be horfe-hoed, ought to have an empty fpace, or interval of thirty inches, on one fide of it at leaft, and of near five feet in all forts of corn: this will feem a monftrous allowance to thofe who have not experienced the good effects of it, but all who have will readily come into the practice of it ever afterwards. The line of corn is called one row, though it be double, triple, or quadruple, becaufe, when four of thefe rows grow up in the fpring, they unite, and feem to be all one row. Wide intervals are neceffary for perfect horfe-hoeing, and the largeft vegetables have generally the greateft benefit by them, though fmall plants may have confiderable benefit from much narrower intervals than thofe of five feet.

In hand-hoeing there is always lefs feed, fewer plants, and a greater crop, cæteris paribus, than in the common Sowing; yet, there the rows muft be much nearer than in horfe-hoeing, becaufe, as the hand moves many times lefs earth than the horfe, the roots will be fent out in a like fmaller proportion; and, if the fpaces, or intervals, where the broad hoe only fcratches a little of the furface, fhould be wide, they would be fo hard and ftale underneath, that the roots of the perennial plants would be a great while in running through them, and the roots of annual plants would not be able to do it at all. The advantage of the horfe-hoeing is principally owing to the depth to which it ftirs the ground, and familiar inftances have proved, that the ftirring it to a like depth, by whatever inftrument, is of the utmoft advantage to whatever plants are fet in the place.

A poor fellow in Wiltfhire was obferved to have always his cabbages much larger and finer than his neighbours, though his ground was no better, and he could afford lefs dung; but the reafon was, that, inftead of clearing away the weeds between them with a hand-hoe, he ufed to dig between them with a fpade, which goes as deep as a horfe-hoe, and comes the neareft anfwering its purpofes of any inftrument whatever. *Tull's Horfe-hoeing Hufbandry.*

SPA-*water*.—The contents of this water, by means of which it is able to do fuch great things in many chronical cafes, are underftood by the following experiments and obfervations.

Firft, when the Spa-water is carried to any diftant place, tho' ever fo well ftopped down, they always, after a time, will precipitate a fmall quantity of a yellow ochreous earth.

Secondly, if a fingle grain of galls be put into an ounce of Spa-water, it tinges the whole with a beautiful purple; but, if the water be heated before the galls are put in, there will not be the leaft change of colour produced in it.

Thirdly, mixed with milk, they do not coagulate it; but when mixed with wine, they make a great ebullition, and throw up a large quantity of air-bubbles with a peculiarly pleafing fmell.

Fourthly, the waters drank at the fpring caufe a fort of drunkennefs, but it does not laft above a quarter of an hour.

Fifthly, a fmall phial, being filled up to a certain height with Spa-water, and afterwards exactly to the fame height with pure diftilled water, and weighed, when filled with each, in a nice balance, was found, when the Spa-water was in it, to weigh three ounces, four drachms, and forty grains; and with the other three ounces four drachms and forty-one grains; fo that the Spa-water, notwithftanding its mineral particles, is fomewhat lighter than the pureft common water.

Sixthly, and finally, a pint of the Spa-water, evaporated over a very gentle fire, leaves behind only a grain and half of a white powder.

Hence, it appears, that the Spa-waters are the lighteſt and moſt ſubtile of all the mineral waters; and the ſmall quantity of earth, and large portion of ſubtile mineral ſpirit they contain, beſpeak their poſſeſſing the moſt exalted virtues of all the mineral waters.

One very remarkable virtue of this water is, that it greatly relieves in all diſorders of the kidnies, ureters, and bladder, whether occaſioned by ſtone, gravel, or ulcerations. It poſſeſſes, beſides, all the virtues of the other mineral waters, and is of the greateſt ſervice in edulcorating ſharp, and dividing viſcous humours, and removing all diſeaſes ariſing from theſe cauſes, by diſpoſing them to paſs off by the proper emunctories.

SPAR (*Dict.*)—Spars are defined to be foſſils not inflammable, nor ſoluble in water. When pure, pellucid and colourleſs, and emulating the appearance of cryſtal, but wanting its diſtinguiſhing characters; compoſed of plane and equable plates, not flexile nor elaſtic; not giving fire with ſteel, readily calcining in a ſmall fire, and fermenting violently with acids, and wholly ſoluble in them.

The obſervation, that Spar is continually formed at this time in caves and grottoes under ground, has given birth to many different conjectures, as to the origin of that ſubſtance. We have accounts from Swiſſerland, and other places, that the ſnow, by long lying on the earth, and being ſubject to repeated freezing, is at length hardened into Spar: this is much of the nature of that opinion of the ancients concerning cryſtal, that it was water frozen by ſevere colds to a ſort of ice, much harder than the common kind; both are equally erroneous and abſurd. But more rational conjectures, as to its origin, are, that it is produced either by effluvia alone, or by the joint force of effluvia iſſuing up from the depths of the earth, and mixing with water ouzing out of the rocks into their cracks and cavities, or by the ſame water or effluvia paſſing through beds of this ſparry matter contained in clay. In the firſt place we are to obſerve, that Spar is capable of being diſſolved either by water or vapour, and ſuſpended imperceptibly in either; and that, though it remains ſuſpended a long time, yet there are occaſions of its ſeparating itſelf from either of theſe vehicles; ſuch are long ſtanding ſtill and evaporation. What is called the growth and formation of Spar, therefore, is properly perhaps only the change of place in this ſubſtance, and all that theſe agents, water and vapours, do, is only to waſh it out of the ſtrata of earth or ſtone, in which it lay in ſcattered particles, and bring it together into the cracks and crevices of ſtones, where it may again ſeparate itſelf, and become more pure and perfect. The operation of nature, in this caſe, is very like that of art in the extracting of ſalts from the various bodies they are mixed with; and Spar, in its two ſtates, when blended in the ſtrata of ſtone, &c. and when pure, and in form of cryſtals in the cracks, may be compared to alum, for inſtance, in its bed and when purified. The alum in the common ſtones, from which it is made, is not perceptible to the eye, but lies in ſcattered particles; water being added to this takes up the ſalt, and, when it has been managed by evaporation and reſt, yields it again purified and alone, and it forms ſuch cryſtals on the ſides of the veſſel, as the other does on the ſides of the fiſſures of ſtone, which are the veſſels where the water, out of which it was formed, was ſet to evaporate, and to reſt a proper time. That ſome Spars grow from vapours alone, is evident from the ſtalactitæ, or ſtony icicles, hanging down from the roofs of our caverns, which, though they grow downwards, yet have many times little plants of the ſame ſubſtance growing out at their ſides, and ſtanding upwards, contrary to the growth of the other, and evidently formed of the matter ſeparated from the vapours in their aſcent, as the ſtalactitæ themſelves are from ſuch as have aſcended to the roof and there been condenſed into water, and ſent down again in drops. Nor is the ſparry matter alone thus raiſed in vapour, for even the metals, and other bodies, as little likely as thoſe to be thus raiſed, yet are found to form ſtalactitæ. The mundics, in general, though they never form regular ſtalactitæ, yet, often are found adhering to the ſides of them, and the metals, particularly iron and lead, form regular ſtalactitæ; the iron ones very common, and very perfect; the lead leſs perfect, and more rare; and Dr. Brown gives us abundant inſtances of Spars growing entirely from vapours in the baths of Buda in Hungary. *Philoſ. Tranſ.* Nº. 129.

SPA'RUS, in the Artedian ſyſtem of ichthyology, a genus of fiſhes, the characters of which are theſe: the coverings of the gills are ſcaly. The teeth are covered with lips as in quadrupeds. The teeth in the jaws reſemble the dentes canini of men. The molares, or grinders, are like thoſe of quadrupeds. The teeth are placed only in the jaws and fauces, their palate and tongue being ſmooth. There is but one back fin. The eyes are covered with a lax ſkin, and the tail in moſt of the ſpecies is forked. The inteſtines are long, and they are twiſted in ſpiral forms, and often fixed to the meſentery. The appendices to the pylorus are large, and few in number, from three to ſeven being the uſual numbers.

SPA'THA, is a word uſed by different authors in various ſenſes; ſome expreſs by it a rib; others the inſtrument called by ſurgeons a ſpatula, and uſed for ſpreading ointments and plaſters; and Celſus calls a ſort of inciſion-knife by this name. It is alſo uſed for the external covering of the fruit of the palm-tree, and by others for a ſword. This laſt is indeed its proper ſignification, and all the others are only metaphorical applications of it to different things, which bear reſemblance to a ſword.

SPATHA, among botaniſts, expreſſes that ſort of cup which conſiſts of a ſimple membrane growing from the ſtalk. This kind of cup is of various figures; often diphyllous, or divided into two parts; often ſimple; ſometimes more divided: it incloſes ſometimes a ſingle flower, ſometimes ſeveral flowers together, and theſe have often no perianthium. The Spatha is of very different texture and conſiſtence, in different plants.

SPEAR-*wort*, in botany, a ſpecies of the Ranunculus. See RANUNCLUS.

SPE'CIES (*Dict.*)—What the accurate Artedi has given, as the definition of the Species in ichthyology, is not confined to fiſhes alone, but, with proper regulations, may be made the baſis of real diſtinctions of Species in all other natural bodies. Every fiſh, which differs from all the other fiſhes of the ſame genus in ſome external part, whether that difference be in exceſs or defect, in number or in proportion, or even in colour, provided that the difference be fixed and invariable, is properly to be called a diſtinct Species.

The ſpecific differences of fiſhes are to be drawn from theſe circumſtances; but it is not to be ſuppoſed that every Species differs in all of them; ſometimes only one, ſometimes more, occaſion the variation.

If any one fiſh, in regard to all the others of the ſame genus, is found to be poſſeſſed of ſome external part which they all want; as, for example, if it have cirri, tubercles in the ſhape of horns on the head, ſpines or prickles in the head, or on any other part of the body, the fiſh is then to be eſteemed a diſtinct Species. If one fiſh differs from the others of the ſame genus in the number of any parts, as fins, ſpines, or tubercles, it is then alſo a diſtinct Species. If one fiſh differs from another in the proportion of any eſſential part, as in the having longer jaws, longer teeth, or the like, it is alſo to be eſteemed a truly different Species. If one fiſh differs from another in the figure of ſome eſſential part, as of the ſnout, the back, the teeth, or the tail, or the lineæ laterales, it is to be eſteemed a diſtinct Species. If one fiſh differs from another of the ſame genus in the exceſs of parts, having ſome part that is deficient in the other; or, if in number, proportion, or figure of ſome of the eſſential parts; the diſtinction will be the more evident as the greater number of parts differ, and the Species will eaſily be found to be truly diſtinct. *Artedi's Ichthyology.*

Change of SPECIES. — The change of Species is a term uſed in huſbandry to expreſs an expedient the farmer often has recourſe to, in order to procure good crops: this is the ſowing firſt one kind of plant, then another, and then a third, and ſo on, upon the ſame land: by this means the moſt is made of the ſoil; and it is found, when it will no longer give a good crop of the firſt corn planted on it, it will ſtill give a good one of ſome other Species; and, finally, of peaſe after all. After this laſt change of Species, it is found neceſſary, in the common method of huſbandry, to renew the land with fallowing and manure, in order to its producing any thing again. See SOIL.

This change of Species has been a practice of the farmers of all times, and is recommended, and judged neceſſary, by moſt of the writers on this ſubject; but Tull, in his New Syſtem of Horſe-hoeing Huſbandry, proves, that it is not neceſſary, and that the land only wants proper tillage, when exhauſted by one ſort of corn, to enable it to produce as good crops of the ſame corn again. The three fundamental propoſitions he lays down to prove this, are, firſt, that plants of the moſt different nature feed on the ſame ſorts of food. Secondly, that there is no plant but what muſt rob every other plant, within its reach, of a part of its nouriſhment. And, thirdly, that a ſoil, which is once proper for any kind of vegetable, will continue to be always proper for it, in reſpect to the ſort of food it gives. If only any one of theſe propoſitions were true, it would follow, that there is no need of a change of Species from year to year; and as they are all ſo, this truth is yet the more inconteſtable; and experience proves it yet more evidently, for the ſame land will produce crops of wheat every year, without any change, only by the practice of the horſe-hoeing huſbandry, inſtead of the common. *Tull's Huſbandry.*

SPI'DER, *araneus*, in zoology, the name of a well-known inſect, of which we have a great number of ſpecies.

The Spider affords to the ſagacious obſerver, as well without, as with the aſſiſtance of glaſſes, a great many extremely curious particulars. As the fly (which is the Spider's natural prey) is an animal extremely cautious and nimble, and uſually comes from above, it was neceſſary the Spider ſhould be furniſhed with a quick ſight, and an ability of looking upwards, forwards, and ſideways, at the ſame time; and the microſcope ſhews, that the number, ſtructure, and diſpoſition of its eyes, are wonderfully adapted to the ſerving all theſe purpoſes.

Moſt Spiders have eight eyes: two on the top of the head or body, for there is no diviſion between them, the Spider having no neck; theſe look directly upwards: there are two more in front, placed a little below theſe, and diſcovering all

all that passes forwards, and on each side: a couple more, one whereof points sideways forwards, and the other sideways backward; so that it can see almost quite round it. All kinds of Spiders have not, however, this exact provision; for in some we find ten, and in others only six, or four. The eyes of the Spider are not pearled; and the field-Spiders, or long-legs, have no more than two eyes.

Whatever be the number of the Spider's eyes, they are however all immoveable and transparent, and are situated in a most curious manner. The best way of viewing them with the microscope, is to cut off the legs and tail, and leave only the head for examination.

All Spiders have eight legs, which they employ in walking; and two shorter, called arms, which they use in seizing their prey. All the legs are thickly beset with hairs; each has six joints, and ends with two hooked claws, which are serrated on their inside; by means of these teeth, or jags in their claws, they seize very fast hold of any thing, and behind these there is a sort of spur, which is perfectly smooth. Besides these, nature has allotted this creature, for the seizing its prey, a pair of sharp crooked claws, or forceps, in the forepart of its head. These stand horizontally, and, when not exerted for use, are concealed in two cases contrived for their reception, in which they fold like a clasp-knife, and there lie between two rows of teeth, which are likewise employed to hold fast the prey.

Each of these claws, or pincers, has a small slit near its point, according to Lewenhoeck, like that in a viper's tooth, through which he supposes that a poisonous juice is, in like manner, thrown out. But Dr. Mead, in his essay on Poisons, dissents wholly from this opinion, having never been able, on repeated examinations, to discover any such opening, not even in the claws of the great American Spider; which, being above fifty times bigger than any of the European Spiders, would more easily have discovered this opening, if nature had allotted any to this part of the animal. Besides, repeated observations also convinced him that nothing dropped out of the claws, which were always dry, while the Spider bit any thing, but that a short white proboscis was, at the same instant, thrust out of the mouth, which instilled a liquor into the wound. And the same author observes, that the quantity of liquor, emitted by our common Spiders when they kill their prey, is visibly so great, and the wounding weapons so minute, that they contain but a very inconsiderable portion thereof, if it were to be discharged that way. *Baker's Microscope.*

Spiders frequently cast their skins, which may be found in their webs perfectly dry and transparent; and from such skins the forceps, or claws, for they are always shed with the skins, may easier be separated, and examined with much greater exactness, than in the common Spider while living.

The Spider's manner of weaving its web is very wonderful. The creature has five little teats, or nipples, near the extremity of the tail; from these there proceeds a gummy liquor, which adheres to every thing it is pressed against, and, being drawn out, hardens instantly in the air, and becomes a string, or thread, strong enough to bear five or six times the weight of the Spider's body. This thread is composed of several finer ones, which are drawn out separately, but unite together at two or three hairs breadth distance from the creature's body. These threads are finer or coarser, according to the bigness of the Spider that spins them. Mr. Lewenhoeck has computed, that a hundred of the single threads of a full-grown Spider are not equal to the diameter of the hair of his beard; and consequently, if the threads and hair be both round, ten thousand such threads are not bigger than such a hair. He calculates farther, that, when young Spiders first begin to spin, four hundred of them are not larger than one which is of full growth: allowing which, four millions of a young Spider's threads are not so big as the single hair of a man's beard.

The eggs of some Spiders are a very pleasing microscopic object; they are round at one end, and flattish at the other, with a depression in the center of the flattish end, and a yellowish circle round it. The colour of these eggs is a pearly or bluish white, and, when the young Spiders hatch, they come out in their perfect form, and run about very nimbly. The female Spider deposits her eggs, to the number of five or six hundred, in a bag composed of her own web, which she either carries under her belly, or hides in some very safe recess. *Philos. Trans.* N°. 272.

SPIEI, in glass-making, the name of an iron instrument, hooked at the end and pointed, with which the workmen take the metal out of the melting-pots for proofs or essays, to to see whether it be fit to work. *Neri's Art of Glass.*

SPIKES, *or Oil of* SPIKE, a name given by our druggists to an essential oil, much used by the varnish-makers and the painters in enamel; and of some use in medicine.

This oil, when genuine, is brought from Provence, and some other parts of France, and is there made of lavender. This plant is called in Provence aspic, and thence came the name oil of aspic, which afterwards degenerated into oil of Spike.

The manner of making the oil upon the spot is this: when the flowers are perfectly ripe, they put them into an alembic with a great quantity of water, and this they distil after several days maceration: there arises with the water a large quantity of an oil of a fine pale amber colour, and this, separated from the water, is the true and genuine oil of Spike.

The flower of this plant is the part which yields the largest quantity of oil; as is the case with all the plants with galeated flowers, of which the husk or flower-cup usually contains almost all the oil of the plant. The aromatic plants, in general, yield indeed but a small quantity of oil, but the vast abundance of this plant, in these places, makes the expence of gathering it so small, that the oil is very cheap. The quantity required on several occasions is, however, much greater than what all the lavender of the country can yield; and the price it is expected to be sold at is so small, that it is not to be wondered that there are several common adulterations of it.

The most usual ways of sophisticating it, however, are two; the one with the spirit of wine, which is esteemed the least hurtful, and the oil thus sophisticated is often called the very best of the country. The method Mr. Geoffroy took to discover the cheat was this: he procured a long and narrow phial, of an equal diameter all the way up; into this he first put an ounce of fair water, and to this he added an ounce of the oil; he marked the height of the water in the phial, then shook the two liquors together, and they became milky, and heated on the mixture, which alone would have been a sufficient proof that there was spirit of wine in the oil. After some standing the liquor became clear, and the oil floated at the top, but in a much smaller quantity than might have been expected, there being not more than a quarter of an ounce of it, the rest having been spirit of wine, which mixed with the water, and thus left all the true oil, which was only one fourth of the quantity, to float alone on the water, which was greatly increased in height in the phial. A pint of this oil of Spike, therefore, contains only four ounces of the genuine oil, and twelve ounces of plain spirit of wine.

The second method of adulterating this oil, which the same gentleman had suspected, was easily discovered next: for, on mixing this quarter of an ounce of pure oil of Spike with three quarters of an ounce of oil of turpentine, there was produced an ounce of a liquor, which appeared wholly the same with the oil of Spike commonly sold in the druggists shops. And indeed, much of what is usually sold is worse than this, being no other than oil of turpentine scented with a small quantity of the true oil of Spike.

The ready way of discovering the oil, counterfeited with oil of turpentine, is to wet a paper in it, and set it on fire; the turpentine will here be discovered by the thick smoke it yields, it being, of all vegetable oils, that which yields greatly the thickest cloud in burning: and, on the contrary, that which has been adulterated with spirit of wine, will be distinguished by the same trial, by its yielding a much finer and thinner smoke, and burning with a bright blue flame. If they be tried by firing them in a spoon, that which is adulterated with spirit of wine will burn very bright, and yield no fume at first; but, as it grows near the bottom, it will smoak a little, and finally will leave no residuum, except that it varnishes over the inside of the spoon: that adulterated with the oil of turpentine will burn more vehemently, smoak more, and leave a coarser varnish upon the spoon; and if it be of the coarsest kind, that is, if it have been adulterated with badly rectified oil of turpentine, the fume will be the more abundant, and there will be left in the spoon a fetid matter, resembling melted pitch.

Mr. Geoffroy tried whether, in the business of varnishing, the oil of turpentine alone might not do as well as the oil of Spike; he found that it dried perfectly well, but that it left a stinking smell upon the work, which never went off; whereas the mixture of this oil, with that of Spike, makes a smell like neither, and which soon goes off.

An ounce of oil of turpentine, with only twenty drops, either of our common oil of lavender, or the pure oil of Spike, makes a liquor tolerably well scented, and which serves for the purposes of oil of Spike. If two drachms of our oil of lavender be added to six drachms of spirit of wine, they immediately mix, and this, afterwards mixed in a small proportion with oil of turpentine, makes a sort of oil of Spike. The most regular method, however, that the artificer can use, if he can get the genuine oil of Spike, is to mix one ounce of it with three of oil of turpentine, which perfectly fits it for his purpose, and makes it the same with that in common use.

The method of making this perfectly pure, is to redistil it in a balneum mariæ; there will thus be procured an oil highly rectified, and pellucid as water, which will dry away, as soon as touched on any thing. *Mem. de l'Acad. Roy.*

SPINA'CHIA, *spinach, or spinage*, in botany, a genus of plants, whose characters are: it hath an apetalous flower, consisting of many stamina included in the flower-cup, which are produced in spikes upon the male plants, which are barren; but the embryoes are produced from the wings of the leaves on the female plants, which afterwards becomes a roundish or angular seed, which in some sorts has thorns adhering to it.

Winter spinage should be sown upon an open spot of ground towards the latter end of July, observing, if possible, to do it when there is an appearance of rain: for, if the season should prove dry for a long time after the seed is sown, the plants will not come up regularly; and many times there will not be half a crop. When the spinage is come up, the ground should be hoed to destroy the weeds, and also to cut up the plants where they are too close, leaving the remaining plants about three or four inches asunder; but this should always be done in dry weather, that the weeds may be destroyed soon after they are cut.

About a month or five weeks after the first hoeing, the weeds will begin to grow again; therefore the ground should be then hoed again the second time, observing, as before, to do it in dry weather. But, if the season should prove moist, it will be proper to gather the weeds up after they are cut, and carry them off the ground; for, if the spinage is not cleaned from weeds before winter, they will grow up, and stifle it so, that in wet weather the spinage will rot away.

In October, the spinage will be fit for use; when you should only crop off the largest leaves, leaving those in the center of the plants to grow bigger; and thus you may continue cropping it all the winter and spring, until the young spinage, sowed in the spring, is large enough for use, which is commonly in April; at which time the spring advancing, the winter Spinage will run up to seed; so that you will cut it up, leaving only a small parcel to produce seeds.

The two sorts with smooth seeds produce much larger and thicker round leaves than the former; but, being somewhat tenderer, are always sown in the spring.

These are either sown upon an open spot of ground, by themselves, or else mixed with radish-seed, as is the common practice of the London gardeners, who always endeavour to have as many crops from their land in a season as possible; but, where land is cheap in the country, it will be the better method to sow it alone without any other sort of seed mixed with it; and, when the plants are come up, the ground should be hoed to destroy the weeds, and cut out the plants where they are too close, leaving the remaining about three inches asunder; and, when they are grown so large as to meet, you may then cut off a part of it for use, thinning the plants that they may have room to spread; and this thinning may be twice performed, as there is occasion for the spinage; at the last of which, the roots should be left eight or ten inches asunder. If then you hoe the ground over again, to destroy the weeds, it will be of great service to the spinage; for, if the land is good upon which it was sown, the third sort, with this management, will many times produce leaves as large as the broad-leaved dock, and be extremely fine.

But, in order to have a succession of spinage through the season, it will be proper to sow the seed at three different times in the spring; the first, early in January, which must be on a dry soil; the second, the beginning of February, upon a moister soil; and the third, the beginning of March, which should be on a very moist soil: and this third sowing should be hoed out thinner at the first time of hoeing it, than either of the sowings; for there will be no necessity to leave it for cutting out thin for use, because the former sowings will be sufficient to supply the table till this third sowing is full grown; besides, by leaving it thin at first, it will not be apt to run up to seed so soon as it would if the plants were close. *Miller's Gard. Dict.*

SPINES *of echini*, in natural history. These in their fossil state make a great appearance in the cabinets of the curious, and in the works of the learned, and are of an almost infinite variety of kinds; and many of them are of the same figures and dimensions with those of the echini now living in our own and other seas, as well known to us. But besides these there are an almost infinite variety of others, which, though allowed on all hands to be truly Spines of some echini or other, yet evidently differ from those of all the known recent fish of that name, and have certainly belonged to species of it which we have not yet the least knowledge of.

SPINOZISM (*Dict.*)—Benedict Spinoza, or Espinoza, was a man well known in Holland. He was born a Jew at Amsterdam, but did not make profession of any religion, either the Jewish or Christian. — He composed several books in Latin; the most celebrated whereof is his Tractatus Theologico-Politicus, wherein he endeavours to overturn the foundation of all religion: the book, accordingly, was condemned by a public decree of the states; though it has since been sold publicly, and even reprinted, both in Latin and French, in that country, and lately in English at London.

Spinoza, here, insinuates, that all religions are only political engines, calculated for the public good; to render the people obedient to magistrates, and to make them practise virtue and morality.

He does not here lay down his notion of the Deity openly, but contents himself with suggesting it.—In his Ethics, published among his posthumous works, he is more open and express; maintaining, that God is not, as we imagine him, an infinite, intelligent, happy, and perfect being; nor any thing, but that natural virtue, or faculty, which is diffused throughout all creatures.

Spinoza, in his Tractatus above-mentioned, is very full on the subject of the authors of the scriptures; and endeavours to shew, that the Pentateuch is not the work of Moses, contrary to the common opinion, both of the Jews and Christians. He has also his particular sentiments, as to the authors of the other books.—This part of the work has been answered by M. Huet, in his Demonstratio Evangelica; and by M. Simon, in his Hist. Crit. du Vieux Test.

Spinozism is a species of naturalism, or pantheism, or hylotheism, as it is sometimes called, i. e. of the dogma which allows of no other God but nature, or the universe; and, therefore, makes matter to be God.—Accordingly, Buddeus, in a dissertation de Spinozismo ante Spinozam, proves at large, that Spinoza's doctrine of God and the world is far from being his own invention, but that it had been held by many philosophers of different sects, both among the Chaldeans and Greeks.—It is certain, the opinion of the Stoics, and those who held an anima mundi, was not far from it. Lucan introduces Cato discoursing thus:

Estne Dei sedes nisi terra, & pontus, & aër,
Et cœlum, & virtus? superos quid quærimus ultra!
Jupiter est quodcunq; vides, quocunq; moveris.
Luc. Pharf. lib. ix. v. 578.

Strato likewise, and others among the Peripatetics, maintained something very like it; and what is more, though no ancient sect seems farther removed from Spinozism than the Platonic, as they attributed the greatest freedom to God, and carefully distinguished him from matter; yet Gundlingius has proved at large, that Plato gave matter much the same origin with Spinoza.—But the sect that approached nearest to Spinozism, was that which taught that all things were one, as Xenophanes the Colophonian, Parmenides Melissus, and especially Zeno Eleates, whence it obtained the name of the Eleatic system of atheism.—To the same may also be reduced the opinion of those, who held the first matter for God, as Almaricus and David of Dinantum. Add that the sect of Foe in China and Japan, that of the Soufi in Persia, and that of the Zindikites in Turkey, are found to philosophise much after the manner of Spinoza.

The chief articles in Spinoza's system are reducible to these: —That there is but one substance in nature; and that this only substance is endued with an infinite number of attributes, among which are extension and cogitation.—That all the bodies in the universe are modifications of this substance, considered as it is extended; and that all the souls of men are modifications of the same substance, considered as cogitative. —That God is a necessary and infinitely perfect being, and is the cause of all things that exist, but is not a different being from them.—That there is but one being and one nature; and that this nature produces, within itself, by an immanent act, all those which we call creatures.—And that this being is at the same time both agent and patient, efficient cause and subject; but that he produces nothing but modifications of himself.

Thus is the Deity made the sole agent as well as patient in all evil, both physical and moral; that called malum pœnæ, as well as malum culpæ: a doctrine fraught with more impieties than all the heathen poets have published concerning their Jupiter, Venus, Bacchus, &c.—What seems to have led Spinoza to frame this system, was the difficulty of conceiving either that matter is eternal, and different from God, or that it could be produced from nothing, or that an infinite and free being could have made a world such as this is.—A matter that exists necessarily, and which nevertheless is void of activity, and subject to the power of another principle, is an object that startles our understanding; as there seems no agreement between the three conditions.—A matter created out of nothing is no less inconceivable, whatever efforts we make to form an idea of an act of the will that can change what before was nothing into real substance. Besides its being contrary to that known maxim of philosophers, Ex nihilo nihil fit.—In fine, that an infinitely good, holy, free being, who could have made his creatures good and happy, should rather chuse to have them wicked, and eternally miserable, is no less incomprehensible; and the rather, as it seems difficult to reconcile the freedom of man with the quality of a being made out of nothing.

These appear to have been the difficulties which led Spinoza to search for a new system, wherein God should not be distinct from matter, and wherein he should act necessarily, and to the extent of all his power, not out of himself (ad extra) but within himself.—But it is certain, if the new system rescue us from some difficulties, it involves us in others much greater.—For,

1. It is impossible the universe should be but one substance; since every thing that is extended must necessarily have parts; and what has parts must be compounded. And, as the parts of extension do not subsist in each other, it follows, either that extension in the general is not substance, or that every part of extension is a different substance. Now, according to Spinoza, extension in general is an attribute of substance. And he allows, with other philosophers, that the attributes of substance do not differ really from the substance itself. He must therefore allow, that extension in general is substance: whence it will follow, that every part of extension is a particular substance: which overturns the whole system.

If it be objected, that Spinoza does not consider different bodies, as different parts of extension, but as different modifications of it: the distinction between part and modification, we doubt, will hardly save him. For let him avoid the word part as much as he please, and substitute that of modality or modification for it, the doctrine will amount to much the same: the characters of diversity are not less real and evident, when matter is divided into modifications, than when it it is divided into parts. The idea of the univerſe will ſtill be that of a compound being, or an aggregate of ſeveral ſubſtances.

For proof of this, it may be obſerved, that modalities are beings which cannot exiſt without the ſubſtance which modifies them; whence it follows, that the ſubſtance muſt be found where-ever its modalities are found; and even that the ſubſtance muſt be multiplied in proportion as the number of incompatible modifications is multiplied: ſo that, where-ever there are five or ſix of theſe modifications, there muſt be five or ſix ſubſtances. It is evident, that a ſquare figure and a circular figure are incompatible in the ſame piece of wax. Whence it follows, that the ſubſtance modified by the ſquare figure cannot be the ſame ſubſtance with that modified by the round figure. So, when I ſee a round and a ſquare table in a room, I may ſafely aſſert, that the extenſion which makes the ſubject of the round table is a diſtinct ſubſtance from the extenſion which is the ſubject of the ſquare table: ſince otherwiſe it would follow, that the ſquare and round figures might be found in the ſame ſubject at the ſame time.— The ſubject, therefore, that is modified by two figures, muſt be two ſubſtances.

2. If it be abſurd to make God extended, as this robs him of his ſimplicity, and makes him be compoſed of parts; it is ſtill worſe to reduce him to the condition of matter, the loweſt of all beings, and that which moſt of the ancient philoſophers ranked immediately above nothing: matter! the theatre of all ſorts of changes, the field of battle of contrary cauſes, the ſubject of all corruptions and generations; in a word, the being moſt incompatible with the immutability of the Deity!

The Spinoziſts, indeed, maintain, that it is not ſuſceptible of any diviſion; but the argument they alledge, in proof of it, we have elſewhere ſhewn to be falſe: it is, that for matter to be divided, it is neceſſary that one of the parts be ſeparated from the other by a void ſpace, which is impoſſible: ſince there is no vacuum in nature.

3. If Spinoziſm appear extravagant, when we conſider God as the ſubject of all the mutations, corruptions, and generations in bodies; it will be found ſtill worſe, when we conſider him as the ſubject of all the modifications of thinking. It is no ſmall difficulty to unite extenſion and thinking in the ſame ſubſtance; ſince it is not an union like that of two metals, or of water and wine, that will ſerve the purpoſe: theſe laſt require only juxta-poſition; whereas to combine thinking and extenſion requires an identity; thinking and extended are two attributes identified with the ſubſtance; and conſequently are identified with each other, by the fundamental rule of all logic.

Again, when we ſay, that a man denies this, affirms that, likes that, &c. we make all thoſe attributes fall on the ſubſtance of his mind, not on his thoughts, which are only accidents or modifications of it. If therefore what Spinoza advances be true, that men are modalities of God; it would be falſe to ſay, 'Peter denies, likes, wills', &c. ſince, in reality, on this ſyſtem, it is God that denies, wills, &c. and conſequently all the denominations which ariſe from the thoughts, deſires, &c. of men, fall properly and phyſically on the ſubſtance of God. From whence it alſo follows, that God affirms and denies, loves and hates, wills and not wills the ſame thing, at the ſame time, and under the ſame conditions, contrary to the great principle of reaſoning: 'Oppoſita ſunt quæ & neq; de ſe invicem, neq; de eodem tertio ſecundum idem, ad idem, eodem modo atq; tempore verè affirmari poſſunt'; which muſt be falſe, if Spinoziſm be true: ſince it cannot be denied but ſome men love and affirm what others hate and deny, under all the conditions expreſſed in the rules.

4. But, if it be phyſically abſurd to ſay the ſame ſubject is modified at the ſame time with all the different thoughts of all men, it is horrible when we conſider it in a moral light. Since it will follow, that the infinite, the all-perfect Being is not conſtant, is not the ſame one moment, but is eternally poſſeſſed even with contrary paſſions; all the uniformity in him, in this reſpect, will be, that for one good and wiſe thought he will have twenty fooliſh and wicked ones. He will not only be the efficient cauſe of all the errors, iniquities, and impurities of men, but alſo the paſſive ſubject of them, the *ſubjectum inhæſionis*. He muſt be united with them in the cloſeſt manner that can be conceived, even by a penetrative union, or rather an identity, ſince the mode is not really diſtinct from the ſubſtance modified.

Several have undertaken to refute Spinoza's doctrine, particularly the learned Dr. Clarke; we have alſo an examination of Spinoziſm, and Mr. Bayle's objections againſt this ſyſtem, by Monſ. de Jariges, in the Mem. de l'Acad. de Berlin. Wolfius has alſo given a refutation of Spinoza, in his *Theol. Nat. Part* 2.

SPIPOLE'TTA, in zoology, the name of a ſmall bird of the lark kind, called tordino by the Venetians, and ſeeming to be the ſtopparola, as alſo the griſola and ſpipola of Aldrovandus.

SPIRÆ'A *Frutex, vulgo*, in botany, a genus of plants, whoſe characters are:

The flower is compoſed of many leaves, which are placed in a circular order, and expand in form of a roſe: out of whoſe flower-cup riſes the pointal, which afterwards becomes a fruit compoſed of ſeveral pods, in which are contained ſeveral oblong ſeeds.

Theſe ſhrubs are very common in the nurſeries near London, where it is ſold with other flowering ſhrubs at a certain price by the hundred. This ſhrub ſeldom riſes above five feet high; ſo, is proper to intermix with other ſhrubs of the ſame growth, in ſmall wilderneſs quarters, and other plantations of flowering trees.

This plant may be propagated from ſuckers, which are ſent forth in plenty from the ſtems of the old plants, or by laying down the tender branches; which, when rooted, ſhould be tranſplanted out in rows at three feet diſtance, and the plants a foot aſunder in the rows. In this nurſery they may remain two years, obſerving to keep the ground clear from weeds, and, in the ſpring, to dig up the ground between the rows, ſo that the roots may the more eaſily extend themſelves; and, if they ſhoot out many ſide-branches, they ſhould be pruned off, ſo as to reduce the ſhrubs to a regular figure; and afterwards they may be tranſplanted where they are to remain, either in ſmall wilderneſs-quarters, or in clumps of flowering ſhrubs, obſerving to place them amongſt other ſorts of equal growth. *Miller's Gard. Dict.*

Convertibility of SPI'RITS. This is a doctrine that has obtained among many of the moſt curious experimenters, and indeed the moſt intelligent of our chemiſts have always allowed, that provided proper care were taken in the getting together the materials, one Spirit may always be changed into another, as brandy into rum, malt Spirit into brandy, and brandy into malt Spirit. The principles on which this is believed are theſe: all ſimple Spirits, as they are called, conſiſt of four parts, water, oil, phlegm, and alcohol: the laſt of theſe is the eſſential part, and is what conſtitutes the whole a Spirit. In reducing Spirits, therefore, to their utmoſt degree of ſimplicity and purity, it is evident that the three ſuperfluous parts are to be got rid of, and the fourth left alone; by this means the alcohol is procured diſtinct, and is a liquor ſui generis of many peculiar qualities, not to be found in any other fluid.

Among others, it has theſe remarkable properties. 1. When abſolutely purified, it is an uniform homogene liquor, capable of no farther ſeparation, without loſs or deſtruction of ſome of its homogeneous parts. 2. It is totally inflammable, having no ſoot, nor any moiſture behind. 3. It has no peculiar taſte or flavour, any more than pure water, except what is owing to its nature, as alcohol, or perfectly pure Spirit. 4. It is an unctuous and criſpy fluid, running veiny in the diſtillation, and its drops rolling on the ſurface of any other fluid, like peaſe upon a table, before they unite. 5. It appears to be the eſſential oil of the body it is obtained from, broken very fine, and intimately and ſtrongly mixed with an aqueous fluid, which is aſſimilated or changed in its nature in the operation. 6. And, laſtly, it ſeems to be a kind of univerſal fluid, producible with the ſame properties from every vegetable ſubject; but, to produce it thus, requires ſome care in the operation.

On theſe principles, is founded the opinion, that all Spirits may be reduced to a perfect ſimilarity, or ſameneſs, from whatever ſubject they are procured, and on this depends their convertibility into one another; for, when once they are brought to this ſtandard of ſimplicity, there needs nothing more than to add the oil of ſuch of the finer Spirits as is required to convert the Spirit into that particular kind. By this means the ſame taſteleſs ſpirit, whether obtained from malt, ſugar, or grapes, may be made into either malt-ſpirit, brandy, or rum, by adding the eſſential oil of the grape, ſugar, or malt; and thus what was once malt Spirit, ſhall become brandy, or whatever elſe the operator pleaſes.

Many methods have been attempted to obtain the firſt point, that is, the reducing the Spirit to perfect and pure alcohol. The moſt practicable means ſeem to be long digeſtion, and the repeated diſtillation from water into water, where the eſſential oil will at once be left upon two ſurfaces, and the acid imbibed. The ſhorter ways are thoſe by rectifying from neutral abſorbent ſalts and earths; ſuch are ſugar, chalk, and the like. And, laſtly, the uſe of fixed alkalies may be tried, for theſe very forcibly keep down both the phlegm and oil; inſomuch that this laſt method promiſes to be the ſhorteſt of all, if the art were known of utterly aboliſhing the alkaline ſavour, which the alcohol is apt to acquire in this operation, and, which, for this purpoſe, is by no means ſuitable, as abſolutely deſtroying all vinoſity, which univerſally conſiſts in a fine volatile pungent acidity. The diſtillers are the only people, whoſe buſineſs would lead them to make the experiment. This method of converting one Spirit into another would be of immenſe profit to them, if they could perfectly ſucceed in it; but, as it would require time and ſlow proceſſes to bring it about, there is but little hope of its ever being brought to bear among them, while they are in their preſent ſcheme of doing every thing with diſpatch and hurry.

Dr. Shaw has ſaid a vaſt deal in the praiſe of a taſteleſs Spirit, which is producible from a vegetable ſubſtance, only overlooked, as he tells us, becauſe it is too common, with which all the foreign Spirits might be imitated to the utmoſt perfection

tion by means of their essential oils, all thin fine wines raised to any due degree of strength, without giving them the brandy flavour, and many other things of great use are performed; but he has not told us what the vegetable substance is from which we are to obtain this. *Shaw's Essay on Distillery.*

SPI'SSUM, in the ancient music, was used to signify those two smaller conjunct intervals of a tetrachord, which taken together were less than the third. The term for this was *πυκνα*.

SPRI'NGES, among sportsmen, a sort of horsehair nooses, made so as to run very easy, and planted in places where birds run into one particular path, to take them as they pass.

SPU'RRY, *spergula*, is sown in the Low-countries twice in a summer. The first sowing is in May; these plants flower in June and July, and the seed is ripe in August. The second time of sowing it is after the rye-harvest; they usually plow up the rye grounds, and sow them with this seed, to serve the cows in winter, when the other sorts of grass are low or dead. The cows that feed on this plant are found to yield better milk, and finer butter is made from it, than from that of cows feeding on any other pasture. Poultry also are very fond of eating this plant, and the farmers in some places have an opinion, that it makes them lay the more eggs. *Mortimer's Husbandry.*

SQUA'LUS, in the Linnæan system of zoology, the name of a distinct genus of fishes, of the general order of the chondropterygii. The characters of this are, that the body is oblong, and the apertures of the gills are five on each side.— Of this genus are the galeus, lamia, zygæna, &c. *Linnæi Syst. Nat.*

The characters of this genus, according to Artedi, are these: the foramina, or apertures of the bronchia, are five on each side, and they are placed longitudinally from the head to the pectoral fins; the head is depressed, the body oblong, and either rounded, or longish and angular; the skin is rough; the eyes are placed at the sides of the head; and the upper part of the tail is longer than the under. The mouth in most of the species is placed in the under part of the head, and opens transversely.

SQUA'TINA, the *monk-fish*, called also in Italian the pesce angelo, and thence in English angel-fish.

It is of a middle shape, between the long and flat cartilagineous fishes, being much broader than the galei, and rounder than the rays. It grows to a very large size, sometimes to four, five, or six feet long. It is covered all over with a mucous substance, but under it the skin is harsh, and rough enough to serve for the polishing wood and ivory. It is of a brownish grey on the back and sides, and white under the belly. The head is flatted and roundish, and the mouth large, and opening at the extremity of the snout, not, as in other of the fishes of this class, under the head. It has three rows of teeth, eighteen in a row. Its eyes are large, and placed near its mouth, and seem as if meant for looking sideways, rather than up or down. Its upper pair of fins very much resemble wings, from whence it has its name of the angel-fish, and at the extremities of these are a number of sharp hooked thorns. It has also a row of short prickles on its back.

It is common in the English seas, and is not unfrequently caught in Cornwall.

SQUA'TT, in minerology, a term given by the English miners to a peculiar sort of bed of ore, less valuable than a load or vein, because of its reaching but a little way.

Though the ore of the Squatts is generally very rich and good, not inferior in quality to the best vein ore, the miners are often terribly disappointed, on finding these Squatts instead of the right veins, after a long search. In the tin countries, the way of searching for mines is by looking after the shoadstones; that is, certain metalline stones which contain some ore, and which have originally made the upper part of the vein of ore, reaching up to the day, or surface of the earth.

SQU'ILLA *aquæ dulcis*, the fresh-water shrimp. Few people are aware of the vast destruction made by this little insect among the small fry of fishes. This insect is commonly very plentiful in standing waters, and particularly in breeding ponds, where they always have their prey in plenty before them; and often suffer none, or scarce any of the numerous young fry, hatched from the spawn of carp and tench, to live to grow up. They may be observed following the shoals of the young fry and seizing multitudes one after another; and at other times lurking among the weeds, to seize such as straggle by themselves. If one of these insects be put into a bason of water with a dozen or two of these young fish, though as big as himself, he will very soon destroy them all. They kill numbers that they cannot eat, but leave them to rot.

STA'BILES, in the ancient music, a name given to the extreme chords of a tetrachord; because they remained the same throughout all the genera and species of music.

STA'BLE.— Nothing conduces more to the health of a horse, than the having a good and wholsome Stable. The situation of a Stable should always be in a good air, and on a firm, dry, and hard ground, that in winter the horse may come in and go out clean. It should always be built somewhat on an ascent, that the urine, and other foulnesses, may be easily conveyed away by means of drains or sinks cut for that purpose.

As there is no animal that delights more in cleanliness than the horse, or that more abominates bad smells, care should be taken that there be no hog-sty, hen-roost, or necessary-house near the place where the Stable is to be built; for the swallowing of feathers, which is very apt to happen when hen-roosts are near, often proves mortal to horses; and the steams of a bog-house, or hog's dung, will breed many distempers; and, particularly, they will bring on the farcy and blindness in many horses. It is much better to build the walls of a Stable of brick than of stone, for the former is always dry, the other often sweats, and is very apt to be damp, and to cause rheums and catarrhs to horses that are set in the Stable in damp weather.

The walls ought therefore to be of brick, and to be made of a moderate thickness, two bricks, or a brick and half at the least, both for the sake of safety and warmth in winter, and to keep off the heat of the sun in the midst of summer, which would spoil the horse's appetite, and sink his spirits. The windows should be made on the east and north sides of the building, that the north air may be let in to cool the Stables in summer, and the rising sun all the year round, especially in winter.

The windows should either be sashed, or have large casements, for the sake of letting in air enough; and there should always be close wooden shutters, that the light may be shut out at pleasure; by which means the horse will be brought to sleep in the middle of the day, as well as in the night, when it is judged proper that he should do so.

Many pave the whole Stable with stone, but it is much better to have that part, which the horse is to lie upon, boarded with oak planks; for it will be not only easier, but more warm and comfortable to the creature.

The boards must be laid as even as possible, for this is the way to make the creature lie most at his ease, and in the most healthful posture. The dealers in horses generally indeed make the boards be laid higher towards the top, and slanting down: this shews a horse to more advantage as he lies, but it is very uncomfortable to the creature, and his hinder parts are always slipping down, and the hind legs are often made subject to swellings by it.

The planks should be laid crosswise, not lengthwise, and there are to be several holes bored through them to receive the urine, and carry it off underneath the floor into some drain, or common receptacle. The ground behind should be raised to a level with the planks, that the horse may always stand even; and the floor behind should be paved with small pebbles, and the place where the rack stands should be well wainscotted. There are to be two rings placed on each side of the stall, for the horse's halter to run through, and a logger is to be fixed to the end of this, sufficient to poise it perpendicularly, but not so heavy as to tire the horse, or to hinder him from eating. The best place for him to eat his corn in is a drawer or locker made in the wainscot partition; this need not be large, and consequently need not take up much room, so that it may be easily fixed, and taken out to clean at pleasure: by this means, the common dirtiness of a fixed manger is to be avoided.

Many people are against having a rack in their Stables; they give the horse his hay sprinkled upon his litter, and if they think he treads it too much, or too soon, they only nail up three or four boards, by way of a trough, to give it to him in. The reason of this is, that the continual lifting up the head to feed out of the rack is an unnatural posture for a horse, which was intended to take his food up from the ground, and makes him, as they express it, withy-cragged. In the way of sprinkling the hay on the litter, or laying it in a trough even with the ground, he not only takes it up as if from the earth in a natural way, but can eat as he lies, which is a piece of indulgence that a horse takes great pleasure in.

When there is Stable-room enough, partitions are to be made for several horses to stand in; these should always allow room enough for the horse to turn about, and lie down conveniently in; and they should be boarded up so high towards the head, that the horses placed in separate stalls may not be able to smell at one another, nor molest each other any way. One of these stalls ought to be covered in, and made convenient for the groom to lie in, in case of a great match, or the sickness of a valuable horse. Behind the horses there should be a row of pegs, to hang up saddles, bridles, and other necessary utensils; and some shelves for the hanging up brushes, &c. and the standing of pots of ointment and other preparations.

The Stables of the nobility are often incommoded by bins for oats placed in them, which take up a great deal of room with very little advantage. Dr. Plot has given us, in his History of Oxfordshire, a very convenient method, used by a gentleman of that county, to prevent this. It is done by making a conveniency to let the oats down from above, out of a vessel like the hopper of a mill, whence they fall into a square pipe of about four inches diameter, let into the wall, which comes down into a cupboard also let into the wall, but with its mouth so near the bottom, that there shall never be more than about a gallon in the cupboard at

a time;

a time; which being taken out, and given to the horses, another gallon immediately succeeds it from above, without any trouble to the groom or any body else. By this means there is not an inch of room lost in the lower part of the Stable where the horses stand; and there is this great conveniency besides, that the oats are always kept sweet by it; for every gallon that is taken away puts the whole quantity above in motion, by the running down of the gallon that supplies its place, and no mustiness ever comes, where there is this continual airing and motion. There may easily be contrived two of these, the one for the oats, the other for split beans; and both of these may be let into the range of presses, the oats and beans being separated above by partitions. The other requisites for a Stable are a dung-yard, a pump, and a conduit; and, if some pond or running river be near, it is greatly the better.

STA'CHYS, *base horsehound*, in botany, a genus of plants, whose characters are:

It hath a labiated flower, consisting of one leaf, whose upper lip is somewhat arched and erect, and the under lip is cut into three segments, the middle one being larger than the other two: out of the flower-cup rises the pointal, attended by four embryoes; which afterwards become so many seeds, which are roundish, and inclosed in an husk, which before was the flower-cup: to these marks may be added downy hoary leaves.

STAG-*worms*, in natural history, a name given to a species of worms produced of the eggs of a fly, and lodged in a very strange place behind, and under the palate of the stag or deer's mouth.

STA'INING, or *colouring of porcelain.*—The Chinese, for a great many ages, used only white porcelain. The first colour they employed was blue, and after that they came into the use of all the rest. Their ancient blues were prepared by themselves from a kind of a lapis lazuli; but we now supply them with the smalt so much cheaper, that it is no longer worth their while to make it themselves. They used to prepare this only by giving a gentle calcination to the stone, and then beating it to powder, and grinding it to the utmost fineness in mortars of unglazed porcelain-ware, with pestles of the same. The red, which the Chinese use, is made of our green vitriol, or common copperas. They put about a pound of this into a crucible, and lute on this another crucible inverted: this last has a hole cut in the top, which they keep covered or open at pleasure. They set this crucible in a furnace of bricks, so contrived, as to throw all the flame upon the lower vessel, in the way of our chemists reverberatory furnaces. They make a large fire of charcoal all round it, and observe the hole at the top; for, so long as there ascend thick black fumes through that, the matter is not sufficiently calcined. They watch the going off of this fume, and, when there appears in the place a fine and thin cloud, they take away the crucible, the matter being then sufficiently burnt. They try this, however, by taking a little out, and examining the colour; if it be not sufficiently red, they let it remain longer in the fire. When they find that it is of a good colour, they take away the fire, and leave the vessels to cool; this done, they find a cake of red matter at the bottom of the crucible, and a quantity of a finer powder about its sides. They keep these separate, the latter being the purest, the finest, and the brightest colour.

One pound of copperas affords about four ounces of this colour, and this is the red which they manage in different shades, and vary so much.

The Chinese have also a white colour, which they use in their figures painted on the China: the ware itself is naturally white, and the varnish, or oil of stone, is a great addition to its whiteness all over. But they have yet a way of making a much brighter and finer than these, as may be seen in most of the fine China-ware where there is any white in the figures. This white is made in the following manner: they collect on the shores of their rivers a sort of agate, which is of a whitish hue without veins, and tolerably transparent. It approaches very much to the nature of crystal, and probably crystal may be found to supply its place with us. They calcine this stone to a white powder, and to every ounce of this, when ground in their porcelain mortars to an impalpable fineness, they add two ounces of cerus in fine powder: this they mix with the varnish, and lay on in the common way of other colours.

This white mixture serves not only for the colouring white, but it is the basis of several other of those beautiful colours which we see on the China-ware, and which our manufacturers have been often perplexed what to make of. Their green colour is made of copper rusted with acid; and their fine deep violet colour is made of this green, by adding to it a due proportion of this white. It is not to be supposed that this effect is produced according to the common laws of mixing colours among our painters, for then the white and green would only make a paler green. But, copper being a metal that as well gives a fine blue, as a fine green, according to the nature of the substances it is mixed with, the white in this case alters the very nature of the green, and converts it into that fine and deep violet blue, which we may draw from copper by means of any of the volatile alkalies; such as spirit of sal armoniac, spirit of harshorn, spirit of urine, or any the like liquor. The workmen know how to bring this blue to any degree, by putting in different proportions of the two colours. There is not any admixture of them, that will not produce a blue of some kind; but always, the more of the green colour is used, the deeper the blue will be, and the less, the paler. The yellow is made by an admixture of seven drachms of this white, and three drachms of copperas, or more, if they desire the colour to be deeper.

These colours are laid on upon the vessels when they have been once baked, but they do not appear till the second baking is over in their proper shades or tinges, and sometimes scarce at all.

The black China is much esteemed in the East, and particularly when it is ornamented with gold; this colour looking better with that ornament than any other. The black is always laid on when the porcelain is first dried, and is prepared by mixing three ounces of the fine deep blue with seven ounces of that fine varnish which they call oil of stones. This admixture gives a fine deep black. When the colour is thoroughly dry, the vessels are baked, and, when this is done, the gold is laid on, and the whole is baked again in a particular furnace made for this purpose. If they would have the black degenerate into blue, they need only add less of the blue, and a little of the cerus and agate white before described.

They have two peculiar ways of applying the red, besides the common one, both which require a nice workman, and make the ware come very dear. They call the one of these oils red, and the other blown red.

There are many things practised by the Chinese in their colouring and forming the several kinds of porcelain, which may be well brought into use among us, and give a new value to our own wares, even though we should never arrive at their art of making the thing itself. One kind of colouring, easily introduced among us, would be what they call hoan ton hoan. This produces vessels of great beauty and price, and is done in this manner: the matter, of which the vessels are made, for this purpose, need not be fine; they usually take any of the common vessels baked, without having been varnished, and consequently simply white, and without lustre. When these are intended to be of one simple colour, they need only be plunged into a liquid varnish or oil, as the workmen there call it, coloured with such ingredients as will strike the most lively tinges: but, if it is to be coloured in compartments, as is usually the custom with this sort of China, it is to be done by the pencil. The usual way is to paint these in pannels, one green, another blue, and so on, and they make a very agreeable appearance. There requires no more to this, than the laying on the colours tolerably thick with a large pencil; but, if the pictures of animals and plants are to be given, they are to be done with the most permanent colours, and the vessel being again well baked, becomes very beautiful.

The Chinese, who are deceivers in every thing, find the way of cheating very much in regard to this sort of China-ware. They paint the flowers of plants, and some parts of the birds, &c. in very bright colours, after the vessel has been baked. Vermilion is a fine colour, which they often add on this occasion; but they cannot use this before the baking, because it would be destroyed by the fire. These colours which are laid on afterwards cannot last, but soon rub off in the wiping, or using the things; the others last for ever; for they are laid on with the greatest heat of all, the vessels being put into the same furnaces to lay on these, as the other things are baked in for the first time.

Salt-petre, and powder of flints, are generally the things added to the colours thus laid on, to make them penetrate, and run properly. Thus for the fine deep violet colour, which makes the greatest figure of all others on this ware, they mix together equal quantities of the fine azure, the powder of flints and salt-petre, all first powdered separately till perfectly fine; this is tempered with water, and then laid on with the pencil, and though it looks rough at first, it comes out of the furnace of as beautiful a glossy hue as any thing can be conceived. The yellow is made by mixing together three ounces of cerus, and three ounces of powdered flints, and adding three, four, or more drachms of the red copperas, till the whole is of the proper degree of colour. The white is composed only of powder of flints and cerus, with a small admixture of the salt-petre, or it will succeed tolerably well without. These are all the particulars necessary to be observed for the making a sort of porcelain of great beauty, in which the nature of the ware itself is not concerned; so that it seems easy to imitate it with any of our own wares.

In the baking of this, or any other kind of coloured China, the second time, there is, however, some caution to be used in the placing the pieces. The Chinese are very artful in their disposition of these, arranging them in the most compact manner, and putting the little ones within the great ones; but great care is also necessary, that the vessels do not touch one another in the parts where they are painted, for the consequence of that would be the spoiling of both vessels, as the colours would run together. The bottom of one vessel may generally be placed on the bottom of another, though both are painted, because the rims are not painted, and they keep the painted parts from touching one another. High and narrow vessels, such

such as chocolate-cups, and the like, are very troublesome on this occasion. The method the Chinese workmen take with them, is this: they place a range of them, so as to cover the whole bottom of the furnace, and they cover this with a thin bed of broken China-ware, over which they place another row of the cups, and so on to the top, where they lay on no covering: they never bake any thing else with these cups, when they are of this kind of twice-baked porcelain. *Observat. sur les Coutumes de l'Asie.*

STA'JOLUS, among the Romans, a measure of length used in surveying land; it was equal to five palms and three fourths of a palm.

STAKE, the name of a small anvil used by smiths; sometimes it stands on a broad iron foot, on the work-bench, to be moved up and down occasionally; and sometimes it hath a strong iron spike at the bottom, by which it is fixed to some place on the work-bench. Its use is to set small and cold work straight, by hammering it on the Stake, or to cut or punch upon with the cold chissel, or cold punch. *Moxon's Mech. Exer.*

STAKE *of a plough.* The Stake is an upright piece of wood, passing at its bottom through that link of the tow-chain which passes through the box of the plough, and at its upper end receiving the end of what is called the bridle-chain, which ties it to the crow-staff, or, if it be not long enough, a wyth, or cord, is used to tie it: it is also tied to it again, a little below the pillow of the plough, by another wyth or cord. *Tull's Husbandry.*

STALACTA'GNIA *, in natural history, the name of a genus of spars.

* The word is derived from the Greek σταλακτὸς, stillatitious, or formed by dropping, and ἁγνὸς, pure.

The bodies of this genus are formed by the dropping of water from the roofs of subterranean caverns, and are the purer sort of what are called by authors stalactitæ. They are crystalline sparry bodies, formed into oblong conical figures, composed of various crusts, and usually found in form of icicles.

STALACTOCI'BDELA *, in natural history, the name of a genus of spars.

* The word is derived from the Greek σταλακτὸς, stillatitious, and κίβδηλος, impure.

The bodies of this genus are formed by the dropping of water from the roofs of subterranean caverns, and are the coarser kinds of what authors have called stalactitæ. They are crystallino-terrene spars, formed into oblong bodies, and found hanging from the roofs of caverns and grottoes.

STALAGMODIAU'GIA *, in natural history, the name of a genus of spars, the bodies of which are the purer kinds of what authors call stalagmoscieria.

* The word is derived from the Greek, σταλαγμὸς, a drop, and διαυγὴς, pellucid.

These spars are found in form of small bells, each composed of numerous crusts, and considerably pellucid and crystalline.

STALAGMOSCIE'RIA *, in natural history, the name of a genus of spars, formed by the dropping of waters. They are composed of numerous and thin crusts, and of an opaque and coarse structure.

* The word is derived from the Greek σταλαγμὸς, a drop, and σκιερὸς, opaque.

STAMPS, in metallurgy, a kind of large pestles, lifted up by water-wheels; serving to pour the ores, and flags of metals.

STA'NCHIONS, in ship-building, those pillars which are placed perpendicularly between a ship's deck, to support the weight of the guns, &c.

STA'NDING *Rigging of a ship*, those ropes which do not run in blocks; as the throuds, stays, backstays, &c.

STAR *of the earth*, a name given by the country people to the coronopus, or buckshorn-plantane, from its leaves being always disposed on the earth, in the form of the rays of a Star.

It is famous for its virtues in curing the bite of a mad-dog. The countess of Suffolk's powder, so much celebrated in many places for that terrible disorder, is principally composed of this plant.

STAR-*fish.*—There are many species of the Star-fish, and those extremely different one from another: they have different numbers of rays, but the most common kind has five. Their upper surface, or that to which the legs are not fastened, is covered with a firm and hard skin, which is full of little eminences of a harder matter, approaching to the nature of that of the shells of the echini marini, and the like. This skin is of different colours in the different species; most usually it is red, sometimes it is green, in some blue, and in others yellow, and of all the degrees of these colours, or the mixtures that may be produced from them. This colour does not extend to the under surface, that is coloured all over with legs and with points, like the eminences of the upper side, only longer; these are all either whitish, or yellowish. In the center of the fish there may be seen a mouth or sucker, by means of which the creature draws its nourishment from the shell-fish, on which it feeds. There are five teeth placed round this sucker, or perhaps they may be more properly called five bony forceps; by means of which it seizes and holds fast the creature, while the sucker does its office in draining out the juices; and probably it is by means of these that they open the bivalve shells, when they feed on the fish in them.

The amazing property of reproducing the essential parts, when lost, is not confined to the polype, and some few others of the insect world, but it is extended to the Star-fish, and to the urticæ marinæ of various kinds, and probably to many others, in which we at present have no expectation of finding it. Mr. Reaumur, on the discovery of this property in the polype, observed these other animals, as they lay on the shores of Poictou, and other places, and often found that species of Star-fish, which is very commonly known, and which has naturally five rays or arms, with only three or four, one or two being wanting; and, on taking up and examining these mutilated ones, nature was always found reproducing the limb that was wanting; and, on cutting or breaking other Star-fish into several parts, it was but a very little while before the broken parts cicatrised, and every part remained alive; and by the appearances of things there remained no doubt, but that these living pieces will all, in time, reproduce their wanting parts.

Mr. Reaumur could not stay long enough on the spot to see this; but Mr. de Villars, on the coast of Rochelle, saw the whole process very frequently in the urticæ marinæ which he cut to pieces on purpose for the experiment, and which always reproduced the parts he had cut off; and the common fishermen of the coasts, where Mr. Reaumur was in company with Mr. Jussieu, seeing them making their experiments on the Star-fishes, appeared to be well acquainted with their nature, and told them that they might cut and tear them as much as they pleased, but they would not be able to kill them: so familiarly was this piece of natural history known among these people, though unknown to those who had employed their lives in the searches after such things.

Mr. Reaumur was very sensible of the advantages that water insects, and animals, have over others, as to the healing of their wounds, but was resolved to try the experiment on some land animals. The creature he first chose for these experiments was the earth-worm; and on cutting these creatures asunder, though many of the pieces dried, yet he had the pleasure of seeing some succeed so perfectly, that the tail part, which wanted not only the head, but also the organs of generation of both sexes (which in these animals are always both contained in the same individual) has been seen to reproduce both these organs and the head, and become as perfect a worm as the whole was. *Philos. Trans.* N°. 464.

STAR-*wort, aster*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind. Its disk is composed of floscules, and its border of semifloscules: these all stand on the embryo seeds, and are contained in one common squammose cup. The embryoes finally ripen into seeds, which are winged with down, and fixed to the thalamus of the flower.

All the species of this plant are propagated by parting their roots early in the spring, and they will grow in almost any soil or situation; and the larger sorts increase so fast, that, if not prevented, they will, in a little time, over-run a lage space of ground. They grow best in the shade. But the lower kinds do not run so much at the root, but should be taken up and transplanted every other year, which will make them produce much fairer flowers. *Miller's Gard. Dict.*

STAR *of Bethlehem.* See ORNITHOGALUM.

STA'TICE, *thrift, or sea-pink*, in botany, a genus of plants, whose characters are: it is a plant with a flower gathered into an almost spheric head, furnished with a common scaly empalement: this head is composed of several clove-gilly-flower-flowers, consisting of several leaves in a proper empalement, shaped like a funnel: in like manner, the pointal rises out of the same empalement, and afterwards turns to an oblong seed, wrapped up in the empalement as in an husk.

STA'TUARY *Marble*, a name given by our present artists to the softer white marble, generally formed into statues; it is the same which the ancients called Parian marble.

STA'TURE (*Dict.*)—The Stature, or pitch of a man, is found admirably well adapted to the circumstances of his existence. Had man, observes Dr. Grew, been a dwarf, he could scarce have been a reasonable creature: for, to that end, he must have had a jolt-head; and then he would not have had body and blood to supply his brain with spirits: or, if he had had a small, proportional head, there would not have been brain enough for his business.—Again, had man been a giant, he could not have been so commodiously supplied with food: for there would hot have been flesh enough of the best edible beasts to supply his turn; or, if the beasts had been made proportionably bigger, there would not have been grass enough, &c.

It is a common opinion, however, and has been so ever since Homer's time, that people, in the earliest ages of the world, much surpassed the moderns in Stature; and it is true, we read of men, both in sacred and profane history, whose pitch appears surprising: but then it is as true, that they were esteemed giants.

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The ordinary Stature of men, Mr. Derham obſerves, is, in all probability, the ſame now, as at the beginning; as may be gathered from the monuments, mummies, &c. ſtill remaining. The oldeſt monument in the world is that of Cheops, in the firſt pyramid of Egypt, which, Mr. Greaves obſerves, ſcarce exceeds the meaſure of our ordinary coffins. The cavity, he ſays, is only 6.488 feet long, 2.218 feet wide, and 2.160 deep: from which dimenſions, and thoſe of ſeveral embalmed bodies, taken by him in Egypt, that accurate writer concludes, there is no decay in nature; but that the men of this age are of the ſame Stature as thoſe three thouſand years ago.

To theſe we have other and later inſtances to add from Hakewell: the tombs at Piſa, which are ſome thouſands of years old, are no longer than ours. The ſame may be ſaid of Athelſtan's in Malmſbury church; Sheba's in Paul's, of the year 693, &c.

The like evidence we have from the ancient armour, ſhields, veſſels, &c. dug up at this day; for inſtance, the braſs helmet dug up at Metaurum, fits one of our men; yet it is allowed to have been left there at the overthrow of Aſdrubal. Add, that Auguſtus was five feet nine inches, which was the meaſure of our queen Eliſabeth; only the queen exceeded the emperor by two inches, allowance being made for the difference between the Roman and our foot.

STA'VERS (*Dict.*)—The moſt approved remedy for this diſtemper, which ſhews itſelf in horſes in a giddineſs, and reeling about, in waterineſs of the eyes, and a variety of odd motions of the head, is the following method: the creature is firſt to be blooded largely, then a glyſter is to be given him, compoſed of two quarts of emetic wine, and four ounces of the unguentum populneum. When he has repoſed an hour or two after voiding his glyſter, let another be given him, made of two ounces of the ſcoriæ of the liver of antimony finely powdered, boiled a little while in five pints of beer, and with the addition of four ounces of the ſame ointment, or of ointment of roſes. This laſt glyſter is to be frequently repeated, and his legs are to be all the while rubbed ſtrongly with wiſps of hay, wetted in warm water, to make a revulſion. His food ſhould be bran and white-bread, and he ſhould be walked from time to time in ſome temperate place. If theſe methods do not ſucceed, let an ounce of Venice treacle be diſſolved in a quart of ſome cordial waters, and given him; and, after this, let the following glyſter be given warm: take Venice treacle and ſal polychreſtum, of each two ounces; diſſolve them in two quarts of a decoction of mallows and camomile flowers; add a quarter of a pint of oil of rue. This repeated two or three times after bleeding, and the other methods, will often cure the worſt ſtages of this diſeaſe.

STEA'TITES. See SOAP-*earth*.

STEEL (*Dict.*)—The manner of making iron into Steel had remained very long a ſecret, but many authors of late date have given the proceſs, though it does not appear the ſame in all, and in many is encumbered with circumſtances, intended only to diſguiſe it. Mr. Reaumur has taken greater pains, than almoſt any man, to come at the truth; but, to be rightly informed of his reaſons, we ought to begin where he did, that is, at the origin of the iron in its pure metallic ſtate.

The ores of this metal are mixed bodies, compoſed of ſome particles truly metallic, and of others ſulphureous, ſaline, and terrene; this compound maſs is put in fuſion by the fire, and on this operation the metallic parts, being heavieſt, ſubſide to the bottom of the veſſel, or furnace, and are then eaſily ſeparated from the lighter ſubſtances which float at the top. This ſeparation, however, is not ſuppoſed to be perfect, but the metal, after this its firſt fuſion, retains many heterogene particles, which prevent it from being malleable. It is after this to be refined, that is, to be melted again, and, that ever ſo often performed, the metal becomes yet more and more pure and perfect, ſome heterogene matter being every time depoſited, or thrown off, and this is uſually much leſs after every fuſion.

The metal, when thus purified by melting, yet remains hard and brittle: theſe are two qualities which we do not want in iron, and this hardneſs and friability are no incompatible qualities, ſince their origin is this, that the iron in this ſtate is compoſed of a multitude of ſmall granules, every one of which is very firm and compact in its own texture, though they cohere but ſlightly one with another. The knife, or the file, cannot eaſily cut any one of theſe granules, but a blow of a hammer eaſily ſeparates large parcels of them from thoſe to which they were joined: this caſt iron is therefore uſed only for ſuch purpoſes as requires a ſubſtance poſſeſſed of theſe qualities; purpoſes where hardneſs is required, and where no blows are to be met with. Thus, backs of grates, iron pots, and the like, are made of it.

One of the general properties of metals is, that they are malleable; that is, their ſeveral particles cohere ſo well together, that they are ductile and extenſible under the hammer, and will ſuffer the whole maſs to bend any way without breaking, that is, without their ſeparating from one another. In the works of the artizans, ſuch ſuppleneſs and pliability is called body in a metal, and the caſt iron, which wants this, is ſaid to have no body, and is what they call no ſoft metal. It is therefore no way fit for ſuch works as require faſhioning by the hammer or the file, nor of ſuch as are to ſtand any violent blows; but, as it is eaſily fuſible, it ſerves for the caſt works where there is no great delicacy in the figuring, ſince it does not run ſo thin as to adapt itſelf to every lineament of a fine figure, nor is qualified to be repaired by inſtruments.

The ill qualities of caſt iron are, in a great degree, remedied in the forged or wrought iron, taken from the ſame quantity, and the ſame fuſion. The forging of iron is only the placing it over the fire till heated to a certain degree, and then beating it out with large hammers till it becomes ſoft. When it has been ſufficiently forged, it becomes ſoft and malleable, even when cold, and, when heated, is eaſily wrought into any figures, which it retains afterwards; and it is eaſily cut by the file when cold, and is not brittle on being ſtruck, as is the caſt iron.

While it gains theſe properties by the forging, it loſes, however, another by the ſame means, which is its fuſibility. It will no longer melt in the fire, but when the workmen give it the ſtrongeſt heat they can, it is only reduced to a ſort of ſoft paſte, and ſweats a little, as they expreſs it; that is, ſome few drops of truly melted iron fall from it.

It is very certain, that both the caſt and the forged iron are mixtures of metalline, ſaline, and ſulphureous particles, and the different arrangement of theſe, in their mere ſimple running together in the fuſion, and their being driven intimately into, and among one another, by the hammering, makes the fuſibility different in the two ſtates.

If the forged iron differ greatly from the caſt, there is however a third ſtate into which it is reducible by art, which is yet different from both; this is what we call Steel; and the quality of iron on receiving this change is not one of its leaſt valuable ones, ſince from this we have all our inſtruments for cutting, ſawing, boring, and the like purpoſes, the value of which to us is almoſt infinite. The German Steel has always been in great repute, and, though ſeveral other nations have made it, yet the Germans have kept their method a ſacred myſtery, to keep up their trade in it.

Steel is conſiderably harder than forged iron, and ſo it is neceſſary that it ſhould be, in order to many of the purpoſes it is imployed in. Shears of Steel, which are intended to cut iron, muſt be harder than iron, otherwiſe their edge will turn, and they will not cut; whereas, if the metal is too hard, then the granules will fly off, and the edge break away in ſmall fragments. This is the caſe with all edged tools; and hence it is, that good Steel is ſo nice and difficult a thing to make, ſince there is required ſuch a degree of hardneſs, and no more.

It is very well known, that Steel acquires its hardneſs from the plunging it into water; it is to be heated to a certain degree, and then immediately plunged, while the fiery particles yet remain in it, into water perfectly cold; it is then to be ſpeedily drawn out of the water, and thus the whole operation is finiſhed. It acquires its hardneſs in degrees, proportionate to its heat when plunged into the water; and this hardneſs, or temper, remains with it only till it is heated as high again; for, after that, if left to cool leiſurely, and not thrown into water, it is loſt. All the maſſes of Steel which are ſold are thus tempered; nevertheleſs, when they are wrought into tools, their temper is loſt, and is to be renewed by plunging them again into cold water, when they have been forged into the ſhape of which they are to be.

Mr. Reaumur affirms, that Steel differs in nothing from forged iron, except that it contains more ſulphurs, and more ſalts. Hence, it follows, that caſt iron ſhould be Steel, ſince it evidently differs from forged iron in the ſame manner, and by the ſame properties; and, in effect, caſt iron is Steel, ſuch as it is, eſpecially the white ſort, which is more pure, and more perfectly diveſted of its earth, than the browner ſorts; and this white kind may be accordingly brought to all the hardneſs of Steel, by repeated heating and quenching in cold water. It follows alſo, that, in order to convert iron into Steel, we are to give it new ſalts and new ſulphurs. It may be aſked, where is the neceſſity of giving again that which the mere caſt iron poſſeſſes? To which the anſwer is, that Steel is required to be malleable in ſome degree, which the mere caſt iron is not; and it is to be added to this, that it may be poſſible for us to give to forged iron ſuch ſalts and ſulphurs as are more proper for the Steel, than thoſe which the caſt iron naturally poſſeſſes.

We have great variety of ſalts and ſulphurs, out of which to chuſe for this purpoſe, and Mr. Reaumur made many trials to find which would ſucceed beſt; and the reſult of all was, that, for ſulphurs, powdered charcoal and common ſoot; and, for ſalts, ſea ſalt alone ſucceeded beſt; and that theſe were properly to be mixed with aſhes, by way of an intermediate ſubſtance. Theſe ſubſtances muſt alſo have their allotted doſe; that is, there muſt not only be a certain proportion of the ſeveral ingredients one to another, which, however, need not be very preciſe and exact, but there muſt alſo be a proportional quantity of the whole employed to the quantity of iron that is to be wrought upon; and in this alſo regard muſt be had to the ſeveral ſorts of ores from which the iron was obtained, ſince the iron of ſome ores is much ſooner convertible into Steel than that of others, and makes alſo a better Steel.

The manner of beſt introducing theſe ſalts and ſulphurs into the

the body of the iron was found by this author a matter of great difficulty to determine. He soon perceived, that fire was the only agent that could convey these bodies into the metal; and in contriving how this might be done most easily, and with least expence, he found out, after many trials, a new sort of furnace, which effected this purpose with great ease, and which was not subject to the inconveniencies of other furnaces.

As Steel is iron with an admixture of heterogene particles, it follows that it must be less metallic, that is, less malleable, or more brittle; it is also necessary that it must be, in some degree, malleable for the purpose it is required for; and it is easy to conceive that these properties cannot be given it, in a proper degree, but by means of a very accurate operation; and, even when all the parts of the process are the same, there is yet much depending on the iron itself, which can never be perfectly known but by trial. Something, however, may be judged of the iron by breaking bars of it: the several sorts of iron, when broken, shew some of them only granules, others flakes, and others fibres; some also shew all three of these moleculæ at once, and others two of them; but it is easy, in either of these cases, to see which sort is in the greatest number. The laminated and the fibrous iron are the two extremes; the first is very brittle, the latter very malleable. The laminated iron is ever the worst of all kinds for making into Steel; and of this kind such pieces are worst of all, the laminæ of which are very white and shining, and are large and irregularly disposed, and arranged in different inclinations. Mr. Reaumur began to reckon from these an arrangement of all the kinds of iron, which coming, each by degrees, to have the laminæ still smaller and smaller, and at the same time less glittering, and placed more evenly together, sunk at last into the irons of the granulated kind. It is easy to conceive how many differences there must be between these; and from these the fibrose ones may be deduced, owing their texture merely to the granulæ, which in these are disposed into long strings or streaks. Though, in this arrangement of the irons, the first are, of all others, the least proper for making Steel, it does not follow that the last are the most so; these indeed usually make a very soft and pliant sort of Steel, which has what the workmen call the greatest body of all the kinds of Steel, and is therefore most proper of all for certain purposes, as the making of watch springs, and the like; but the want of hardness makes it very unfit for cutting tools of all kinds, from the razor to the ax. The granulated iron always makes the finest and hardest Steel; and of these such succeed best, whose granules are smallest.

One thing remarkable is, that all Steel, though made of iron of the granulated or striated kind, yet is, before it has been hammered, of a flaky, or a sort of laminated structure; but this seems owing to the fire's having melted some of the granules in the operation, and run great numbers of them together into these plates. The smallness of these flakes in Steel, which has not been worked, are a proof of its being a bad kind.

A bar of iron, when converted into Steel, is not equally so converted in all its parts; the fire has always acted more strongly on its surface than on its central parts, and it is therefore more perfectly Steel there than in its inner parts; but a perfection in the operation is not necessary to the Steel's being good and useful, and the whole bar is often very good Steel, as are also many bars made at the same time, yet, all perhaps, somewhat differently affected.

If the composition, which is to convert the iron into Steel, be too strong, or if the fire be too violent, or the matter contained too long in it, in all these cases the Steel will be over made; that is, there will be an over proportion of saline and sulphureous parts added to the iron: these will therefore too far separate the particles of the metal asunder, and the consequence will be, that the Steel will be too brittle to bear hammering, and will be of great loss to the proprietor in the great quantities that will be broken, besides the loss he will have from the abundance of scales which will fly off in the working. The way to meliorate such Steel as this must be to divest it of a part of its salts and sulphurs, but particularly of the last; and Mr. Reaumur found, that by the burying the bars of such Steel in lime, or any other alkaline substance that would readily absorb the sulphurs, and placing it for a proper time in the fire, it would be in a manner decomposed again, and come out a very good and perfect Steel; and this is no trivial proof, that the account given of the manner of iron's becoming Steel is the true one.

By this management Steel may again be converted, or reduced to its primitive iron, and a body of any middle degree, between Steel and iron, may be produced, by stopping this process at different points of time, or continuing it till all the adventitious salts and sulphurs are drawn off or absorbed. Hardness and flexibility are the two great points of this operation, and what the metal gets of the one of these, it assuredly loses of the other. The greater hardness is from the greater quantity of the adventitious salts and sulphurs; and the greater flexibility, or, as the workmen call it, the greater body, is from the greater quantity of the metallic; and he who is able to calculate properly the quantities of his salt, charcoal, and soot, and to regulate exactly the degree of fire, is capable to make Steel of what degree of temper or perfection he pleases.

Iron, impregnated with new salts and new sulphurs, is not however perfectly reduced to the state of what the workmen expect in Steel; there wants yet the quenching it while hot in cold water, to compleat the operation. The Steel, penetrated every way by the particles of fire, and at that instant plunged into water, is by that quenching stopped in the very state in which it was, and is not suffered to exhale the igneous bodies, as it would otherwise have done. It was, while in the fire, rarified and dilated, and this quenching continues it in that state, and it is found, on measuring, considerably thicker and larger than it was while unheated. It might be supposed from hence, that the particles of fire, which were lodged in the Steel while red-hot, were thus detained and imprisoned in it, and so wrought the change, as they are known to remain in many calcined bodies, though they have not been so suddenly quenched; but, if this were the case, the Steel must be increased in weight as well as bigness, as many calcined bodies are; but this is not found to be so in fact.

Recourse must be had therefore to some other operation on the Steel, and this appears, in reality, to be no other than the change of its texture, or internal structure. If a body be naturally composed of a number of particles, which are in themselves hard and compact, but between which there are certain spaces; if one takes from these hard and compact particles somewhat to fill up these voids, it must appear very evidently, that, though by this the proper particles are rendered less hard, yet the whole body must be made harder than it was before. In the converting of iron into Steel, Mr. Reaumur conceives that the particles of iron, being naturally very covetous of salts and sulphurs, have imbibed great quantities of these adventitious bodies, while the spaces between them have been able to retain very few. This being then the first state of the Steel, when it is afterwards heated, in order to its being tempered by quenching, the fire drives these sulphureous and saline particles, so abundant in the iron, out of its granules, and disperses them throughout the spaces between these granules; and that it is to this equal and regular distribution of these salts and sulphurs, fixed in this state by the immediate quenching, that the hardness and other qualities of Steel are owing.

To the advantage the metal gets by this means, there is however always joined a disadvantage, which is, that its grain naturally and necessarily becomes coarser by it, and the Steel has the less body. The hardest Steel always must necessarily have the least body; but, according to the rules laid down by Mr. Reamur, one may dispose the hardness in what degree one pleases, and consequently all the other properties are in the direction of the same laws.

If the opposition of the qualities of Steel be nicely considered, we shall find, that, instead of being hurtful, they are truly what should be most wished for, and are productive of the most desireable consequences. It may appear somewhat strange, that hardness and flexibility in Steel should be such directly opposite and contradictory principles, and that the quenching, which makes Steel more powerful to resist pressure or rubbing, should, at the same time, make it more feeble in action; but this is plainly the case, and a piece of Steel wire, which, before it is tempered by quenching, will, when hung vertically, suspend a certain weight, will not sustain the same weight when tempered, but will be broken even by a less; and that if the trial be made by tempering it up to one certain part, and no farther, the wire will assuredly break at that very part where the tempered and nontempered portions meet. The increase of size in every grain of Steel, from the quenching, gives the plain solution of this phænomenon. The rupture of any body whatever, that is, the separation of its parts, by whatever means it is done, must be more difficult, the more intimately those parts touch, or the more points they touch in. The granules of Steel are those touching parts, and it is very evident that these granules, becoming larger on the quenching, must after this touch in fewer points, in the whole combination of the mass; and, on the other hand, as they are larger, they also must mutually touch each other in a larger space. Here are two contrary principles, which constitute the facility and the difficulty of the rupture by different means; and it cannot be, but that the one of these constrictions must give the greater force to resist pressure or friction, and the other to resist drawing or traction.

It has been already observed that Steel is the harder, according as it was more or less hot at the time when it was plunged into the water; and it must be added to this, that it also is the more so, the more cold the water is into which it is plunged. The degree of heat in the Steel is easily known by its colour, and the distinctions in it are familiar to the workmen. Several persons have thought there was great virtue to be communicated to the water by means of different ingredients: this Mr. Reaumur carefully tried, and the result was, that he found common cold water the best and most useful of all liquors: it is true, that vinegar and verjuice harden the Steel somewhat more, and aqua fortis greatly so; but the latter of these renders it too hard for service, and repeated ed trials have evinced, that common water alone will give Steel all the hardness it can be wished to have, provided only that it be plunged into it at a time when it is sufficiently hot. If Steel, after tempering, be found too hard, there is a very familiar way of bringing it back to what state one pleases, between that and iron, which is only the heating it in the fire; for it may be kept in the fire so long, as to be reduced wholly to iron again. It is easy to infer from hence, what was before observed, that cast iron is Steel of a peculiar kind; its properties plainly evince, that it is Steel with an over proportion of all that makes it so, and consequently of all its properties. It is not malleable, is very brittle, and too hard for the file, or any other tool, to cut. These are the qualities of Steel which is over tempered, or, as it may be called, too much Steel: it owes these qualities to its being overcharged with those sulphurs and salts, which in a due proportion make Steel of iron. The method of reducing this to the state of wrought iron is the same that we have before observed is to be used to untemper too high tempered Steel, that is, keeping it in the fire till part of its salts and sulphurs are driven off; and, if the fire alone be thought too difficult or too tedious a method, Mr. Reaumur has found that those alkaline substances, which naturally absorb sulphurs, will assist the reducing this to the state of wrought iron, as they do to the untempering of Steel; and that the very same substances of this kind, which have been found best in the untempering Steel, succeed best in the rendering this malleable; such are lime, chalk, and the like.

Cast iron may be taken for these operations in two states; the one that of simply melted iron in its first fusion, the other that of the iron which has been run into the mould. When a cast piece of iron, in a certain form, is heated again with the calx of animal bones, which is one common way, this being a substance extremely divested of salts and sulphurs, it absorbs those of the metal too greedily, and divests it of too great a quantity of them; so that, when the piece comes afterwards to be filed, the fragments fly off in large scales, and the beauty of the cast figure must be lost: to remedy this difficulty, some powdered sulphur is to be added in the heating; for this, being a sulphureous and saline body, checks and moderates the effect of the calx of bone.

Chalk in the same manner can only be employed with certain regulations; it succeeds very well, if the fire be not too violent, or too long continued; but, if it be excessive in either of these particulars, the chalk throws into the body of the iron salts and sulphurs of its own, which lay hid in its structure, and which would not have been dislodged by a smaller fire; but which being dislodged, and thrown into the iron, act upon it, and render the success of the operation quite different from what was intended, the iron becoming more hard and more brittle by it.

One great nicety, in all these operations, is the understanding the signs by which it is known at what time cast iron is sufficiently softened, or overtempered Steel is sufficiently reduced towards the state of iron again; but this is only to be acquired by nice observation, and on this depends the whole certainty of the processes, since every minute's continuance in the fire gives the operation a different turn in degree.

Mr. Reaumur, in one of his experiments in the softening a piece of cast iron of a beautiful figure, found, on taking it out, that it had lost prodigiously of its weight; and, coming to a nicer examination, he found that it was hollow, its outer crust having been sooner converted into malleable, that is, into fusible iron, than the rest, and the violence of the fire afterwards having melted away the inner part, which was not yet so changed. This accident led him to experiments, by which he found that he could, at any time, melt out the central part of a thick square bar of cast iron, the outer part changing first into the condition of malleable iron, and serving as a crucible for the fusion of the yet unaltered fusible iron within. By a proper management of this discovery, it will be easy to take off the unweildy weight of many works of cast iron, which do not require so much strength as that of the solid contained in their circumference. *Mem. de l'Acad. des Scien.* 1722.

Mr. Cramer observes, that the method of making Steel out of iron, is either by fusion, or byce mentation. That by cementation may be performed in the following manner: chuse some bars of pure iron, not too thick; prepare a cement of charcoal dust, moderately pulverised, one part, and wood ashes half a part; or of charcoal dust two parts, bones, horns, leather, or hair of animals, burnt to a blackness in a close vessel, and in a gentle fire, and afterwards reduced to a powder, one part, wood ashes half a part; mix them together. Prepare a cylindrical earthen vessel, two or three inches higher than the bars are long; put into the bottom of this vessel the cement, prepared as before directed, so that, being gently pressed down, it may cover the bottom of the vessel an inch and a half deep; place then the iron bars perpendicularly, so that they may be every-where an inch distant from the sides of the vessels, and from each other; fill the interstices with the cement, and cover the bars with it, that the vessel may be quite full; cover it with a tile, and stop the joints with a lute; put this vessel into a furnace, and keep it moderately, but equally red-hot, for six or ten hours. When this is over, take the red-hot bars out, and dip them in cold water; they will then be brittle, and turned to Steel.

The method of making Steel by fusion is this: take of iron ore, or of unmalleable iron of the first fusion; divide it into small parcels, and put them into a bed made of charcoal dust in a smith's forge; let the quantity of the iron be but small for the experiment; put to it, as a defensive menstruum, some of the vitrescent scoriæ of sand, or stones of the same nature; then put upon them a quantity of charcoal, light this, and admit only a small blast of the bellows, that the scoriæ and metal may both melt regularly: when this has been some time kept in fusion, take it out, divide it into two parts, which make red-hot, and hammer into long bars; finally, heat them red-hot, and plunge them into cold water, and they will then be found to be Steel, so very hard, as not to be filable; and so brittle, as to break asunder, when struck with a considerable force. *Cramer's Art of Assaying.*

Mr. Lemery shews a simple method of reducing Steel to a very fine powder, without rusting it: pour water on filings of Steel in an earthen vessel, till it is four inches above the filings; stir it well every day, supplying more water, as that in the vessel subsides, so that the Steel is always covered; continue this operation till the Steel falls into an impalpable black powder; then dry it for use. *Mem. de l'Acad. des Scien.* 1736.

Mr. Boyle tells us of his having opened the body of Steel, by a highly rectified spirit of urine made per se, and poured upon new filings of the Steel. This being put into a warm place, the menstruum dissolved a considerable part of the metal. *Mem. de l'Acad. des Sciences*, 1736.

Annealing of STEEL, is by some used for the softening it, in order to make it work easier; which is usually done by giving it a blood-red heat in the fire, and then taking it out, and letting it cool of itself.

Steel may indeed be made a little softer than in the common way, by covering it with a coarse powder of cow-horn, or hoofs; thus inclosing it in a loam, heating the whole in a wood fire till it be red-hot, and then leaving the fire to go out of itself, and then the Steel to cool. *Mox. Mechan. Exercises.*

STEE'LING, in cutlery, the laying on a piece of Steel upon a larger mass of iron, to make that part which is to receive the edge harder than the rest. The body of an axe may very well be of iron, as it never comes in use to cut with, and perhaps is stronger, and less liable to break than if of Steel; but it must have a quantity of Steel at that part where the edge is to be made.

STE'MPLES, in mining, cross bars of wood in the shafts which are sunk to mines. In many places the way is to sink a perpendicular hole, or shaft, the sides of which they strengthen from top to bottom with wood-work, to prevent the earth from falling in: the transverses pieces of wood, used to this purpose, they call Stemples, and by means of these the miners in some places descend, without using any rope, catching hold of these with their hands and feet. *Ray's Engl. Words.*

STE'NO's *Duct*, a name given from its discoverer to the superior salival duct.

STEP, in a ship; that piece of timber whereon the masts or capstans do stand at bottom, is called the Step of the mast or capstan.

STEREO-*statics*, is used by some for the statics or science of the equilibrium of solid bodies. *Cartel. Math. Univ.*

STERN-*posts*, in a ship, a great timber let into the keel at the stern of a ship, somewhat sloping, into which are fastened the after-planks; and on this post, by its pintle and gudgeons, hangs the rudder. See SHIP *Building*.

STIL *de grain*, in the colour trade, the name of a composition used for painting in oil or water, and is made of a decoction of the lycium or Avignon berry, in alum-water, which is mixed with whiting into a paste, and formed into twisted sticks. It ought to be chosen of a fine gold yellow, very fine, tender, and friable, and free from dirt. *Pomet's Hist. of Drugs.*

STILE, or STYLE, in a philosophical Stile, the only end of which is accurately to explain our thoughts to others; thence the particular rules to be observed by a philosopher in delivering his doctrines, naturally follow: such as,

1. Not to deviate from the received signification of terms.
2. That the same terms be always taken in the same sense.
3. To fix the meaning of such words as have only a vague sense.
4. To signify objects, essentially different, by different names.

From these rules, the use and necessity of terms of art appear, and shews with how little reason they are vulgarly condemned.

5. The philosopher ought always to make use of proper expressions, and use no more words than what are precisely necessary to establish the truth of his doctrines. *Wolf. Disc. Prælim. Logic.* See STYLE, in the Dictionary.

STILL-*bottoms*, in the distillery, a name given by the traders to what remains in the still after working the wash into low wines.

These

These bottoms are procured in the greateſt quantity from the malt waſh, and are of ſo much value to the diſtiller in the fattening of hogs, &c. that he often finds them one of the moſt valuable articles of the buſineſs.

The liquor left behind in the Still, after the rectifying the low wines into proof-ſpirit, is alſo called by ſome by the name of Still-bottoms; but this is little more than mere phlegm, or water impregnated with a few acid and oily parts, not worth ſeparating, unleſs for curioſity. The liquor left in the Still, after the rectifying the proof-ſpirit into alcohol, is alſo of the ſame kind.

The bottoms of melaſſes ſpirits ſeem calculated for many uſes. It is very probable that the vinegar-makers would find their account in the trying them; and the ſtrong and laſting yellow colour, with which they tinge the hands, may recommend them to the dyers. A ſmall proportion of them, added to the new treacle to be fermented, greatly promotes the operation, and increaſes the quantity of ſpirit.

The bottoms of the wine ſpirit, that is, the remainder, after diſtilling the ſpirituous part from damaged wines, or wine lees, may be brought to afford Mr. Boyle's acid ſpirit of wine, and that ſubſtance called by Becher the media ſubſtantia vini. A parcel of tartar may alſo be procured in very great perfection; and the laſt remainder may be converted into excellent and genuine ſalt of tartar. The liquor may otherwiſe be ſerviceable in making vinegar and white lead. *Shaw's Eſſay on Diſtillery.*

STILL *houſe.* The Dutch have much the advantage of us in the ſtructure of their Still-houſes, and have every thing in great readineſs and neatneſs. The general rules in building theſe houſes ſhould be theſe.

The firſt caution is to lay the floor aſlope, not flat, where any wet work is to be performed; it ſhould alſo be well flagged with broad ſtones, ſo that no wet be detained in the crevices, but all may run off, and be let out at the drains made at the bottom and ſides.

The Stills ſhould be placed abreaſt on that ſide of the Still-houſe to which the floor has its current. The largeſt Stills in Holland, for their greateſt works, are never of that monſtrous ſize that we ſee them of in England, but much more manageable and handy, as ſeldom containing more than ſix or eight hogſheads; and, with ſuch Stills, a ſingle hand will perform much more buſineſs than ten with one of a much larger ſize. Fronting the Stills, and adjoining to the back-wall, ſhould be a ſtage for holding the fermenting backs, and theſe, being placed at a proper height, may empty themſelves, by means of a cock and a canal, into the Stills, which are thus charged with very little trouble.

Near this ſet of fermenting backs ſhould be placed a pump or two, that may readily ſupply them with water by means of a trunk or canal, leading to each back. Under the pavement, adjoining to the Stills, ſhould be a kind of cellar, wherein to lodge the receivers, each of which ſhould be furniſhed with its pump, to raiſe the low wines into the Still for rectification; and through this cellar the refuſe waſh, or Still-bottoms, ſhould be diſcharged by means of a hoſe, or other contrivance.

Theſe are the principal things to be regarded in the erecting a Still-houſe for the original production of ſpirits, and, if theſe rules are well obſerved, malt-ſpirit will be made with little more trouble than melaſſes; for by this means the buſineſs of brewing and cooling the waſh, which, according to the method generally practiſed in England, takes up ſo much time and trouble, is entirely ſaved, fermentation is carried on to a much greater advantage, and the quantity of ſpirit increaſed. *Shaw's Eſſay on Diſtillery.* See the article MALT *Diſtillery.*

STOCCA'TO, in the Italian muſic, ſignifies that every note muſt be divided and ſeparated from the next in a very plain and diſtinct manner. *Broſſard's Muſical Dict.*

STOCKS, among ſhip-carpenters, a frame of timber and great poſts, made aſhore to build pinnaces, ketches, boats, and ſuch ſmall craft, and ſometimes ſmall frigates. Hence we ſay, a ſhip is on the Stocks, when ſhe is a building.

STŒ'CHAS, *French lavender*, in botany, a genus of plants, whoſe characters are: it hath a labiated flower, conſiſting of one leaf; whoſe upper lip is upright, and cut in two; but the under lip, or beard, is cut into three parts; but both are ſo divided, as at firſt to appear like a flower cut into five ſegments; out of whoſe flower-cup riſes the pointal, attended by four embryo's, which afterwards become ſo many roundiſh ſeeds incloſed in the flower-cup: to theſe marks muſt be added, that the flowers are ranged in a various ſeries into ſcaly heads; out of the top of which peep ſome ſmall leaves, which look very beautifully.

The flowers of the Stœchas are much uſed in medicine, in diſeaſes of the head and nerves, eſpecially ſuch as are ſuppoſed to ariſe from cold cauſes. They alſo promote the evacuation by urine, and by the menſes, and in ſome places are eſteemed one of the greateſt antidotes, and given in large doſes againſt the effect of poiſons, and the bites of venomous animals. Meſue, and the Arabians in general, ſpeak of it as a purge, and particularly as good in caſes where phlegm was to be evacuated; though they ſay it did this but ſlowly and weakly. At preſent we do not acknowledge any purging quality in it. There is a very fragrant oil drawn from the flowers and tops of this plant, in the ſame manner as that from lavender; but it is not much in uſe with us. The flowers are an ingredient in the Venice treacle, mithridate, and ſome other of the officinal compoſitions.

It is to be obſerved that there is another plant, called Stœchas, in the ſhops; and, by the writers on the Materia Medica, this has the epithet citrina, for its diſtinction from the Stœchas we have been treating of, which is either called Stœchas without any addition, or Stœchas Arabica. The citrine Stœchas has none of the virtues of this kind, nor is it of the ſame genus of plants.

Theſe plants may be cultivated by ſowing their ſeeds upon a bed of light dry ſoil in March; and, when the plants are come up, they ſhould be carefully cleared from weeds until they are two inches high; at which time they ſhould be removed; therefore there muſt be a ſpot of light dry ground prepared, and laid level, which muſt be trodden out in beds; into which the plants ſhould be planted at about five or ſix inches diſtance each way, obſerving to water and ſhade them until they have taken root; after which they will require no further care, but to keep them clear from weeds the following ſummer; but, if the winter ſhould prove very ſevere, it will be proper to cover them with mats, peaſe-haulm, or ſome other light covering, to guard them againſt the froſt, which otherwiſe would be apt to injure them while they are ſo young: but in March, or the beginning of April, the following ſpring, they muſt be removed in the places where they are to remain; obſerving, if poſſible, to tranſplant them in a warm moiſt ſeaſon, and not to let them remain long above-ground; for if their roots are dried they ſeldom grow well after. The ſoil in which theſe are planted ſhould be a dry warm ſand or gravel; and, the poorer the ſoil is in which they are planted, the better they will endure the cold of the winter, provided the ground be dry; though, indeed, the plants will thrive better in ſummer upon a rich moiſt mould; but then they will not produce ſo many flowers, nor will the plant afford near ſo ſtrong an aromatic ſcent; as is the caſe with moſt ſorts of aromatic plants.

Theſe plants may alſo be propagated by planting ſlips or cuttings of any of the kinds in the ſpring, obſerving to refreſh them with water until they have taken root; after which, they may be managed as hath been directed for the ſeedling-plants; but as thoſe plants, raiſed from ſeeds, are much better than theſe; it is hardly worth while to propagate them this way, eſpecially ſince their ſeeds ripen ſo well in this country.

STONE-*braſh*, in agriculture, is a light lean ſoil, full of larger and ſmaller maſſes of rubble-ſtones.

Theſe are to be tilled according to the condition in which they are found, for if they are graſſy they fallow them pretty late; but, if they have no graſs upon them, they fold them in winter, when the ſheep's dung, with the help of ſome hay-ſeed, will furniſh them with graſs: or elſe, early in the ſpring, they lay upon them old thatch or ſtraw, or the ſtrawy part of old dunghills, earth out of ditches, or the like, which will all, more or leſs, help forward a coat of graſs upon the land; for it is a rule, in regard to theſe lands, that they muſt have a covering of graſs before they are fallowed, elſe they will yield but a poor crop. *Plot's Oxfordſhire.*

STO'NY *land.* The farmers expreſs by this term two ſorts of land, the one full of large flints and pebbles, and the other full of fragments of free-ſtone, and other coarſe ſtones. Theſe lands in many places yield good crops, and the general rule is, that in ſtiff and cold lands the ſtones ſhould be as carefully picked out as may be, but in light and dry grounds they ſhould be left. In Oxfordſhire they have great quantities of a lean earth, and a ſmall rubble-ſtone, or a ſowre ſort of land mixed with it; this is ſometimes very full of weeds, and ſometimes very clear of them: if they are weedy, they fallow them late; but if they be ſeary, as they expreſs it, that is, if they have ſwerd upon them, they either fold them in winter, and add ſome hay-ſeed to the Sheep's dung, to bring up graſs; or elſe they lay old thatch, or ſtraw, and dung upon it; for they reckon, that, if theſe lands have no ſwerd upon them before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other unprofitable herbs. In September, November, and December, they fallow as the ſwerd directs them: if this is done in either of the two laſt months, they call it a winter fallowing, and never ſtir it again till they plow it, and ſow it with barley; and theſe lands are reckoned to do better than if finely tilled. They will bear wheat and meſlin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart.

They always fallow theſe lands every other year, unleſs they ſow peaſe upon them; ſometimes they ſow them with lentils; and, when they are quite worn out, they lay them down for clover, or rye-graſs. *Mortimer's Huſbandry.*

STOOL, in mining, is uſed when the miners leave digging deeper, and work in the ends forward. The end before them is called the Stool. *Houghton's Compl. Miner.*

STO'PPER, in a ſhip, a piece of rope having a wale-knot at one end, with a lannier ſpliced into it; and at the other end made faſt in the place where it is to be uſed. Its uſe is to ſtop the main-halliards, or the cable.

STOVES,

STOVES, are contrivances for the preſerving ſuch tender exotic plants, which will not live in theſe northern countries, without artificial warmth in winter. Theſe are built in different methods, according to the ingenuity of the artiſt, or the different purpoſes for which they are intended; but in England they are at preſent reducible to two.

The firſt is called a dry Stove, being ſo contrived, that the flues through which the ſmoke paſſes are either carried under the pavement of the floor, or elſe are erected in the back-part of the houſe, over each other, and are returned ſix or eight times the whole length of the Stove. In theſe Stoves the plants are placed on ſhelves of boards laid on a ſcaffold above each other, for the greater advantage of their ſtanding in ſight, and enjoying an equal ſhare of light and air. In theſe Stoves are commonly placed the tender ſorts of aloes, cereus's, euphorbiums, tithymals, and other ſucculent plants, which are impatient of moiſture in winter; and therefore require, for the moſt part, to be kept in a ſeparate Stove, and not placed among trees, or herbaceous plants, which perſpire freely, and thereby often cauſe a damp air in the houſe, which is imbibed by the ſucculent plants, to their no ſmall prejudice. Theſe Stoves may be regulated by a thermometer, ſo as not to overheat them, nor to let the plants ſuffer by cold; in order to which, all ſuch plants, as require nearly the ſame degree of heat, ſhould be placed by themſelves in a ſeparate houſe; for, if in the ſame Stove there are plants placed of many different countries, which require as many different heats, by making the houſe warm enough for ſome plants; others, by having too much heat, are drawn and ſpoiled.

The other ſorts of Stoves are commonly called bark Stoves, to diſtinguiſh them from the dry Stoves already mentioned. Theſe have a large pit, nearly the length of the houſe, three feet deep, and ſix or ſeven feet wide, according to the breadth of the houſe; which pit is filled with freſh tanners bark, to make an hot-bed; and in this bed the pots of the moſt tender exotic trees, and herbaceous plants, are plunged: the heat of this bed being moderate, the roots of the plants are always kept in action; and the moiſture, detained by the bark, keeps the fibres of their roots in a ductile ſtate, which, in the dry Stove, where they are placed on ſhelves, are ſubject to dry too faſt, to the great injury of the plants. In theſe Stoves, if they are rightly contrived, may be preſerved the moſt tender exotic trees and plants, which, before the uſe of the bark was introduced, were thought impoſſible to be kept in England; but, as there is ſome ſkill required in the ſtructure of both theſe Stoves, we ſhall deſcribe them as intelligibly as poſſible, particularly the bark Stove; by which it is hoped every curious perſon will be capable of directing his workmen in their ſtructure.

The dimenſion of this Stove ſhould be proportioned to the number of plants intended to be preſerved, or the particular fancy of the owner; but their length ſhould not exceed forty feet, unleſs there are two fire-places; and, in that caſe, it will be proper to make a partition of glaſs in the middle, and to have two tan-pits, that there may be two different heats for plants from different countries, for the reaſons before given in the account of dry Stoves; and were I to erect a range of Stoves, they ſhould be all built in one, and only divided with glaſs partitions, at leaſt, the half way towards the front; which will be of great advantage to the plants, becauſe they may have the air in each diviſion ſhifted by ſliding the glaſſes of the partitions, or by opening the glaſs-door, which ſhould be made between each diviſion, for the more eaſy paſſage from one to the other.

This Stove ſhould be raiſed above the level of the ground, in proportion to the drineſs of the place; for, if it be built on a moiſt ſituation, the whole ſhould be placed upon the top of the ground; ſo that the brick-work in the front muſt be raiſed three feet above the ſurface, which is the depth of the bark-bed, whereby none of the bark will be in danger of lying in water; but, if the ſoil be dry, the brick-work in front need not be more than one foot above-ground, and the pit may be ſunk two feet below the ſurface. Upon the top of this brick-work, in front, muſt be laid the plate of timber, into which the wood-work of the frame is to be mortiſed; and the upper timber in front muſt be placed four feet aſunder, or ſomewhat more, which is the proportion of the width of the glaſs-doors or ſaſhes: theſe ſhould be about ſix feet and an half, or ſeven feet long, and placed upright; but from the top of theſe ſhould be ſloping glaſſes, which ſhould reach within three feet of the back of the Stove, where there ſhould be a ſtrong crown-piece of timber placed, in which there ſhould be a groove made for the glaſſes to ſlide into. The wall in the back-part of the Stove ſhould be at leaſt thirteen inches thick; but eighteen inches is ſtill better; becauſe, the thicker the outſide wall is built, the more the heat of the flues will be kept in the houſe; and carried up, about nine feet above the ſurface of the bark-bed; and, from the top of this wall, there ſhould be a ſloping roof to the crown-piece where the glaſſes ſlide in. This crown-piece ſhould be about ſixteen feet high from the ſurface of the bark-bed or floor, which will give a ſufficient declivity to the ſloping glaſſes to carry off the wet, and be of a reaſonable height for containing many tall plants. The back-roof may be ſlated, covered with lead, or tiled, according to the fancy of the owner: for the manner of this outſide building is often very various, and differently built.

In the front of the houſe there ſhould be a walk, about eighteen or twenty inches wide, for the conveniency of walking; next to which the bark pit muſt be placed, which ſhould be in width proportionable to the breadth of the houſe: if the houſe is twelve feet wide, which is a due proportion, the pit may be ſeven feet wide; and behind the pit ſhould be a walk eighteen inches wide, to paſs in order to water the plants, &c. then there will be twenty-two inches left next the back-wall, to erect the flues, which muſt be all raiſed above the top of the bark-bed: theſe flues ought to be one foot wide in the clear, that they may not be too ſoon ſtopped with the ſoot; and the lower flue, into which the ſmoke firſt enters from the fire, ſhould be two feet deep in the clear; and this may be covered either with caſt iron plates, or broad tiles; over this the ſecond flue muſt be returned back again; which may be eighteen inches deep, and covered on the top as before; and ſo, in like manner, the flues may be returned over each other three or four times, that the heat may be ſpent before the ſmoke paſſes off. The thickneſs of the wall in front of theſe flues need not be more than four inches; but it muſt be well jointed with mortar, and plaiſtered withinſide to prevent the ſmoke from getting into the houſe; and the outſide ſhould be faced with mortar, and covered with a coarſe cloth, to keep the mortar from cracking, as is practiſed in ſetting up coppers. If this be carefully done, there will be no danger of the ſmoke entering the houſe, which cannot be too carefully avoided; for there is nothing more injurious to plants than ſmoke, which will cauſe them to drop their leaves; and, if it continue long in the houſe, will intirely deſtroy them.

The fire-place may be made either at one end, or in the middle, according as there is moſt conveniency; for, where-ever it is placed, it ſhould have a ſhed over it, and not be expoſed to the open air; for it will be impoſſible to make the fire burn equally, where the wind has full ingreſs to it; and it will be troubleſome to attend the fire in wet weather, where it is expoſed to the rain.

The contrivance of the furnace muſt be according to the fuel which is deſigned to burn: but, as turf is the beſt firing for Stoves, where it can be had, becauſe it burns more moderately, and laſts longer, than any other ſort of fuel, and ſo requires leſs attendance, I ſhall deſcribe a proper ſort of furnace for that purpoſe.

The whole of this furnace ſhould be erected within the houſe, which will be a great addition to the heat; and the front wall on the outſide of the fire-place, next the ſhed, ſhould be three bricks thick, the better to prevent the heat from coming out that way. The door of the furnace, at which the fuel is put in, muſt be as ſmall as conveniently may be to admit of the fuel; and this door ſhould be placed near the upper part of the furnace, and made to ſhut as cloſe as poſſible; ſo that there may but little of the heat paſs off through it. This furnace ſhould be about twenty inches deep, and ſixteen inches ſquare at bottom; but may be ſloped off on every ſide, ſo as to be two feet ſquare at the top; and under this furnace ſhould be a place for the aſhes to fall into, which ſhould be about a foot deep, and as wide as the bottom of the furnace: this ſhould alſo have an iron door to ſhut as cloſe as poſſible; but juſt over the aſh-hole, above the bars which ſupport the fuel, ſhould be a ſquare hole about four inches wide, to let in air to make the fire burn: this muſt alſo have an iron frame, and a door to ſhut cloſe when the fire is perfectly lighted, which will make the fuel laſt the longer, and the heat will be more moderate.

The top of this furnace ſhould be nearly equal to the top of the bark-bed, that the loweſt flue may be above the fire; ſo that there may be a greater draught for the ſmoke; and the furnace ſhould be covered with a large iron plate, cloſely cemented to the brick-work, to prevent the ſmoke from getting out; or it may be arched over with bricks: but you ſhould be very careful, where-ever the fire is placed, that it be not too near the bark-bed; for the heat of the fire will, by its long continuance, dry the bark, ſo that it will loſe its virtue, and be in danger of taking fire; to prevent which, it will be the beſt method to continue an hollow between the brick-work of the fire and that of the pit, about eight inches wide; which will effectually prevent any damage ariſing from the heat of the fire; and there ſhould be no wood-work placed any where near the flues, or the fire-place, becauſe the continual heat of the Stove may in time dry it ſo much, as to cauſe it to take fire; which ought to be very carefully guarded againſt.

The entrance into this Stove ſhould be either from a green-houſe, the dry Stove, or elſe through the ſhed where the fire is made, becauſe, in cold weather, the front-glaſſes muſt not be opened.

The other ſort of Stove, which is commonly called the dry Stove, as was before ſaid, may be either built with upright and ſloping glaſſes at the top, in the ſame manner, and after the ſame model of the bark Stove; or elſe the front-glaſſes, which ſhould run from the floor to the cieling, may be laid ſloping floping, to an angle of forty-five degrees, the better to admit the rays of the fun in fpring and autumn: the latter method has been chiefly followed by moft perfons who have built this fort of Stoves: but, were I to have the contrivance of a Stove of this kind, I would have it built after the model of the bark Stove, with upright glaffes in front, and floping glaffes over them, becaufe this will more eafily admit the fun at all the different feafons; for, in fummer, when the fun is high, the top glaffes will admit the rays to fhine almoft all over the houfe; and, in winter, when the fun is low, the front glaffes will admit its rays; whereas, when the glaffes are laid to any declivity in one direction, the rays of the fun will not fall directly thereon above a fortnight in autumn, and about the fame time in fpring; and, during the other parts of the year, they will fall obliquely thereon; and, in fummer, when the fun is high, the rays will not reach above five or fix feet from the glaffes.

Befides, the plants placed towards the back-part of the houfe will not thrive int he fummer-feafon for want of air; whereas, when there are floping glaffes at the top, which run within four feet of the back of the houfe; thefe, by being drawn down in hot weather, will let in perpendicular air to all the plants; and, of how much fervice this is to all fort of plants, every one who has had opportunity of obferving the growth of plants in a Stove, will eafily judge: for, when plants are placed under cover of a cieling, they always turn themfelves towards the air and light, and thereby grow crooked; and if, in order to preferve them ftraight, they are turned every week, they will neverthelefs grow weak, and look pale and fickly, like a perfon fhut up in a dungeon; for which reafons, I am fure, whoever has made trial of both forts of Stoves, will readily join with me to recommend the model of the bark Stove for every purpofe. *Miller's Gard. Dict.*

STOWS, in mining, are feven pieces of wood, fet upon the furface of the earth, faftened together with pins of wood.

STRAIKS, in the military art, are ftrong plates of iron, fix in number, fixed with large nails, called Straik-nails, on the circumference of a cannon-wheel, over the joints of the fellows, both to ftrengthen the wheel, and to fave the fellows from wearing on hard ways or ftreets.

STRAKE, in the fea phrafe, a feam between two planks; as the garboard Strake is the firft feam next the keel. They fay alfo a fhip heels a Strake; that is, hangs or inclines to one fide the quantity of a whole plank's breadth.

STRA'WBERRY, *fragaria*, in botany.—The common Strawberry is frequent in the woods of England, and is thence tranfplanted into gardens. The beft feafon for this is in September, that the plants may be rooted before the frofts. They may alfo be tranfplanted in February; but then, if the fpring fhould prove dry, they will require a great deal of watering to keep them alive.

The proper foil for Strawberries is a light hazely loam, not over rich; the ground muft be well dug, and very carefully cleared of all noxious weeds; and, when it is levelled even, it fhould be marked out into beds about three feet and a half wide, leaving a path-way between each bed of two feet broad. In each of thefe beds fhould be planted four rows of plants, fo that they may ftand about a foot diftance from each other in the rows, and they fhould be planted at about eight inches plant from plant in each. This is the proper diftance for the wood Strawberry, which is of the leaft growth of any; but the fcarlet Strawberry muft be planted at a foot diftance every way, and the hautboy fixteen inches; and, finally, the large Chili Strawberry, which is the largeft grower of all, muft be fet at twenty-two inches diftance plant from plant.

In the fpring, when the Strawberries begin to flower, if the feafon is dry, they muft be very plentifully watered, and they muft be kept very carefully cleared from weeds. At Michaelmas the beds fhould be dreffed, the weeds all very carefully taken up, all the ftrings or runners muft be taken from the roots, and the weak plants, which ftand too clofe, muft be pulled up; throwing a little fine earth, at the fame time, over the plants, alfo greatly ftrengthens their roots. Thefe beds, however, well managed, will not continue good above three years; and, the beds of the firft year bearing but few fruit, it is neceffary to new-plant fome frefh ground every third year, and deftroy the old beds; but the new ones muft be firft of one year's growth.

Different palates prefer different fpecies of Strawberries, but the white-fruited one is, of all others, the beft flavoured; though it is but a very bad bearer. The great Chili Strawberry is cultivated in the fields in that country; it is a much ftronger and larger plant than any of our kinds, and its fruit is as large as a walnut, but not fo well tafted as our own Strawberries. Mr. Frezier brought them fome years ago to Paris, and, fince that, they have been fpread over the feveral parts of Europe. They grow beft in a loamy foil under the fhade of trees. *Miller's Gard. Dict.*

STREAK-*fallowing*, in hufbandry, a particular fort of tillage. The way of doing it, is to plow one furrow, and leave one, fo that but half the land is plowed, each furrow that is fo lying on that which is not: when this is ftirred, it is then clean plowed, and laid fo fmooth, that it will come, at fowing time, to be as plain as before. This is done, when lean and poor lands are not fwardy enough to bear clean tillage, nor light enough to lie to get fward. The intent of this tillage is to keep the fun from fcorching them too much; but in many places they think this wears their land too faft, and therefore are not fond of having recourfe to it. *Plot's Oxfordfhire.*

STRI'KING-*wheel*, in a clock, the fame with that which by fome is called the pin-wheel, becaufe of the pins which are placed on the round or rim, which in number are the quotient of the pinion divided by the pinion of the detent-wheel. In fixteen-days clocks, the firft, or great wheel, is ufually the pin-wheel: but, in fuch as go eight days, the fecond wheel is the pin-wheel, or ftriking-wheel.

STRINGS *of metal*, a term ufed by our miners to exprefs thofe thin and fmall veins of ore, into which the beds or veins degenerate towards their terminations.

STRO'BILUS, among botanifts, a kind of pericarpium, formed of a number of vaginæ with contorted points applied clofe to one another.

STRO'CAL, in glafs-making, a long iron inftrument like a fire-fhovel, ufed to empty the metals out of a broken pot into a whole one. *Neri's Art of Glafs.*

STROMA'TEUS, in ichthyology, a genus of fifhes of the malacopterygious, or foft-finned kind, the characters of which are thefe: the body is very much compreffed, and very broad and thin; it has no belly-fins, and has only one back-fin, which is extended over the whole back. The only known fpecies of this genus is the callichthys of authors, a fifh called the fiatola at Rome. The tail is very forked; the mouth is very fmall; the teeth are placed in the jaws and palate; and the tongue is fmooth and broad. The body is ftriped crofsways.

STRO'MBUS, in conchyliology, the name of a genus of fhells, nearly allied to the buccinums, and called by the generality of authors turbo.

STRUT, a term ufed by fome builders for that brace which is framed into the king-piece and the principal rafters.

STU'DDING-*fail*, in a fhip, the fame with what is called a goofe-wing.

STUM, in the wine-trade, a term for the unfermented juice of the grape, when it has been feveral times racked off, and feparated from its fediment. The cafks are for this purpofe well matched, or fumigated with brimftone every time, to prevent the liquor from fermenting, as it would otherwife readily do, and become wine.

It is this fume of the fulphur from the match that prevents, in this cafe, all tendency to fermentation, and continues the natural juice of the grape in a fweet tafte, fit to be readily mixed with wines inftead of fugar; for which purpofe it is very much ufed in Holland, and fome other countries, as alfo for giving a new fret or brifknefs to decayed wines. So that very large quantities of this Stum are annually imported to all parts along with the foreign wines; and after the fame manner a Stum is prepared in England from the juice of apples, which ferves the ordinary purpofes of the wine-cooper. In the preferving this liquor in this ftate, we fee the vaft ufe of brimftone, for it could never be done otherwife than by the matching the cafks. *Shaw's Lectures.*

Artificial STUM.— An artificial muft, or Stum, as good as the natural, and as fit for the refermenting, fretting, improving, or making of wines, vinegars, or fpirits, may be prepared in the following manner:

Take three pounds of fine lump fugar, or fuch as has been well refined from its treacle; melt it in three quarts of water, and add in the boiling of Rhenifh tartar, finely powdered, half an ounce; this diffolves with a remarkable ebullition, and gives a grateful acidity to the liquor; take the veffel from the fire, and fuffer it to cool, and you have an artificial muft, which, in all refpects, refembles the natural tafte and fweet juice of a white flavourlefs grape, when well purified, and racked off from its fediment, in order to make Stum. If this artificial muft be ftummed, that is, well fumigated, with burning brimftone, it becomes a perfect Stum, and may be made of any flavour, at the difcretion of the artift. *Shaw's Lectures.*

STU'RIO, *the fturgeon*, a very well known large and fine-tafted fifh, caught in many places, and fometimes in the river Thames, being one of thefe fifhes called anadromi by authors, which fpend a part of their time in the fea, and a part in rivers.

It never goes into the fea to any great diftance, and never is caught there of any very great fize. The fea ferves for its production, but it is only in large rivers that it grows to its ufual fize. *Ray's Ichthyogr.*

STYE, or STITHE, the Englifh name for a diforder on the eye-lids, called by the phyficians hordeolum, and by fome crithe, chalazium, or grando.

It is a fmall encyfted tumor, ufually about the bignefs of a barley-corn, which fometimes degenerates into matter, and occafions great pain and uneafinefs.

When they are fmall, it is beft to let them take their own courfe; but if fo large as to occafion deformity, or danger of hurting the fight, the way to extirpate them is to make a longitudinal incifion on the part, and carefully take them out whole; or, if it cannot be thus got out clean, it muſt be cut out, as far as may be, with ſciſſors, and dreſſed with Ægyptian ointment, and a little red precipitate; or touched at times with the common cauſtic, till eaten thoroughly away, and then the wound dreſſed and healed in the common manner.

STYLO'BATON, or STYLOBATA, in architecture, the ſame with the pedeſtal of a column. It is ſometimes taken for the trunk of the pedeſtal, between the cornice and the baſe, and then called truncus. It is alſo called by the name of abacus.

SUBDU'PLICATE ratio of any two qualities, is the ratio of their ſquare roots.

SU'BITO, in the Italian muſic, is uſed to ſignify that a thing is to be performed quickly and haſtily; thus we meet with volti Subito, turn over the leaf quickly.

Blue SUB'LIMATE, a preparation of mercury with ſome other ingredients, yielding a fine blue for painting. The method of making it is this: take quickſilver two parts, flower of brimſtone three parts, ſal ammoniac eight parts; grind theſe upon a porphyry, and with the quickſilver put them into a long-necked glaſs veſſel luted at bottom; place it in a ſand-heat, and when the moiſture is aſcended, you will have a fine blue Sublimate for painting. *Neri's Art of Glaſs.*

SUBSI'STENCE, in the military art, is the money paid to the ſoldiers weekly, not amounting to their full pay, becauſe their cloaths, accoutrements, tents, bread, &c. are to be paid; it is likewiſe the money paid the officers upon accompt, till their accompts be made up, which is generally once a year, and then they are paid their arrears.

SU'BSTANCE (*Dict.*)—Spinoſa maintains, that there is but one only Subſtance in nature, whereof all created things are ſo many different modifications; and thus he makes the ſoul of the ſame Subſtance with the body. The whole univerſe, according to him, is but one Subſtance; which Subſtance he holds endowed with an infinity of attributes, in the number of which are thinking and extenſion. All bodies are modifications of this Subſtance, conſidered as extended; and all ſpirits modifications of the ſame Subſtance, conſidered as thinking.

Mr. Locke's philoſophy of Subſtances is more orthodox: our ideas of Subſtance, that great author obſerves, are only ſuch combinations of ſimple ideas, as are taken to repreſent diſtinct things, ſubſiſting by themſelves; in which the confuſed idea of Subſtance is always the chief. Thus the combination of the ideas of a certain figure, with the powers of motion, thought, and reaſoning, joined to Subſtance, make the ordinary idea of man; and thus the mind obſerving ſeveral ſimple ideas to go conſtantly together, which being preſumed to belong to one thing, or to be united in one ſubject, are called by one name; which we are apt, afterwards, to talk of and conſider as one ſimple idea.

We imagine the ſimple ideas do not ſubſiſt by themſelves; but ſuppoſe ſome ſubſtratum, wherein we ſubſiſt, which we call Subſtance.

The idea of pure Subſtance is nothing but the ſuppoſed, yet unknown ſupport of thoſe qualities which are capable of producing ſimple ideas in us.

The ideas of particular Subſtances are compoſed out of this obſcure and general idea of Subſtance, together with ſuch combinations of ſimple ideas, as are obſerved to exiſt together, and ſuppoſed to flow from the internal conſtitution, and unknown eſſence of that Subſtance.

Thus we come by the ideas of man, horſe, gold, &c. Thus the ſenſible qualities of iron, or a diamond, make the complex idea of thoſe Subſtances, which a ſmith, or a jeweller, commonly knows better than a philoſopher.

The ſame happens concerning the operations of the mind, viz. thinking, reaſoning, &c. which we concluding not to ſubſiſt by themſelves, nor apprehending how they can belong to body, or be produced by it, we think them the actions of ſome other Subſtance, which we call ſpirit; of whoſe Subſtance or nature we have as clear a notion, as of that of body; the one being but the ſuppoſed ſubſtratum of the ſimple ideas we have from without; as the other of thoſe operations, which we experiment in ourſelves within: ſo that the idea of corporeal Subſtance in matter is as remote from our conceptions, as that of ſpiritual Subſtance.

Hence we may conclude, that he has the perfect idea of any particular Subſtance, who has collected moſt of thoſe ſimple ideas which exiſt in it; among which, we are to reckon its active powers and paſſive capacities, though not ſtrictly ſimple ideas.

Subſtances are generally diſtinguiſhed by ſecondary qualities; for our ſenſes fail us in the diſcovery of primary ones, as the bulk, figure, texture, &c. of the minute parts of bodies, on which their real conſtitutions and differences depend.—And ſecondary qualities are nothing but powers, with relation to our ſenſes.

The ideas that make our complex ones of corporeal Subſtances, are of three ſorts: firſt, the ideas of primary qualities of things, which are diſcovered by our ſenſes; ſuch as bulk, figure, motion, &c. Secondly, the ſenſible ſecondary qualities, which are nothing but powers to produce ſeveral ideas in us, by our ſenſes. Thirdly, the aptneſs we conſider in any Subſtance, to cauſe or receive ſuch alterations in its primary qualities, as that the Subſtance ſo altered ſhould produce in us different ideas from what it did before.

Beſides the complex ideas we have of material Subſtances, by the ſimple ideas taken from the operations of our own minds, which we experiment in ourſelves, as thinking, underſtanding, willing, knowing, &c. co-exiſting in the ſame Subſtance; we are able to frame the complex idea of a ſpirit: and this idea of an immaterial Subſtance is as clear, as that we have of a material.

By joining theſe with Subſtance, of which we have no diſtinct idea, we have the idea of ſpirit: and by putting together the ideas of coherent ſolid parts, and a power of being moved, joined with Subſtance, of which likewiſe we have no poſitive idea; we have the idea of matter.

Further, there are other ideas of Subſtances, which may be called collective, which are made up of any particular Subſtance, conſidered as united into one idea; as a troop, army, &c. which the mind does by its power of compoſition. Theſe collective ideas are but the artificial draughts of the mind, bringing things remote, and independent, into one view, the better to contemplate and diſcourſe of them united into one conception, and ſignified by one name. For there are no things ſo remote, which the mind cannot, by this art of compoſition, bring into one idea; as is viſible in that ſignified by the name univerſe.

Such is the generally received doctrine of Subſtance: but Bp. Berkeley, in his Principles of Human Knowledge, and Mr. Collier, in his Clavis Univerſalis, have made great refinements thereon.

SUBSTAN'TIAL, or SUBSTANCIAL, in the ſchools, ſomething belonging to the nature of Subſtance.

It is generally diſputed, whether or no there be ſuch things as Subſtantial forms? i. e. forms independent of all matter; or forms that are ſubſtances themſelves.

SUBSTANTIAL is alſo uſed in the ſame ſenſe with eſſential, in oppoſition to accidental: in which relation it gives room for abundance of diſtinguo's

SU'BSTANTIVE (*Dict.*)—All nouns either ſignify an individual, as Socrates, Alexander, &c. or a ſpecies, as man, horſe, &c. or an eſſential quality, as rational, material, &c. or an accidental one, as black, white, good, fair, &c. or a dignity, office, art, &c. as king, preſident, philoſopher, &c.

Thus have we four kinds of nouns; whereof the firſt is very rarely taken adjectively; for, as they ſignify individuals or particular beings, they can ſcarce be applied to any thing but the thing they properly ſignify: yet we have ſometimes known the name of Cato taken adjectively; as, 'This is to be Cato, indeed.' Nor does Malherbe ſcruple to ſay in French, 'Plus Mars que le Mars de la Thrace.' Add that proper names are ſometimes converted into the name of dignities, &c. as Cæſar, Auguſtus, &c. In which caſe, they may be conſidered, in the ſame light, as nouns of the fourth kind.—Nouns of the ſecond kind are alſo ſometimes taken adjectively, as, 'He is much a man,' &c. The third kind are adjectives of themſelves. For the fourth kind, all grammarians rank them among Subſtantives, excepting F. Buffier who will have them to be adjectives; or, to uſe his own term, modificatives. Be that as it will, they are frequently uſed adjectively: 'He is more a king, and more a philoſopher, than any of his predeceſſors.'

Now for adjectives taken ſubſtantively, 1°, Particles paſſive are very rarely thus taken; though we ſometimes ſay, 'The loved are leſs happy than the lovers; the taught have the advantage of the untaught: the beſieged made a ſalley,' &c. And, 2°, Participles active are taken ſtill more rarely for Subſtantives. We ſcarce ever, e. gr. ſay 'the loving, the reading;' but 'the lover, the reader:' yet we ſay, 'the ſtudent, the proteſtant, the tenant, the appellant, the opponent,' &c. — 3°, For nouns adjectives, thoſe applied to men are not only uſed ſubſtantively, but are even become Subſtantives by uſe; whether they be ſuch as regard religion; as 'Chriſtian, Pagan, Mahometan,' &c. or opinion; as 'Stoic, Peripatetic, Carteſian,' &c. or country; as 'the Engliſh, French, Italians;' or temperament; as 'the melancholic, phlegmatic, choleric,' &c. Under the ſame rule, are likewiſe comprehended abundance of adjectives, ſignifying a number of people agreeing in ſome common attribute; as, 'the learned, the great, the devout, the brave, the diſſolute,' &c. But uſe is here to be regarded; for we do not ſay 'the elegant,' as we ſay 'the learned;' but 'elegant writers,' &c. It is cuſtom, and the ear alone, that are to decide about theſe differences.

Again, adjectives taken Subſtantively, for other things beſides men, are either ſo uſed, to ſignify a number or ſet of things that have ſome common quality; or to expreſs an abſtract quality. In both which, as in thoſe of men, there are ſome authoriſed by cuſtom, and others formed every day on their model.

SVEGLIA'TO, in the Italian muſic, is uſed for a briſk, lively, gay manner of ſinging or playing. Thus they ſay maniera Svegliata.

SU'FFOCATIVE *catarrh*, in medicine, the name of a diſeaſe, which conſiſts in a copious eruption of a ſerous and mucous humour

humour into the vesicles of the lungs, which takes its origin from a sudden congestion of humours about the breast, and a flaccid and weak state of the breast and lungs.

Method of cure. In the time of the fit a stimulating clyster must be given, made of a decoction of marjoram and other warm herbs, with colocynth, and a few grains of euphorbium, in order to abate the infarction of the breast, and give a new course to the matter that might add to it; and, when there appears to be a plethora besides, a vein must be immediately opened after the clyster. After this, if the stomach be nauseating and uneasy, let a scruple of salt of vitriol be given as a vomit, with a large quantity of warm water; and, if the patient is of a very phlegmatic habit, a few grains of gamboge may be added to this, to carry the humour off downwards; or, if the case be very pressing, a draught of a decoction of asarum, or of tobacco, may be taken, the bad effects of which last are taken off by a draught of wine with the spices; and all this time there may be frictions and sinapisms applied to the lower extremities: and, finally, to attenuate and discuss the mucous stasis, gentle alexipharmics and sudorifics may be given, such as the essence of amber, tincture of salt of tartar, and tartarised tincture of antimony; and all nitrous medicines are also of the greatest use, as they partly mitigate the causes, and partly prepare the humours for evacuation; and, after all these, the cortex eleutheriæ is of great use in discussing and mitigating the pain. As soon as the fit is over, the corroborating medicines are to be given, and all things that can restore the parts to their due tone; of this number are the milder chalybeates, and the like; and with these analeptics are to be given, to recruit the flesh and strength, such as emulsions, and a proper diet; and, in such as are used to wine, the richest wines, in moderate quantities, and the highest foods will be of service. If there be perceived a fever after the other symptoms are gone off, this must be cured by the gentle alexipharmics, and by powders of nitre, and the absorbents; and, if a chronic indisposition seems left behind, then the gums, which act as discutients, are to be given for some time, such as the ammoniacum and sagapenum, and a warm regimen is to be recommended. And, finally, to prevent a return of the disease, bleeding is very proper in the spring and autumn, and purging medicines taken in the intermediate time; the patient must also avoid all violent passions of the mind, and must never sleep in a damp air. We are not to fear bleeding in the time of the fit, because of the patient's complaining of want of strength; for, as the danger of suffocation is sudden and imminent, it must be suddenly removed, and, when that is done, the patient's strength will return in good time: the same is also to be alledged in favour of the violent vomits. In people of very phlegmatic constitutions, bleeding is not necessary nor proper; but in these cases a vomit is safe and right, and usually gives great relief, especially if the patient have eaten heartily some little time before. *Junker's Consp. Med.*

SU'FFOLK-*powder*, the name of a medicinal powder, good for the bite of a mad dog. It had its name from a countess of Suffolk, who used to give it with great success. It is still kept as a secret in some private families, but seems to be only the star of the earth, or the common buck-thorn plantain dried and powdered, or this powder with some very trifling addition. This plant has been famous for its virtues in this case a great while among us, and De Grey, in his Complete Farrier, gives the method by which he had cured dogs by it with great success. See *Phil. Transf.* N°. 450.

SU'GAR-*candy*, *saccharum candum*, or *crystallinum*, — is Sugar depurated and and crystallised.

This is better made of earthed Sugar, than refined Sugar, in regard the former is sweeter.

The Sugar to be used herein is first dissolved in a weak limewater, then clarified, scummed, strained through a cloth, and boiled, and put in forms or moulds that are traversed with little rods, to retain the Sugar, as it crystallises. These forms are suspended in a hot stove, with a pot underneath, to receive the syrup that drops out at the hole in the bottom, which is half stopped, that the filtration may be the gentler. When the forms are full, the stove is shut up, and the fire made very vehement.

Upon this the Sugar fastens to the sticks that cross the forms, and there hangs in little splinters of crystal. When the Sugar is quite dry, the forms are broke and the Sugar taken out, candied. Red Sugar-candy they make, by casting into the vessel, where the Sugar is boiling, a little juice of the Indian fig; and, if it is desired to have it perfumed, they cast a drop of some essence in, when the Sugar is putting into the forms.

This method of making Sugar-candy is that of F. Labat, practised in the Caribbees: the method in Europe, described by Pomet, is somewhat different.

White SUGAR-*candy* they make of white refined Sugar, boiled with water into a thick syrup, in a large pan. It is candied in a stove, whither it is carried, inclosed in brass peels, crossed with little rods, about which the crystals fasten, as they are formed.

The fire of the stove is kept equable for fifteen days; after which the Sugar is taken out of the peels to be dried. Red or brown Sugar-candy is made like the white, except that they only use brown Sugars and earthen pots.

Barley SUGAR, *saccharum hordeatum*, is a Sugar boiled till it be brittle, and then cast on a stone anointed with oil of sweet almonds, and formed into twisted sticks, about the length of the hand, and the thickness of a finger.

It should be boiled up with a decoction of barley, whence it takes its name; but in lieu thereof they now generally use common water, to make the Sugar the finer.—To give it the brighter amber colour, they sometimes cast saffron into it.—It is found very good for the cure of colds and rheums.

SUGAR-*spirit*, a name given by our distillers to a spirit made in England, Holland, and other places, from the washings, scummings, dross, and waste of a Sugar-baker's refining-house. The manner of preparing it is the same with that used for the malt and melasses spirits. The refuse of the Sugar is fermented with water in the usual manner, then distilled into what is called low wines, and afterwards rectified, without an addition, into proof spirit.

When the operation is well performed, and no foul, fœtid, or foreign matter, has got in among the wash, this is a tolerably clean spirit. We usually make it such, but in Holland it is usually made very nauseous and disagreeable; though capable, by an easy rectification familiar with us, though not much known abroad, of being brought to a fine and clean spirit. With us this Sugar spirit is used to mix with and adulterate brandy, rum, and arrac, which will receive a large dose of it without its being at all discoverable; but the Dutch who have it very coarse, can only adulterate rum with it, and even that will bear but a small proportion, without being trayed by its nauseousness.

This Sugar spirit reduced to alcohol makes one of the purest spirits we are acquainted with, much superior to that of melasses, and much more to that of malt. *Shaw's Essay on Dist.*

Fixed SULPHUR is used by the enamellers, and is prepared in the following manner: boil flower of brimstone in common oil for an hour, take the matter off the fire, and pour on it a quantity of very strong vinegar, the flower of brimstone will on this sink to the bottom; pour off the liquors, and repeat the operation to the third time, and the powder then separated is the fixed sulphur. *Neri's Art of Glass.*

SUMP, in metallurgy, a round pit of stone lined with clay within, for the receiving the metal on its first fusion from the ore. *Ray's Words.*

SUMP, in the English salt works, where sea water is boiled into salt, is used as the name of a sort of pond which they make at some small distance from the saltern on the sea shore, between full sea and low water mark. From this pond they lay a pipe, through which, when the sea is in, the water runs into a well adjoining to the saltern; and from this well they pump it into troughs, through which it is carried to their cisterns, in order to be ready to supply the pans.

SUN-*fish*, mola, in ichthyology. See the article MOLA.

SUN-*flower*, corona solis, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind; its disk is made up of floscules, and its outer edge of semifloscules; these stand upon the embryo seeds, and are separated from one another by little leaves of an imbricated figure, and contained in a scaly husk, or cup; the embryo's finally ripen into seeds furnished with two little leaves.

There are several different species of this flower, all which are very beautiful in large gardens. They are most of them annual plants, and are to be sown every spring in a bed of good light earth. When the shoots are about three inches high, they must be transplanted into nursery beds, and set at eight inches distant every way; they should remain there till they are a foot high, and then be carefully taken up with a ball of earth at their roots, and planted in large borders, or intermixed in the bosquets of large growing plants; they must be frequently watered till they have taken root, and after that will require no farther care. In July the flowers appear, and stand a considerable time: the largest of these should be left to stand for seed. The birds are very apt to devour this seed, but it should be carefully guarded from them, and the head left on the plant till October, at which time it should be cut off, and hung up to dry in an airy place, and in a month more the seeds will be perfectly hardened.

Several species of this plant also are perennial, and increase greatly by the root. Among these the common smaller flowered one is a very valuable plant in gardens, as it requires no culture, will grow in all soils and situations, and is a very ornamental flower, continuing in bloom from June to October. *Miller's Gard. Dict.*

SUN-*scorched*, a term used by our gardeners in some parts of England to express a distemperature of fruit-trees, owing to the sun's affecting them too forcibly and too suddenly; the consequence of which is the loss and withering of the fruit. Such trees only are subject to this, as are planted in places sheltered from the spring sun, and only open to the summer's; and it may be always cured by proper waterings.

SUPE'RFLUOUS *Interval*, in music, is one that exceeds a true diatonic interval by a semitone minor. Thus the

SUPERFLUOUS *Second*, or *tone*, contains a femitone minor more than a tone, or greater fecond; and will therefore be expreffed by $\frac{125}{108}$, or by $\frac{75}{64}$. The firft of thefe expreffions is a tone minor, and a femitone minor; fince $\frac{10}{9}\times\frac{25}{24}=\frac{125}{108}$: and the other is a tone major, and a femitone minor; for $\frac{9}{8}\times\frac{25}{24}=\frac{75}{64}$. This laft occurs in practice, and is one of the intervals of the chromaticum toniæum.

In temperate fcales thefe two Superfluous tones coincide. Thus from B ♭ to C fharp, or from F to G fharp, are Superfluous tones.

SUPERFLUOUS *Third*, is greater than the third major by a femitone minor, and will therefore be expreffed by $\frac{125}{96}=\frac{5}{4}\times\frac{25}{24}$. It is not in ufe. It feems a fourth on our harpfichords. Thus from B ♭ to D fharp is, properly fpeaking, a Superfluous third; but, D fharp and E ♭ being confounded, it paffes for a fourth.

SUPERFLUOUS *Fourth*. This interval is expreffed by $\frac{25}{16}=\frac{4}{3}\times\frac{25}{24}$. It is by practitioners, and in temperate fcales, confounded with the tritonus.

SUPERFLUOUS *Fifth*, is expreffed by $\frac{25}{16}=\frac{3}{2}\times\frac{25}{24}$. This is equal to two thirds major, for $\frac{5}{4}\times\frac{5}{4}=\frac{25}{16}$. The Superfluous fifth occurs in practice as from C to G fharp.

SUPERFLUOUS *Sixth*. This interval is of two kinds, being the refpective complements of the two diminifhed thirds to the octave. One only, ftrictly fpeaking, anfwers to the general definition of a Superfluous interval, which is that interval which exceeds the fixth major by a femitone minor, and is therefore expreffed by $\frac{125}{72}=\frac{5}{3}\times\frac{25}{24}$. But the other interval, which is a comma more than the former, and is two femitones major lefs than the octave, is chiefly ufed in harmony, as between B ♭ and A fharp, where it has a fine effect. It is expreffed by $\frac{225}{128}=\frac{2}{1}:\frac{16}{15}:\frac{16}{15}=\frac{2}{1}:\frac{256}{225}$.

See the article INTERVAL.

SUPERFLUOUS *Seventh*, is expreffed by $\frac{15}{8}\times\frac{25}{24}=\frac{125}{64}$. This is a diefis lefs than the octave.

SUPERFLUOUS *Octave*, is a femitone minor more than the octave, as from C to C fharp. It fometimes occurs in the baffes of inftrumental pieces.

SU'SSEX *Marble*, a name given by many to a peculiar fpecies of marble found in the county, the name of which it bears, and formerly much ufed in the pillars of churches, and other buildings, but now lefs in efteem. The ground of this marble is grey, with a faint caft of green, and it is very thick fet in all parts with fhells: thefe are chiefly of the turbinated kind, and they are generally filled with a white fpar, which adds very greatly to the beauty of the ftone.

It is plain, from confidering the whole mafs of this marble, that this fpar was received into the fhells before they were depofited in the marble. This is about the hardnefs of the common white Genoefe marble, if any thing, fomewhat more hard. The flender round fcapi of the pillars in Weftminfter-Abbey, and in many other of our Gothic buildings, are made of this kind of marble. Some people have thought that the fcapi of pillars of this kind, which occur in moft of our Gothic buildings, are artificial, and that they are a kind of fufile marble caft in cylindric moulds. But any one who will compare the marble, of which thofe pillars are made, with its fhells, and the fpar they are filled with, with the marble of Suffex quarries, will find both to be the fame in every particular. *Woodward's Cat. of Foff.*

SU'TURE, in chirurgery, denotes a feam made to clofe the lips of a wound, in order to its healing.

The ancients invented a great variety of Sutures, which they reduced to three kinds; incarnatives, reftrictives, and confervatives.

Incarnative SUTURE, is thus called, becaufe, by rejoining the edges of a wound, and keeping them together by means of a thread run acrofs them with a needle, they grow together, and incarnate as before.

This they fubdivided into five kinds, viz. the 'interrupted, intertwifted, penned, or feathered, with clafps, and the dry Suture.'

Of thefe five, two are perfectly difufed, viz. the feathered Suture, and the Suture with clafps, as being too barbarous, and at the fame time unneceffary. The firft was called pinned, when little pins were made u e of; and feathered, when the barrels of feathers or quills were ufed.

To perform it, two or three needles, threaded with a double thread, were paffed through the lips of the wound, at a finger's breadth from each other, and a pin or feather put in the ftitch; and another pin or feather bound with the ends of the fame thread, and the feathers might keep the lips of the wound clofe together.

To perform the fecond, they had large, crooked clafps, pointed at each end; one of which they thruft into the upper part of the wound, the other into the lower, to bring the lips together.

Thefe Sutures, cruel as they were, are yet known to be ufelefs; for in the only cafes where they fhould feem ferviceable, viz. in deep wounds, where the contraction of the flefhy parts keeps the lips far afunder, and in wounds of tendons; they expofe the patient to terrible convulfions and fhudderings, which are avoided, by diminifhing the dilatation of the wounds, by moderate compreffions, and waiting till the fibres relax.

Reftrictive SUTURES, were thofe wherewith they endeavoured to ftop the flux of blood from large wounds, where any confiderable veffels were cut.

To this end, they invented feveral kinds, in the number whereof, were the fhoe-makers, taylors, fkinners, and other feams, each more impertinent than other. It is evident, the very defign of fuch a Suture is blameable: for fuppofing the wound fo exactly fewed up, that no blood could efcape thro' the lips thereof; yet will it ftill flow out of the veffels, and will thus be forced to make its way between the laminæ of the mufcles, by which means the part will fwell, rot, and gangrene. Yet, the fkinners Suture, futura pellionum, is ftill in ufe for wounds of the inteftines: it is thus called, becaufe the fkinners ufe the like, in fewing up the holes made by the butchers, in fleaing off the fkin.

Confervative SUTURE, is that kind of ancient Suture, whereby the lips of large wounds, wherein there was a lofs of fubftance, were prevented from receding too far. But a bandage, now, fuffices.

Intertwifted SUTURE, is thus called, becaufe, the needles being left fticking in the wound, the thread is wound around them; much after the fame manner as the taylors do the threaded needles they keep in their fleeves, &c. This Suture is performed two ways; for either the needles are paffed a-crofs the wound, or they are ftuck on the fides thereof.

All the Sutures, hitherto mentioned, are made with needle and thread: befides which, there is another kind called dry Sutures, which are performed with glue or fize, or other proper vifcous matter.

The dry SUTURE, is ordinarily made with fmall pieces of leather, on linen cloth, indented like a faw, fo that the teeth may fall between each other, and the whole row may be clofed. The cloth, before it is cut into this form, is fpread with fome proper plaifter, in order to its firm adhefion.

The plaifters thus prepared, being cut into the form, are applied on the firm flefh, according to the length of the wound, reaching from it to the diftance of fome inches; and after they are dried, or well faftened to the part, the lips of the wound being approached, they may conveniently be held together by the Suture in that pofture.

This kind of Suture is principally ufed for wounds in the face, to prevent unfightly fcars: it is likewife convenient when the fibres of the mufcles are cut a-crofs, and where it is difficult or impoffible to apply a bandage.

In the other kinds of Sutures, the ftitches ought always to be taken of a depth proportionable to that of the wound; care being had to avoid the nerves as much as poffible. In long wounds they are beft begun at the ends, but in fhort ones at the middle.

SWA'LLOW, *hirundo*, in the Linnæan fyftem of zoology, makes a diftinct genus of birds of the order of the pafferes.

The characters of this are, that the beak is extremely fmall, pointed, and depreffed at the bafe, and the opening of the mouth larger than the very head of the bird. *Linnæi Syft. Nat.*

The characters of this genus, according to Ray, are thefe: they have very large heads, and very fhort beaks, but very wide mouths, adapted to the fwallowing large infects, which are their food. Their tails are long and forked, their eggs are white, they are birds of paffage, and with us are the foretellers of fummer.

The common houfe Swallow is well known every-where with us, and is fometimes feen all over of a fine white.

The martin, or martlet, has a very broad and flat head, and a very broad beak pointed at the end; its legs are very fhort, and its claws white; its toes are all covered, to the very claws, with a white downy plumage, by which it is diftinguifhed from all the other Swallows.

The fand martin, or fhore bird, is the fmalleft of all the Swallow kind. Its head, neck, and back, are of a moufe colour; its breaft and belly white; it has a ring of brown round the lower part of its throat. It builds in the banks of the rivers, and makes its neft of ftraw, the ftalks of plants, &c. and covers it with feathers. It is not uncommon with us, but is extremely plentiful in Spain, in the fummer months, where it is eaten, and is called by the common people papilion or montana. *Ray's Ornithology.*

The black martin or fwift, by fome called the diveling, is the largeft of all the Swallow kind: its head is remarkably broad and flat; its beak is very fmall, fhort and weak; but its mouth opens to an immenfe width, like that of the goat-fucker, or churn owl. It is all over of a brown colour, with a ſlight admixture of green, and has no other variegation but a greyiſh white ſpot at the top of its throat. Its legs are extremely ſhort, and its feet remarkably ſmall. It feeds on beetles, and other inſects, and ſeldom alights on the ground, the ſhortneſs of its legs making it not eaſy for it to riſe again. *Ray's Ornithol.*

SWARM. — The ſignal of the going out of a Swarm from a hive is ſometimes only by a humming noiſe made by one ſingle bee, but that a very particularly acute and clear ſound: this ſeems to be the voice of the new queen or female bee, calling together the Swarm that is to follow her out, and animating them with a ſort of martial muſic for the great adventure they are going to engage in.

Some who have pretended to be extremely well verſed in the language of the bees, as Butler, and others, ſay, that this is a voice of intreaty, by which the young queen begs permiſſion of the old queen, or parent of the hive, to take out a Swarm with her to ſome other place: they ſay this noiſe of intreaty uſually laſts about two days, and that, at the end of that time, if the parent grants the requeſt, ſhe is heard to anſwer with a louder and clearer voice of the ſame kind. Theſe noiſes are not to be heard, unleſs the ear be applied cloſe to the place; and they ſay, that when this laſt ſound is made, the new Swarm may be expected certainly to go out the next day, if the weather be proper.

But he ſeems to have taken great pains to diſtinguiſh theſe ſounds; he gives all the modulations of the voice of the young female, and every note that ſhe runs into; and obſerves, that all theſe are notes of ſupplication, and that the ſounds iſſued by the parent, or reigning queen of the hive, have an air of majeſty, and are greatly different; and adds, that, if the young female attempts to make the ſounds of the reigning bee, it is looked upon as a rebellion in the hive: and he pretends to be acquainted with the proceedings againſt her in theſe caſes; he ſays ſhe loſes her head, and that ſeveral of the bees that followed her are treated in the ſame manner for having been ſeduced to a rebellion. *Reaumur's Hiſt. Inſect.*

If a hive has been very well peopled during the winter, the young progeny go out early in the ſpring; and, if it have been very thinly peopled, it is ſometimes as late as the middle of June before they go out, even without any accidental delay from the want of a queen.

The people who manage bees, are informed of the time when they are going to ſend out new Swarms by ſeveral ſigns. One is, when the hive is ſo peopled, that many of the bees cannot find room within, but ſtand in cluſters on the outſide of the hive; another, is the appearance of a large number of drones, or male bees; theſe, however, are not certain ſigns, nor do they point out the very day of the ſwarming; but there is one which declares it very punctually, which is the obſerving, that though the hive be very full, and the day very fine, yet very few bees go out in ſearch of honey; in this caſe it is a certainty that they are aſſembling themſelves in the hive, and preparing to be gone in a very little time. If a perſon go near the hives that are ready to ſend out Swarms, in the evening, or even in the night, he will hear a ſort of a humming noiſe in them, which is not to be heard at ſuch times on any other occaſion: in ſhort, the whole is in agitation on the occaſion, and the tumult never ceaſes till the new colony goes out.

SWEA'TING-*houſe*.— The natives of North-America, when we firſt ſettled among them, had a great many houſes to Sweat in, it being their general remedy for diſeaſes of whatever kind; but at preſent they are leſs uſed among them.

The cave, or Sweating-houſe, was uſually eight feet in diameter, and four feet high, the roof being ſupported by ſticks or boards. They uſually dug theſe caves in the ſide of a hill, and as near as could be to ſome river, or pond. The entrance into the cave was ſmall, and, when any perſon was Sweating in it, the door was covered with a blanket, or ſkin. Near the cave they uſed to make a large fire, and heat in this a quantity of ſtones, perhaps, five hundred weight; theſe they rolled into the cave, and piled up in a heap in the middle. When this is done, the Indians go in naked, as many as pleaſe, and ſit round the heap of ſtones; and as ſoon as they begin to grow faint, which is uſually in a quarter of an hour, they come out, and plunge themſelves all over in the water, remaining in it a minute or two; and, repeating this a ſecond time, they dreſs themſelves, and go about their buſineſs.

This has been uſed for many ages among them with ſucceſs, in caſe of colds, ſurfeits, ſciaticas, and pains fixed in their limbs; and the Engliſh have often uſed the ſame means, and found relief by it. It is practiſed equally at all times of the year, and the Indians do it not only in ſickneſſes, but by way of refreſhment after long journies, and other fatigues, and ſo ſtrengthen themſelves for any expeditions. *Philoſ. Tranſ.* N°. 384.

SWEET *Corn*, a term uſed by the Indians to expreſs a ſort of corn they are very fond of, and generally keep it in their houſes.

While the ear of the maiz, or Indian corn, is yet green, but full, they gather it, and firſt boil, and afterwards dry it, and lay it up for uſe in bags, or baſkets. When they eat it, they boil it again, either whole, or groſly beaten in a mortar; they then mix it with fiſh, or with veniſon, or beaver fleſh, and account it a very fine diſh. The green ears, or freſh Sweet corn, they alſo ſometimes eat as ſoon as it is gathered, roaſting it before the fire, and then picking out the grains. This is a new ſupply of food for them many times, when their winter or laſt harveſt-ſtore is exhauſted. Their ſoldiers alſo commonly go out to war againſt their enemies about this time of the year, and find this ſupply in their enemies fields.

SWEET-*williams*, the Engliſh name of ſeveral ſpecies of cariophyllus, or carnation.

There is a great variety of ſpecies, and very elegant diverſities of colouring in theſe flowers; the principal difference, however, is between the ſingle and double kinds.

The ſingle kinds are to be propagated by ſowing their ſeeds in March, on a bed of light earth; in May, they will be ready to plant out, and muſt then be ſet at ſix inches diſtance in beds of the ſame kind of earth. In theſe beds they ſhould remain till Michaelmas, and then be tranſplanted to the places where they are to remain. They will flower the next year in May, and ripen their ſeeds in Auguſt, when that of the beſt flowers ſhould be ſaved.

The double kinds are propagated by layers in the ſame manner with the carnations; they love a middling ſoil, neither too light, nor too ſtiff; they continue flowering a long time, and are very beautiful, eſpecially the male kind, which produces yearly too full blooms of flowers, the one in May, the other in July. *Miller's Gard. Dict.*

SWINE, *ſus*.—Swine are very profitable creatures to the owner, being kept at ſmall expence, feeding on things that would be otherwiſe thrown away, and producing a very large increaſe. They are apt to dig up the ground, and to break fences; but this may be prevented, by putting rings in their noſes, and yokes about their necks. Leiceſterſhire, Northamptonſhire, and Hampſhire, are famous for theſe animals, which ſeems owing to their being clayey countries, and that more beans and peaſe are ſown there, than in other places. The wild kind never grow ſo large as the tame, but they are much better taſted. The keepers of hogs ſhould always chuſe ſuch boars to breed out of as are long-bodied, and have deep bellies and ſides, ſhort noſes, thick thighs, ſhort legs, high claws, a thick neck, and a thick chine, well ſet with large briſtles. It is not proper to keep too many breeding ſows; for they will produce ſo many young at a time, and this three times a year, that they will not find food enough. They uſually bring thirteen or fourteen young ones in a litter, ſometimes more; but they can bring up no more than they have teats to ſuckle, and they bring forth three times in a year. Young ſhoots, as they are called, that is, Swine of three quarters of a year old, are beſt for pork, and thoſe of a year and half, for bacon. Moiſt and ſedgy grounds are good for Swine, for they eat the roots of many of the plants that grow there; and the fruit of the beech, cheſnut, and hedge buſhes, fatten them well, and make their fleſh much better taſted, than when bred intirely in the ſtye. *Mortimer's Huſbandry.*

SWING-*wheel*, in a royal pendulum, the wheel which drives the pendulum. In a watch or balance clock, it is called the crown-wheel.

SWINGLE, in the wire works in England, the wooden ſpoke which is fixed to the barrel that draws the wire, and which, by its being forced back by the cogs of the wheel, is the occaſion of the force with which the barrel is pulled. *Ray's Engliſh Words.*

SYMBOLO'GICE, is uſed by ſome for that part of the ſcience of medicine which treats of the ſymptoms of diſeaſes.

SYMPLE'XIUM *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but not of the determinate and regular figure of moſt of the genera of thoſe bodies; but compoſed of various irregular connections of differently ſhaped, and uſually imperfect bodies.

* The word is derived from the Greek συμπλέκω, to connect or compound a mixed maſs of different things.

SYMPO'SIARCH, in antiquity, the director or manager of an entertainment.

SY'MPTOSIS, a word uſed by the ancients to expreſs a contraction, or ſubſidence of the veſſels, ſuch as happens under evacuations. It alſo is ſometimes uſed to expreſs a remiſſion in a diſeaſe, and the falling away in fleſh of people in ſickneſs.

SYNAGELA'STIC, an epithet uſed to expreſs the fiſhes of the gregarious kind, or which ſwim together in large ſhoals, in oppoſition to the ſolitary kinds.

SY'NCAUSIS, a word uſed by ſome medical writers to expreſs the drying, and, as it were, burning up of the excrements within the body, by a febrile heat.

SY'NCHISIS, a word uſed by the old medical writers to expreſs a confuſion and perturbation of all the humours in concoction, from the imbecillity of the ſtomach. It is alſo uſed to expreſs a diſeaſe of the eye, which conſiſts in a confuſion of the humours: this generally proceeds from a violent blow; ſometimes from an inflammation of the uvea, occaſioning a rupture of the veſſels, and an effuſion of the humours.

SY'NCHYSIS, in rhetoric, a confused manner of expression, where the natural order of the words is perverted. Horace affects it much: thus *lib.* i. *sat.* 5.

Pœne macros arsit dum turdos versat in igne.

SY'NCRISIS, a word used by the chemical writers to express a concretion or coagulation of any thing, effected by a spontaneous, or violent reduction of a liquid substance to a solid one, by a privation of the humid.

SYNGENE'SIA *, in botany, a class of plants with hermaphrodite flowers, whose stamina are naturally formed into a single regular congeries.

* The word is derived from the Greek συν, together, and γένεσις, formation. The plants comprehended under it are those whose stamina, by the junction of their apices, are formed into a single regular cylindric body; and among these are the lettuce, succory, hawkweed, &c.

The Syngenesia expresses the same class of plants with the compound flowered plants of Ray, and others. The general characters of the class are these:

The cup is the crown of the seed, and stands on the summit of the germen. The flower consists of one petal, and has a very narrow and long tube placed upon the germen: this is either tubular, ligulated, or naked.

The tubular flower of the Syngenesia has, at the summit of the tube, a wide campanulated mouth, divided into five segments, which are expanded, and somewhat bent backward. The ligulated flower is that which has a plain and straight edge turning outwards, with a truncated apex undivided, but furnished with three or four teeth. The naked flowers are those which have no mouth at all; and often, in these, even the tube is also wanting. The stamina are five very short and slender filaments, inserted into the tube of the flower. The antheræ are of the same number with the stamina: they are slender, erect, and grow together at their sides, so as to form a tubular cylindric body of the length of the mouth of the flower, and divided into five segments at the edge. The germen of the pistil is oblong, and placed under the receptacle of the flower. The style is capillary, erect, and of the length of the stamina, and goes through the cylinder formed by the antheræ. The stigma is divided into two parts, which stand open, and bend backwards. These plants have properly no pericarpium, tho' in some few species there is a coriaceous crust placed about the seed. The seed is single and oblong, often of a quadrangular figure, and sometimes narrower at the base than in any other part. *Linnæi Gen. Plant.*

SYNGNA'THUS, in ichthyology, the name of a genus of fishes, the characters of which are these: the coverings of the gills are on each side composed of a thin and single bony lamella; the head is oblong and compressed; the jaws are closed up at the sides; and the mouth is only capable of opening at the extremity of the snout. The body is long and very slender; the shape is sometimes roundish, but more usually angular. The fins are in most species four in number, but in some only one.

SYNO'NYMISTS, among the botanical writers, such as have employed their care in the collecting the different names or synonyma, used by different authors, and reducing them to one another.

SYNTE'NOSIS, a word used by anatomists to express an articulation of the bones when they are connected, as the ossa sesamoidea of the toes only by a tendon.

SY'RINGA, *the pipe-tree*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the rosaceous kind, being composed of several petals arranged in a circular form. The pistil arises from the cup, and finally becomes a fruit adhering to the cup, of a turbinated form, and divided into four cells, which contain small seeds.

The several species of this beautiful and sweet flowering shrub are easily propagated, by taking off their suckers in autumn, of which they always produce great plenty. These should be transplanted into the nursery, where after they have remained two years, they will be fit to be removed to the places where they are to remain. They are very hardy, and may be planted in almost any soil or situation; and require no farther culture, but to take away the suckers, and cut out the dead wood every year, and now and then to dig up the earth about their roots. They flower in May and June. *Miller's Gard. Dict.*

SYRINGOI'DES *Lapis*, the pipe-stone, in natural history, the name of a very beautiful fossil substance of which there are several different kinds. The tubuli marini, or cases of sea worms, lodged in any solid substance of the fossil kind, constitute what is called the lapis Syringoides.

The most frequent kind is made of the common matter of the ludus Helmontii, or septaria, with tubuli of different kinds and dimensions in it; but the most beautiful sort is that made of the bottoms of ships, old boards, or piles of wood; which, having been long in the sea, have been pierced by the sea worms, which have made their several burrows, and left their shells behind in them: the whole of these substances, becoming afterwards petrified, is found in a form of wood, with all the knots, veins, and other characters, but wholly of the hardness of stone. This is usually of a blackish colour, and, the pipes being of a pale yellow, the whole makes a very elegant appearance.

Our clay-pits about London afford also a Syringoides of this kind, but, the earth there abounding with the matter of the common vitriolic pyrites, that substance by degrees gets into the pores of the wood, and the whole seems a mass of pyrites with these pipes lodged in it in different directions. This has been called by authors pyrites Syringoides. *Hill's Hist. of Foss.*

SYSTEMA'TICAL *Qualities*, a term used by Mr. Boyle to express such qualities as are also called cosmical, and do not depend on the nature and constitution of the body itself, but on its being a member of this general system of the universe, in which capacity it is acted upon by agents unperceived by us, which occasions great changes in it.

SYSTEMA'TISTS, in botany, those authors, whose works in this science are principally employed about the arranging plants into certain orders, classes, or genera. *Linnæi Fund. Bot.*

T.

TA'BLES (*Dict.*)—*Astronomical* TABLES.—The oldest astronomical Tables are the Ptolemaic, found in Ptolemy's Almagest; but these no longer agree with the heavens.

In 1252, Alphonso XI, king of Castile, undertook the correcting them, chiefly by the assistance of Isaac Hazan, a Jew; and spent 400 thousand crowns therein. Thus arose the Alphonsine Tables, to which that prince himself prefixed a preface. But the deficiency of these was soon perceived by Purbachius and Regiomontanus; upon which Regiomontanus, and after him Waltherus and Warnerus, applied themselves to cœlestial observation, for the further amending them: but death prevented any progress therein.

Copernicus, in his books of the cœlestial revolutions, instead of the Alphonsine Tables, gives others of his own calculation, from the latter, and partly from his own observations.

From Copernicus's observations and theories, Eras. Reinholdus afterwards compiled the Prutenic Tables, which have been printed several times, and in several places.

Tycho de Brahe, even in his youth, became sensible of the deficiency of the Prutenic Tables; which was what determined him to apply himself with so much vigour to cœlestial observation. Yet all he did thereby, was to adjust the motions of the sun and moon; though Longomontanus, from the same, to the theories of the several planets published in his Astronomia Danica, added Tables of their motions, now called the Danish Tables; and Kepler likewise, from the same, in 1627, published the Rudolphine Tables, which are now much esteemed. These were afterwards, anno 1650, turned into another form, by Maria Cunitia, whose astronomical Tables, comprehending the effect of Kepler's physical hypothesis, are exceedingly easy, and satisfy all the phænomena, without any trouble of calculation, or any mention of logarithms; so that the Rudolphine calculus is here greatly improved.

Mercator made a like attempt in his Astronomical Institutions, published in 1676; and the like did J. Bap. Morini, whose abridgment of the Rudolphine Tables was prefixed to a Latin version of Street's Astronomia Carolina, published in 1705.

Lansbergius, indeed, endeavoured to discredit the Rudolphine Tables, and framed perpetual Tables, as he calls them, of the heavenly motions; but his attempt was never much regarded by the astronomers; and our countryman Horrox gave an abundant check to his arrogance, in his defence of the Keplerian astronomy.

Nor was the authority of the Rudolphine Tables impaired by the Philolaic Tables of Bullialdus, the Britannic Tables of Vincent Wing, calculated on Bullialdus's hypothesis; or the Britannic Tables of Newton; or the French ones of the count de Pagan, or the Caroline Tables of Street, all calculated on Dr. Ward's hypothesis, or the Novalmagestic Tables of Ricciolus. Among these, however, the Philolaic and Caroline Tables are esteemed the best; insomuch that Mr. Whiston, by the advice of Mr. Flamsteed (a person of undoubted authority in such cases) thought fit to subjoin the Caroline Tables to his astronomical lectures.

The Ludovician Tables were published in 1702, by M. de la Hire, wholly from his own observations, and without the assistance of any hypothesis; which, before the invention of the micrometer, telescope, and the pendulum-clock, was held impossible.

But the latest, and much the best, are those of the celebrated Dr. Halley.

TACO'MAR-*tree*, a name by which some authors call the sugar-cane.

TA'DPOLE.—The animal called by this name is no other than the frog in its first state from the spawn; and this creature furnishes the curious in microscopic observations with a beautiful view of the circulation of the blood, especially when the animal is young.

The method of procuring them for this purpose in the greatest perfection is this: let a small quantity of frog's spawn be kept some days in water, and from this will be produced a vast number of young Tadpoles; these, while very young, are perfectly transparent, and, when placed before the double microscope, the heart may be easily seen, and its pulsation regularly observed; and the blood protruded thence may be beautifully seen circulating through the whole body; but particularly in the tail, where, though so very minute, more than fifty vessels may be seen at one view. The young brood grow more and more opake every hour, and in a day or two the circulation of the blood can only be seen in their tail, or in the fins near the head. *Baker's Microscope.*

TA'FFETAS noir lustré is our Alamode. — Non lustré is our lustring.

There are Taffaties of all colours, some plain, others striped with gold, silver, silk, &c. others chequered, others flowered, others in the Chinese point, others the Hungarian; with various others, to which the mode, or the caprice of the workmen, give such whimsical names, that it would be as difficult, as it is useless, to rehearse them; besides that, they seldom hold beyond the year wherein they first rose. The old names of Taffeties, and which still subsist, are Taffeties of Lyons, of Spain, of England, of Florence, of Avignon, &c. The chief consumption of Taffeties is in summer-dresses for women, in linings, scarves, window-curtains, &c.

There are three things which contribute chiefly to the perfection of Taffeties, viz. the silk, the water, and the fire. The silk is not only to be of the finest kind, but it must be worked a long time, and very much, before it be used. The watering, besides that it is only to be given very lightly, seems only intended to give that fine lustre, by a peculiar property not found in all waters. Lastly, the fire, which is passed under it to dry the water, has its particular manner of application, whereon the perfection of the stuff depends very much.

Octavio May, of Lyons, is held the first author of the manufacture of glossy Taffeties; and tradition tells us the occasion of it.—Octavio, it seems, going backwards in the world, and not able to retrieve himself by the manufacture of Taffeties, such as were then made, was one day musing on his misfortunes, and, in musing, chanced to chew a few hairs of silk which he had in his mouth. His reverie being over, the silk he spit out seemed to shine, and on that account engaged his attention. He was soon led to reflect on the reason; and, after a good deal of thought, concluded, that the lustre of that silk must come, first, from his having pressed it between his teeth. Secondly, from his having wet it with his saliva, which had something glutinous in it: and, thirdly, from its having been heated by the natural warmth of his mouth. All this he executed upon the next Taffeties he made; and immediately acquired immense riches to himself, and to the city of Lyons the reputation it still maintains, of giving the gloss to Taffeties, better than any other city in the world.

It will not, we conceive, be less useful than curious, to give here the description of the engine contrived by Octavio to give the gloss to Taffety; to add the manner of applying it, and the composition of the water used therein.

The machine is much like a silk loom, except that, instead of iron points, here are used a kind of crooked needles, to prevent the Taffety from slipping: at the two extremities, are two beams; on one of which is rolled the Taffety, to take the gloss; and, on the other, the same Taffety as fast as it has received it. The first beam is kept firm by a weight of about 200 pounds; and the other turned by means of a little lever passing through mortises at each end. The more the Taffety is stretched, the greater lustre it takes; care, however, is to be used it be not over-stretched.

Besides this instrument for keeping the stuff stretched, there is another to give it the fire: this is a kind of carriage, in form of a long square, and the breadth of the Taffeties. It moves on trundles, and carries a charcoal fire under the Taffety, at the distance of about half a foot.

The two machines prepared, and the Taffety mounted, the lustre is given it by rubbing it gently with a ball, or handful of lists of fine cloth, as it rolls from one beam to the other; the fire, at the same time, being carried underneath it to dry it. As soon as the piece has its lustre, it is put on new beams to be stretched, a day or two; and, the oftener this last preparation is repeated, the more it increases the gloss.

For black Taffeties, the gloss is given with double beer, and orange or lemon juice; but this last is the least proper, as being

ing apt to whiten. The proportion of the two liquors is a gallon of orange juice to be boiled together to the consistence of a rich broth. For coloured Taffeties they use gourd-water, distilled in an alembic.

TA'GETES, *African marygold*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind: its disk is composed of floscules divided into several segments, and its outer edge of semi-floscules; all standing on embryo seeds, and contained in a one-leaved cup of a tabulated form. The embryo's finally become seeds of an angular form, furnished with a foliaceous head, and affixed to the thalamus of the flower. There are also some species in which the flower is wholly composed of semi-floscules.

We have a great many species of this plant annually raised in our gardens, for the beauty of their flowers. They are propagated by sowing the seeds in spring, on a moderately hot bed; when the young plants come up, they must have air allowed them; and, when three inches high, they should be removed to another hot-bed, which should be arched over with hoops that it may be sheltered with mats. They are to be planted here at about eight inches distance, and, when they are grown stronger, as about the beginning of May, they are to be taken up with a ball of earth about their roots, and placed where they are to remain; or else at eighteen inches distance in a nursery, where, when they flower, the finest sorts may be marked and removed, with a large ball of earth to their roots, either into pots, or into the borders of the flower-garden. They are very beautiful; but their smell is very offensive. *Miller's Gard. Dict.*

TAILS *of comets*.— We have an enquiry into the cause of the Tails of comets by Mr. Euler in the Mem. de l'Acad. de Berlin. He thinks there is a great affinity between these tails, the zodiacal light, and the aurora borealis; and that the common cause of them all is the action of the sun's light on the atmospheres of the comets, of the sun, and of the earth. He supposes that the impulse of the rays of light on the atmosphere of comets may drive some of the finer particles of that atmosphere far beyond its limits; and that this force of impulse, combined with that of gravity towards the comet, would produce a Tail, which would otherwise always be in opposition to the sun, if the comet did not move. But the motion of the comet in its orbit, and about an axis, must vary the position and figure of the Tail, giving it a curvature, and deviation from a line drawn from the center of the sun to that of the comet; and that this deviation will be greater, as the orbit of the comet has the greater curvature, and the motion of the comet is more rapid. It may even happen, that the velocity of the comet, in its perihelion, may be so great, that the force of the sun's rays may produce a new Tail before the old one can follow; in which case the comet might have two or more tails. The possibility of this is confirmed by the comet of 1744, which was observed to have several Tails, while it was in its perihelion. See the article ZODIACAL *Light*.

TA'LED, in the Jewish antiquities, a sort of habit that the Jews wore, chiefly when they repeated their prayers in the synagogue.

TA'LPA, *the mole*, in the Linnæan system of zoology, makes a distinct genus of animals, the characters of which are: that they have feet with five claws on each, as well on those behind as on those before; and have their fore-feet made like hands, and fitted for digging. *Linnie Syst. Nat.*

It hath been supposed by many, that the mole had no eyes; and others have affirmed, that it had eyes, but that they were covered with a membrane; but neither of these assertions are true. The eyes are small, and have apertures in the skin, through which they may easily be discerned by a curious observer; and are very black, about the size of a millet seed, and fastened to a nerve.

The reason they have not been observed by the common people, is, that they are hid by the fur, but, only blowing them away, they always shew themselves. It has no ears.

Its skin is extremely firm and tough, so that it requires a sharp knife to pierce it. *Ray's Syn. Quad.*

TA'MARINDS (*Dict.*)— *Plate* XL. *fig.* 8, represents the Tamarind tree, where *a* is the flower, *b* the fruit, *c* the seed. For a description of both the tree and fruit, consult this article in the Dictionary.

TAMARI'SCUS, *the tamarisk-tree*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the rosaceous kind, being composed of a number of petals, arranged in a circular form; the pistil arises from the cup, and, finally, becomes a capsule, resembling that of the willow, of a long figure and membranaceous structure, and containing seeds winged with down. *Tourn. Inst.*

TA'MBOS, in Peruvian antiquity, buildings placed at certain distances for the lodgings of the princes of that country, in their travels through their dominions.

TAN (*Dict.*)— Tan is of great use in gardening: first, by its fermentation, when laid in a body, which is always moderate, and of a long duration, which renders it of great service to hot-beds: and, secondly, after it is well rotted, it becomes excellent manure for all sorts of cold stiff land; upon which one load of Tan is better than two of rotten dung, and will continue longer in the ground.

The use of Tan for hot-beds has not been many years known in England; the first Hot-beds of this sort, which were made in England, were at Blackheath, in Kent, about fifty-five years ago: these were designed for raising of orange-trees; but, the use of these hot-beds being but little known at that time, they were made but by two or three persons, who had learned the use of them in Holland and Flanders, where the gardeners seldom made any other hot-beds: but in England there were very few hot-beds made of tanner's bark, before the ananas were introduced into this country, which was in 1719. Since which time the use of these hot-beds have been more general; and are now made in all those gardens, where the ananas plants are cultivated, or where there are collections of tender exotic plants preserved: and the gardeners here are now better skilled in making and managing of these hot-beds, than in most other countries; which might render it less necessary to give a full description of them here: but, yet, as there may be some persons in the remote parts of England, who have not had an opportunity of informing themselves of the use of tanners bark for this purpose, I shall insert the shortest and plainest method of making and managing these hot-beds, as they are practised by the most knowing persons, who have long made use of these hot-beds: and, first, I shall begin with the choice of the Tan.

The tanners in some parts of England do not grind the bark, to reduce it into small pieces, as is commonly practised by the tanners near London; where there is great difference in the size of the bark, some being ground much smaller than the other, according to the different purposes for which it is intended; but in many places the bark is only chopped into large pieces, which renders it very different for the use of hot-beds; for, if the Tan is very coarse, it will require a longer time to ferment, than the small Tan; but, when it begins to heat, it will require a much greater degree, and will retain the heat a much longer time than the small; therefore, where there is choice, the middling-size Tan should be preferred; for it is very difficult to manage an hot-bed when made of the largest Tan: the heat of which is often so great, as to scald the roots of plants, if the pots are fully plunged into the bed; and I have known this violent heat continue upwards of two months; so that it has been unsafe to plunge the pots more than half their depth into the Tan, till near three months after the beds have been made: therefore, where the persons, who have the care of these beds, do not diligently observe their working, they may in a short time destroy the plants which are placed in the beds: on the other hand, if the Tan is very small, it will not retain the heat above a month, or five weeks; and will be rotten and unfit for an hot-bed in a short time; so that, where the middle-sized Tan can be procured, it should always be preferred to any other.

The Tan should be always such as has been newly taken out of the pits; for if it lies long in the tanner's yard, before it is used, the beds seldom acquire a proper degree of heat; nor do they continue their heat long; so that when it has been more than a fortnight or three weeks out of the pit, it is not so good for use as that which is new. If the Tan is very wet it will be proper to spread it abroad for two or three days to drain out the moisture, especially if it is in the autumn or winter season; because, then, as there will be little sun to draw a warmth into the Tan, the moisture will prevent the fermentation, and the beds will remain cold: but, in the summer-season, there is no great danger from the moisture of the Tan; the heat of the sun through the glasses will be then so great, as soon to cause a fermentation in the Tan.

These Tan-beds should always be made in pits, having brick walls round them, and a brick pavement at the bottom, to prevent the earth from mixing with the Tan; which will prevent the Tan from heating: these pits must not be less than three feet deep, and six feet in width: the length must be in proportion to the number of plants they are to contain: but, if they are not ten feet in length, they will not retain their heat long: for, where there is not a good body of Tan, the outside of the bed will soon lose its heat; so that the plants which are there plunged, will have no benefit of the heat; nor will the middle of these beds retain their heat long; so that they will not answer the purpose for which they are intended.

When the Tan is put into the bed, it must not be beaten or trodden down too close; for that will cause it to adhere, and form one solid lump; so that it will not acquire an heat; nor should it be trodden down at the time when the pots are plunged into the beds; to avoid which there should be a board laid cross the bed, which should be supported at each end to prevent its resting on the Tan; upon which the person should stand, who plunges the pots; so that the Tan will not be pressed down too close. When the Tan is quite fresh, and has not been out of the pits long enough to acquire an heat, then the beds will require a fortnight or three weeks time, or sometimes a month, before they will be of a proper temperature of warmth to receive the plants: but, in order to judge of this, there should be three or four sticks thrust down into the Tan,

Tan, about eighteen inches deep, in different parts of the bed; ſo that by drawing out the ſticks, and feeling them at different depths, it will be eaſy to judge of the temper of the beds; and it will be proper to let a few of theſe ſticks remain in the bed, after the plants are plunged, in order to know the warmth of the Tan; which may be better judged of by feeling theſe ſticks, than by drawing out the pots, or plunging the hand in the Tan.

When the Tan is good, one of theſe beds will retain a proper degree of heat for near three months; and, when the heat declines, if the Tan is forked up, and turned over, and ſome new Tan added to it, the heat will renew again, and will continue two months longer; ſo that by turning over the Tan, and adding ſome new Tan every two months, or thereabout, as the bed is found to decline of its heat, they may be continued one year: but every autumn it will be proper to take out a good quantity of the old Tan, and to add as much new to the bed, that the heat of the bed may be kept up in winter; for, if the heat is ſuffered to decline too much during the cold ſeaſon, the plants will ſuffer greatly: to prevent this, there ſhould always be ſome new Tan added to the bed in winter, when the heat is found to decline; but the Tan ſhould be laid in a dry place a week or ten days, to dry, before it is put into the bed; otherwiſe the moiſture will chill the old Tan in the bed, and prevent the fermentation: ſo that unleſs the Tan is turned over again, there will be little or no heat in the beds; which often proves fatal to the plants which are plunged into them: therefore, whoever has the management of theſe beds, ſhould be very careful to obſerve conſtantly the warmth of the Tan; ſince, upon keeping the beds in a due temperature of warmth, the whole ſucceſs depends; and, where this caution is not taken, it frequently happens, that the ananas plants run into fruit very ſmall, or the plants are infeſted by inſects; both which are occaſioned by the growth of the plants being ſtopped by the decline of the heat of the Tan; therefore great regard muſt be had to that, eſpecially in winter.

The great advantages which theſe Tan-beds have of thoſe which are made of horſe-dung, are the moderate heat which they acquire; for their heat is never ſo violent, as thoſe of horſe-dung; and they continue this heat much longer; and, when the heat declines, it may be renewed, by turning the beds over, and mixing ſome new Tan with the old; which cannot be ſo well done with horſe-dung; and, likewiſe, the beds will not produce ſo great ſteams, which are often injurious to tender plants; ſo that theſe Tan-beds are much preferable to thoſe of horſe-dung for moſt purpoſes.

Tan, when it is well rotted, is alſo an excellent manure for all cold and ſtiff lands; and if it is laid upon graſs-ground in autumn, that the rains in winter may waſh it into the ground, it will greatly improve the graſs; but, when it is uſed new, or in the ſpring of the year, when dry weather comes, it is apt to cauſe the graſs to burn; which has occaſioned the diſuſe of Tan in many places; but, if properly uſed, it will be found an excellent dreſſing for all ſtiff lands.

Flowers of TAN.— Flower of Tan is a name given by the people employed in the tanning-trade to a yellow ſubſtance, often found upon old Tan, or oak bark broken to pieces, which has been uſed as Tan, and is of no farther ſervice.

The name, however, is very improper; and, though every body converſant in Tan-yards muſt have ſeen the thing, yet it has always paſſed as an effloreſcence of the bark, till the curious Mr. Marchand enquired more accurately into its nature, and found it to be a plant of itſelf, wholly different from the matter of the Tan; and to which the bark which had been often wetted and dried again, ſerved as a proper matrix. He found it to be more nearly allied to the ſpunge than to any other genus of plants, and therefore named it ſpongia fugax, mollis, flava, et amœna in pulvere coriario naſcens, ſoft, beautiful, yellow, fading ſpunge, growing on tanners bark.

It makes its appearance moſt frequently in the ſummer months, and is then ſeen in ſmall tufts of a beautiful yellow colour, on different parts of the old heaps of bark. It appears at firſt in form of a thin yellow ſcum, and is of a ſort of jelly-like ſtructure; but it every day grows larger and thicker, till it ſtands above half an inch out from the ſurface of the bark. As it grows, its ſurface becomes more and more cavernous and ſpungy, the pores or holes being of different diameters, and the interſticial matter forming a ſort of net-work more or leſs regular, and often interrupted by irregular prominences in ſeveral parts; and, in fine, when the growth is complete, the whole more reſembles a ſpunge, than any other vegetable ſubſtance, and is of a deep yellow colour, and conſiderably thick and tough conſiſtence; there are no roots to be diſcovered iſſuing from it; its ſmell is like to that of rotten wood, and its taſte is ſomewhat ſtyptic. It always appears in the warm months, and always upon ſuch old Tan as has begun to ferment, and is in the ſtate in which our gardeners uſe it for hot-beds. If it happens to ſtand expoſed to the ſouth ſun, it is but of ſhort duration; but, if it be in a ſheltered place, it will laſt a conſiderable time, and often ſpread itſelf to a great extent, and make a very beautiful figure for many weeks. *Mem. Acad. Par.* 1727.

TA'NNING (*Dict.*)— The operation of Tanning is performed, on leather, better in the Weſt-Indies than in England. They uſe three ſorts of bark, the mangrave-bark, the olive-bark, and another; and the whole buſineſs is ſo ſoon done, that a hide delivered to them is in ſix weeks ready to be worked into ſhoes, though they beſtow leſs labour than we do. *Phil. Tranſ.* N°. 36.

Every part of the oak-tree, of what age or growth ſoever, is fit for the tanners uſe, and all oaken coppice-wood, of any age or ſize, being cut and procured in barking-time, will tan all ſort of leather, at leaſt as well as the bark alone. When this material is got at the proper ſeaſon, it muſt be very well dried in the ſun more than the bark alone; thence it is to be cut up, and preſerved in a covered place for uſe.

When it is to be uſed, the greater wood muſt be firſt cleft ſmall, to fit it for the beating and cutting engine; and the ſmaller muſt be put into the engine as it is. Which done, it muſt be again dried on a kiln, and after that ground in the ſame manner that the tanners grind their bark. Such wood as is to be uſed preſently after it is gotten, will require the better and the more drying upon the kiln; and, if this is omitted, it will blacken and ſpoil all the leather it is to be uſed about. Where oak is ſcarce, black-thorn will tolerably well ſupply its place, and, where that is not to be had in ſufficient plenty, the white-thorn will do. *Philoſ. Tranſact.* N°. 108.

Birch alſo, being ordered in the ſame manner with oak, is fit for ſome uſes in Tanning, particularly it does very well for Tanning of ſhoe-ſoal leather. All theſe ingredients will tan much better than bark alone, and that with much leſs charge; ſo that this diſcovery may very well ſave the felling of trees when the bark is wanted, at a ſeaſon when the ſap is up, which, when it is done, cauſes the outſides of the trees to rot and grow worm-eaten; whereas, if the trees had been felled in winter, when the ſap is down, they would have been almoſt all heart, as the people expreſs it, and not ſubject to worms. This manner of uſing the wood with the bark, in Tanning, will alſo increaſe the value of underwoods very conſiderably. *Phil. Tranſ.* N°. 105.

The engine neceſſary for cutting the wood conſiſts of a long ſquare wooden block, and ſome pieces of iron to be faſtened on, and uſed about it, viz. a hammer, an anvil, and iron holding the wood to be bruiſed and cut, and a knife to cut it. The whole is a very ſimple and cheap machine, and is deſcribed at large, and figured in the above-mentioned number in the Philoſophical Tranſactions.

By Mr. de Buffon's experiments upon different ſkins, it was found that a decoction of young oak wood ſucceeded perfectly well in Tanning ſheep and calves ſkins, but did not do equally well for ox, and the other harder ſkins. This, however, he imagines might be only for want of knowing the beſt method of uſing the wood. And, certainly, theſe trials deſerve to be farther proſecuted; ſince the ſmall branches of the oak, which are of little value, might be thus made to ſupply the place of a much dearer commodity, the bark; and as, in many trees, the bark of the young branches is found to be of greatly more virtue than that of the larger branches, or the trunk, the uſe of theſe ſmall bows, bark and all, might very probably be found to anſwer to all the effects of the bark, of the larger kind alone. *Memoires Acad. Scien. Par.* 1736.

TAP-*root*, in trees, that part of the root that deſcends ſtraight down.

In removing or tranſplanting young oaks, great care ſhould be taken not to wound this root, much leſs to cut it off; but it muſt be dug up to the bottom, and the hole prepared deep enough to ſet it; otherwiſe the tree either dies, or, if not, yet it is always greatly ſtinted and impeded in its growth. *Ray's Engliſh Words.*

TAPE-*worm*, a ſpecies of worm breeding in the human bowels, and called by authors tænia, and lumbricus latus, or the broad worm.

The true hiſtory of this animal is, that it is ſhort and broad. What is called a link of the long worm is really a diſtinct worm; and, when one of theſe multiplies in the bowels, its young adhere to it, and to each other endwiſe, ſo as to form a ſort of chain, which lengthens as they continue to increaſe, and, in fine, becomes immoderately long. Hence it is, that the breaking, as it is called, of this worm, does not deſtroy it, and that the voiding large pieces of it is no cure, ſince it ſtill recovers that length again by new young ones. Every ſeparate link of ſuch a chain, if examined, is found to be intire, lively and briſk, and not at all injured by the ſeparation.

Authors who have treated of theſe worms as a diſeaſe, have given a canine appetite, or unnatural appetite to food, as one of the ſymptoms; but this is wrong, for it has never been found, in reality, that theſe worms, even where moſt numerous, have at all increaſed the natural appetite; and, indeed, it is very difficult to judge of their being in the body by ſymptoms, ſince they occaſion none which are not alſo common in many other diſeaſes. Many people have had them a long courſe of time, without being ſenſibly hurt by them; and there has never been a known inſtance of their occaſioning any one's death, or indeed any conſiderable diſorder. See the article WORMS.

TAPHNEUS, a word uſed by ſome writers to expreſs any

thing

thing when depurated or purified to the greateſt degree, as the ſalts by repeated ſolutions and cryſtalliſations, and the like. Paracelſus uſes it for a ſpecies of earth, and things produced from which, he ſays, never alter their nature by calcination or reverberation, or the like operations.

TAPI'NOSIS, in rhetoric, the ſame with diminution.

TA'PLINGS, in the Engliſh ſalt-works, the name given to certain bars of iron which ſupport the bottom of the pan in which the brine is boiled.

Theſe pans are very large, and cover a wide furnace; but as their width would make them apt to bend in the middle, which would ſpoil the working of the ſalt, there is a ſort of wall of brick carried along the middle of the furnace; and on the top of this are placed theſe Taplings: they are about eight inches high, and from four to ſix in thickneſs, being ſmalleſt at the top. Theſe are placed at about three feet diſtance one from another, and the wall which ſupports them, and which is called the mid-feather, is broad at the baſe, and ſo narrow at the top, as barely to give room for the baſes of the Taplings.

TAR-*water*.—In ſome parts of America, Tar-water is made by putting a quart of cold water to a quart of Tar, and ſtirring them well together in a veſſel, which is left ſtanding till the Tar ſinks to the bottom. A glaſs of clear water, being poured off for a draught, is replaced by the ſame quantity of freſh water, the veſſel being ſhaken, and left to ſtand as before. And this is repeated for every glaſs, ſo long as the Tar continues to impregnate the water ſufficiently, which will appear by the ſmell and taſte.

But, as this method produces Tar-water of different degrees of ſtrength, Biſhop Berkley ſays, he chuſes to make it in the following manner: pour a gallon of cold water on a quart of Tar, and ſtir and mix them thoroughly with a ladle or flat ſtick, for the ſpace of three or four minutes; after which the veſſel muſt ſtand eight and forty hours, that the Tar may have time to ſubſide; when the clear water is to be poured off, and kept for uſe, no more being made from the ſame Tar, which may ſtill ſerve for common purpoſes.

It has been found, that ſeveral perſons infected with cutaneous eruptions and ulcers were immediately relieved, and ſoon after cured, by the uſe of this medicine. It is ſaid, that, even in the fouleſt diſtempers, it proved much more ſucceſsful than ſalivations and wood-drinks had done. It alſo ſucceeded, beyond expectation, in a tedious and painful ulceration of the bowels, in a conſumptive cough, and, as appeared by expectorated pus, an ulcer in the lungs, in a pleuriſy and peripneumony. And, when a perſon who had been for ſome years ſubject to eryſipetalous fevers, perceived the uſual forerunning ſymptoms to come on, the drinking of Tar-water prevented the eryſipelas.

Tar-water cures indigeſtion, and gives a good appetite. It is an excellent medicine in an aſthma; it imparts a kindly warmth and quick circulation to the juices, without heating, and is therefore uſeful, not only as a pectoral and balſamic, but alſo as a powerful and ſafe deobſtruent in cachectic and hyſteric caſes. As it is both healing and diuretic, it is very good for the gravel. The biſhop ſays, he believes it to be of great uſe in a dropſy, having known it cure a very bad anaſarca in a perſon whoſe thirſt, though very extraordinary, was in a ſhort time removed by the drinking of Tar-water. It may likewiſe be ſafely uſed in inflammatory caſes; and, in fact, hath been found an admirable febrifuge, at once the ſafeſt cooler and cordial.

To ſailors, and all ſea-faring perſons, who are ſubject to ſcorbutic diſorders, and putrid fevers, eſpecially in long ſouthern voyages, he is perſuaded this Tar-water would be very beneficial.

It is to be obſerved, that Tar-water ſhould not be made in unglazed earthen veſſels, theſe being apt to communicate a nauſeous ſweetneſs to the water.

The ſame ingenious author recommends Tar-water in the plague, and for the diſtemper among the horned cattle now raging; with what ſucceſs muſt be left to experience.

TA'RSO, in the glaſs-trade, a ſort of white ſtone found in many rivers of Italy, and other places; and uſed inſtead of ſand for the fineſt cryſtal-glaſs, being firſt burnt, and calcined with the ſalt of the polverine into frit. *Neri's Art of Glaſs.*

The Tarſo of this and other authors is truly a cryſtalline matter debaſed by an admixture of white earth, and found in form of ſmall pebbles, of a whitiſh, yellowiſh, or pale reddiſh colour; and this is common in all the gravel-pits of England, and in the beds of ſome of our rivers; and might be uſed with great advantage by our glaſs-makers, if they knew it was ſo eaſily to be had.

On comparing theſe ſtones of ours with the cuogolo or Tarſo of the foreign glaſs-makers, there is no difference diſtinguiſhable to the eye, nor will the niceſt experiments by the fire, acid menſtrua, &c. ſhew the leaſt diſtinction between them. We are not to wonder, however, that the glaſs-makers did not hitherto diſtinguiſh this to be the true cuogolo or Tarſo, ſince the characters of foſſils have been hitherto ſo little aſcertained, that the beſt and lateſt author on theſe ſubjects, Dr. Woodward, ſo far miſtook the ſtructure of this ſtone, as to call it a ſparry pebble. It is certain that ſpar could never have any thing to do with glaſs-making; but this ſtone has no ſpar in its compoſition.

Soluble TARTAR. The proceſs for making ſoluble Tartar is this: take of an alkaline fixed ſalt a pound, of water a gallon; and, having diſſolved the ſalt in this water boiling, throw in cryſtals of Tartar in powder as long as any fermentation is raiſed, which uſually ceaſes before thrice the weight of the alkali is thrown in. Then ſtrain the liquor through paper; and after due evaporation ſet it by for the ſalt to cryſtalliſe, or elſe evaporate the liquor wholly away, that the ſalt may be left dry.

This ſalt, by the action of the alkali on the acid of Tartar, being freed from thoſe groſs terreſtrious parts, with which the cryſtals of Tartar, how pure ſoever, remain ſtill charged; it diſſolves readily, and keeps ſuſpended in cold water. *Pemberton's Lond. Diſp.*

TA'WING (*Dict.*)—*Method of* TAWING, *or drawing ſkins in white.*—The wool or hair being well got off the ſkins, by means of lime, &c. as deſcribed under the article SHAMMY, they are laid in a large vat of wood or ſtone ſet in the ground, full of water, wherein quick-lime has been ſlacked; wherein they continue a month or ſix weeks, as the weather is more or leſs hot, or as the ſkins are required to be more or leſs ſoft and pliant.

While in the vat, the water and lime is changed twice, and they are taken out and put in again every day. When taken out for the laſt time, they are laid all night to ſoak in a running-water, to get out the greateſt part of the lime; and, in the morning, are laid, ſix together, on the wooden leg, to get off the fleſh, by ſcraping them ſtoutly, one after another, on the fleſh ſide, with a cutting two-handed inſtrument, called a knife; and, while this is in hand, they cut off the legs, and other ſuperfluous parts about the extremes.

This done, they are laid in a vat or pit with a little water; where being well fulled with wooden peſtles for a quarter of an hour, the vat is filled up with water, and the ſkins rinſed therein. They are next thrown on a clean pavement to drain; which done, they are caſt into a freſh pit of water, where being well rinſed, they are taken out, and laid on the wooden leg, ſix at once, with the hair ſide outermoſt, over which they rub a kind of whetſtone very briſkly, to ſoften, and fit them to receive four or five more preparations given them on the leg, both on the fleſh ſide and the hair ſide, with the knife, after the manner above-mentioned.

Theſe over, they are put in a pit with water and wheat-bran, and ſtirred about therein, with wooden poles, till the bran is perceived to ſtick to them; and then they are left; as they riſe of themſelves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and, at the ſame time, fire is ſet to the liquor, which takes as eaſily as if it were brandy, but goes out the moment the ſkins are all covered.

This operation is repeated as often as the ſkins riſe above water; and, when they riſe no more, they are taken out, laid on the wooden leg, the fleſh ſide outermoſt, and the knife paſſed over it to ſcrape off the bran. The bran thus cleared, the ſkins are laid in a large baſket, where they are loaden with huge ſtones to promote their draining; and, when ſufficiently drained, their feeding is given them, which is performed after the following manner:

For a hundred large ſheep-ſkins, and for ſmaller in proportion, they take eight pounds of alum, and three of ſea-ſalt, and melt the whole with water in a veſſel over the fire; pouring the diſſolution out while yet lukewarm into a kind of trough, wherein are twenty pounds of the fineſt wheat flower, with eight dozen yolks of eggs; of all which is formed a kind of paſte, a little thicker than children's pap; which, when done, is put into another veſſel, to be uſed in manner following: a quantity of hot water being poured into the trough wherein the paſte was prepared, two ſpoonfuls of the paſte are mixed therewith; in order to which, they uſe a wooden ſpoon, which contains juſt what is required for a dozen ſkins: and, when the whole is well diluted, two dozen of the ſkins are plunged therein: care being taken, by the way, that the water be not too hot, which would ſpoil the paſte, and burn the ſkins.

Having ſtaid ſome time in the trough, they are taken out, one after another, with the hand, and ſtretched out; which is repeated twice: when they have all had their paſte, they are put in tubs, where they are fulled afreſh with wooden peſtles. Then they are put in a vat, where they remain five or ſix days, or more; and are at laſt taken out in fair weather, and hung out to dry on cords or racks; the quicker they dry, the better; for, if they be too long a drying, the ſalt and alum within them are apt to make them riſe in a grain, which is an eſſential fault in this kind of dreſſing.

When the ſkins are dry, they are put up in bundles, and juſt dipped in fair water; from which being taken out and drained, they are thrown into an empty tub; and, after ſome time, are taken out, and trampled under foot.

They are then drawn over a flat iron inſtrument, the top whereof is round like a battledore, and the bottom fixed into a wooden block, to ſtretch and open them: when opened, they are hung in the air upon cords to dry; and, when dry, are

are opened a second time by repassing them over the same instrument.

Lastly, they are laid on a table, pulled out, and laid smooth; and are thus in a condition for sale and use.

After the same manner are dressed horses, cows, calves skins, &c. for the sadlers, harness-makers, &c. as also dogs, wolves, bears-skins, &c. excepting that in these the use of the paste is omitted, salt and alum-water being sufficient.

TEETH (*Dict.*)—When the Teeth are subject to be overspread with a black or yellow crust, it is a very good method to rub them well every day with a mixture of tincture of gum lac, honey of roses, and spirit of vitriol, which will not only whiten the Teeth, but render the gums more firm.

The world is fond of tooth powders, and a moderate use of them may do service; but the daily rubbing with them does more harm to the teeth than wholly neglecting them. Powders of this kind may be prudently used once in six or seven days, and will render the Teeth white and splendid. The common powders, prepared for this purpose, are too hard, and wear away the gums; softer substances should be employed, and, when the gums are furred, a few drops of some acid spirit may be added to the powder. The following is a very efficacious and safe powder: take chalk in powder, myrrh, burnt hartshorn levigated, and Florentine rice-root, of each two drachms. Spirit of salt, six drops; mix all into a powder.

The common trick of mountebanks, and other such practisers, is to use various washes for the Teeth, the sudden effects of which, as cleaning and whitening the Teeth, surprise and please people; but the effects are very pernicious. All the strong acid spirits will do this. As good a mixture as any thing can be, on this occasion, is the following: take plantane-water, an ounce; honey of roses, two drachms; spirit of salt, ten drops: mix the whole together, and rub the Teeth with a piece of linen rag dipped in this, every day, till they are whitened. The mouth ought to be well washed with cold water, after the use of this or any other acid liquor; and indeed the best of all Teeth-washes is cold water, with, or without a little salt; the constant use of this will keep them clean and white, and prevent them from aching. *Heister's Surg.*

TEGS, a term used in some parts of the kingdom by the farmers, to express lambs of a year old.

TELEO'LOGY, the science of the final causes of things. This is an ample and curious field of enquiry, though pretty much neglected by philosophers. *Wolf. Disc. Prælim. Logic.*

TELE'PHIUM, *orpine*, in botany, the name of a genus of plants; the characters of which are these: the flower is of the rosaceous kind, consisting of several petals, arranged in a circular form, and contained in a cup, consisting also of many leaves. The pistil arises from the cup, and is finally converted into a triangular shaped unicapsular fruit, containing a number of small and roundish seeds. To these marks it may be added, that the leaves stand alternately on the stalks.

TE'MACHIS, in natural history, the name of a genus of fossils, of the class of the gypsums, the characters of which are these: it is of a softer substance than many of the other genera, and of a very bright and glittering hue.

The name is derived from the Greek τεμαχιον, frustulum, a small irregular fragment; the bodies of this genus being composed of an assemblage of multitudes of irregular flaky fragments, as are all gypsums; but no genus of them so visibly as these.

TE'MPERATURE, or *climate for plants.*—The difference of climate or Temperature of the air has a very great effect on plants. The different degree of heat is the great cause of these changes, and the different degree of moisture somewhat assists in it. The American and Asian plants, famous in medicine, when of the growth of their native soils, yet when removed into our climate, though they grow and even produce their flowers and ripen their seeds, which seems the last perfection of a plant, when put to the trial, have been always found to want their proper medicinal virtues.

Many of those plants and trees, which, though natives of another climate, will endure the open air with us, and grow in our gardens; yet lose much of their strength, and become dwarfs, in proportion to what they were when in their proper climate. But much less violent changes than these are able to produce the like effects, at least in some degree. The several parts of Europe are able to alter the quality of the same plant, even while it grows naturally in them. Thus, the blue aconite or napellus, the root of which is a terrible poison in the south of France; yet, in Brittany, a northern province of the same kingdom, the root of the same plant, though it seems to grow with equal vigour there, is equally large and succulent, has no bad effects; but has been eaten by old people and children without any injury.

In general, the farther north we go the less and less hurtful this plant becomes. It is common to almost all Europe, and we find the inhabitants of some places dreading it, and that, with great justice, as a fatal poison; while those of others eat the leaves in their sallads, and even esteem them good to restore the appetite.

The common woad which succeeds well in many parts of England, is not so certain in France; but the different climates, in different parts of that great kingdom, make strange alterations in its juices. In upper Languedoc they raise great quantities of it, and it makes an extremely fine blue dye for stuffs of all kinds; but, in Brittany, though the plant grows as high, and seems to flourish as well, yet the leaves never are so succulent, and the colour obtained from them is not of so fine a blue, but is dusky and brownish.

This effect of the different climates, in changing the nature of things produced in them, is not confined to plants; but the animal kingdom shares in it. The whole serpent kind are in general larger and more venomous, as we approach the hotter climates. The tarantula, so poisonous in the hot countries, is found greatly less so, as it is found in more cold regions; and the scorpion, whose sting is fatal in some parts of Africa, is little more mischievous than the wasp or hornet, in some of the coldest places where it lives. Nay, the Philosophical Transactions inform us, that the bite of the tarantula, even in those very places where most mischievous, does not exert its power in cold weather; but that the person bitten at such a time feels not the effect of the bite till the next sultry hot day, though that may not happen till after two or three weeks.

The differences, made by variety of climates upon plants, are not limited to distance of place, but even in the same province the climate differs greatly in different years, by means of accidents, and more or less heat; and more or less moisture will do as much violence to plants sometimes, as change of place, which only operates by means of the same agents. Our farmers complain of great mischiefs, from long droughts; and the French husbandmen, in many of the provinces, always find, that when there has fallen very much rain, or thick fogs have been very frequent, all the bread-corn of every kind degenerates; the wheat and barley are poor and thin in the ear, and the grain small; but the rye becomes so altered, that it is pernicious to use it in making of bread; and the poor, who are obliged to eat the bread made with it, are subjected to many diseases by it. They call the rye thus vitiated ergot, and blé cornu. *Dressand's Trait. Phys.*

TENCH, the English name of the tinca of the modern authors, the fullo and gnapheus of the ancients.

It is, according to the Artedian system, a species of the cyprinus, and distinguished by that author by the name of the blackish, mucous, or slimy cyprinus, with the end of the tail even.

This is a delicately tasted fish, though it lives in foul water, and seems to feed very coarsely. It is always found in the muddiest parts of ponds, and where there are most weeds.

The slime of the skin of this fish is said to be of a healing nature, and to cure all fresh wounds; and it is pretended that the other fish know this property in it, and always apply to the Tench when wounded. Whether their opinion be true or false, the Tench has obtained by it the name of the fishes physician. The pike is said to pay such respect to this fish, on this account, that he never seizes him. But these are things easier to be fancied and said than proved; and, if it should prove that the pike does not eat the Tench, it may be resolved into a much more natural cause, by supposing the slime of the Tench too disagreeable in his stomach to suffer it.

The season for angling for Tench is in June, July, and August. The time of their biting is early in the morning, or late in the evening, and, in hot weather, all night long. The favourite bait for the Tench is a large red worm, and they will take this much more greedily, if it be dipped in tar, after it is put on the hook. There are several sorts of paste also that he bites very well at, particularly one made of brown bread and honey, with an admixture of tar. All pastes that have any of the strong-scented oil in them, are also good baits. Other baits are the cad-worm, lob-worm, flag-worm, green-gentle, marsh-worm, or soft-boiled bread-corn. All these will do very well at a proper season.

When a number of Tench are to be taken out of a muddy pond, where they will not bite freely at the hook, the method is to take a very good and large casting-net, well leaded, and with the meshes from the crown to a full yard and an half, not too small; for then, if the pond be deep, the fish will strike away before the net gets to the bottom. The place where the net is intended to be thrown, must be made clean from bushes and large weeds, with a rake. When the place is thus cleared of any obstacles to the even descent of the net, a bait is to be prepared to draw the fish together, where the net is to be thrown. This bait is to be thus made: put a quarter of a peck of wheat into three quarts of water, send it to an oven, and let it be well soaked; then add to it five pints of blood, and as much bran as is necessary to give it the consistence of a paste. Mix some clay with it, that it may the better hold together; and, finally, add a quart of lob-worms chopped to pieces. Let the whole be wrought up into a stiff paste, and rolled into balls of the size of a hen's egg; and let these be thrown into the pond, in the place where the net is to be thrown. At times these, and at times some grains, are to be thrown in; and the place in this manner thoroughly baited for several days. When the fish may be supposed to

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be very well acquainted with the spot, let a very good baiting be given in the morning, and in the close of the evening let the casting-net be carefully thrown in. When the net is sunk, the mud all about is to be stirred up with a long pole, with a fork at the end; the net is to lie half an hour, and the mud to be thus stirred all the time; by this means the Tench will be raised, and will be taken in the pulling out the net; but, if the net were to be thrown in and taken out in the common way, there would hardly be one fish taken; for the custom of both Tench and carp, when they are frighted, is to plunge their heads up to eyes in the mud, and thus placed, with their tails erect, any net in the world must draw over them, without a possibility of its entangling them.

TE'NTER (*Dict.*)—It is usually about four feet and a half high, and for length exceeds that of the longest piece of cloth.—It consists of several long square pieces of wood, placed like those which form the barriers of a manege, so, however, as that the lower cross piece of wood may be raised or lowered, as is found requisite, to be fixed at any height, by means of pins.—Along the cross-pieces, both the upper and under one, are hooked nails, called Tenter-hooks, driven in from space to space.

To put a piece of cloth on the TENTER; while the piece is yet quite wet, one end is fastened to one of the ends of the Tenter; then it is pulled by force of arms towards the other end, to bring it to the length required: that other end being fastened, the upper list is hooked on to the upper cross-piece, and the lowest list to the lower cross-piece, which is afterwards lowered by force, till the piece have its desired breadth.—Being thus well stretched, both as to length and breadth, they brush it with a stiff hair-brush, and thus let it dry.—Then they take it off; and, till they wet it again, it will still retain the width and breadth the Tenter gave it.

TE'PID, in natural history, a term used by writers on mineral waters, to express such of them as have a less sensible cold than common water.

They distinguish all the medicinal springs into three kinds; the hot, the tepid, and the cold; but the middle term might easily be understood to mean a great deal more than they express by it; all that have what can be called the least sensible warmth, are called hot; and the tepid are distinguished from the absolutely cold, only by their being less cold.

Some of this class of mineral waters, and some few also of the cold ones, have a sharpish vinous taste, which is never observed in any of the hot ones. This taste is lost on the giving the waters the slightest heat, and is therefore very difficult to be guessed at as to its origin. It is not only found in the aluminous and vitriolate waters, but also in those which are manifestly nitrous, and which abound in sulphureous salts, quite different in their nature from acids. It is therefore an additional somewhat, quite distinct from the saline properties of the fluid, and as easily connected with one kind of that as with the others.

The causes of heat in the mineral waters remain yet wholly unknown, notwithstanding all that has been written concerning them. It is hard to believe, that there are continual subterranean fires near enough the surface, to give a heat that preserves itself in so great a degree to the very place of their eruptions; and it is equally hard to conceive, that there can be beds of fermenting mineral matters, sufficient in quantity and force to have given the same degree of heat to waters for so many ages, as some of our hot springs are known to have subsisted. *Duclos's Exam. des Eaux Miner.*

TEREBI'NTHUS, *the turpentine-tree*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the apetalous kind, being composed of several stamina, furnished with their apices; these are however barren, and the embryo-fruits are produced on other plants of the same species, which produce no flowers. These finally become a capsule, composed of one or two cells, and containing oblong seeds.

TERE'DO, a name given by naturalists to a species of sea-worm, which eats its way into the bottoms of ships, lining the hole it makes with a kind of shelly matter.

The head of this creature is well prepared by nature for the hard offices it is to undergo, being coated with a strong armour, and furnished with a mouth like that of the leech; by which it pierces wood, as that animal does the skin. A little above this it has two horns which seem a kind of continuation of the shell. The neck is as strongly provided for the service of the creature as the head, being furnished with several strong muscles. The rest of the body is only covered by a very thin and transparent skin, through which the motion of the intestines is plainly seen by the naked eye; and, by means of the microscope, several other very remarkable particulars become visible there.

At that part where the intestines end, the tail begins; this is longer than all the rest of the body; it is depressed in the middle, and puffed out on each side, and is joined to the callous part of the lower end of the body in an irregular manner, so that there is an intermediate void space left between: this occupies the middle part between what the natural historians call two soleæ-form fins. This creature is wonderfully minute, when newly excluded from the egg, and at its utmost bigness is a foot long; three or four inches is however its more frequent length.

The skin of this little animal being stripped off, the heart, stomach, and intestines come plainly in view, as also the callous muscles of the neck, and two white ovaries; the heart is composed of two pyramidal vessels.

TERRE *verte*, in the colour trade, the name of a green earth much used by painters, both singly for a good standing green, and in mixture with other colours.

The name is French, and signifies green earth.

It is an indurated clay, of a deep bluish green colour, and is found in the earth, not in continued strata or beds as most of the other earths are, but in large flat masses of four or five feet in diameter; these break irregularly in the cutting, and the earth is generally brought out of the pit in lumps of different sizes. It is of a fine regular and even structure, and very hard. It is of an even and glossy surface, very smooth to the touch, and in some degree resembling the morochthus, or French chalk, but adhering firmly to the tongue. It does not stain the hands in touching it; but, being drawn along a rough surface, it leaves an even white line, with a greenish cast. It does not ferment with acids, and it burns to a dusky brown colour.

It is dug in the island of Cyprus, and in many other parts of France and Italy. That from the neighbourhood of Verona has been used to be esteemed the best in the world; but, of late, there has been some dug in France that equals it. There is also an earth dug on Mendip Hills, in the sinking for coal, which, though wholly unobserved, is nearly, if not wholly, of equal value. *Hill's Hist. of Fossils.*

TERRES'TRIAL *Line*, in perspective, is the line an object is placed or stands upon, of which each object has its particular one, and the whole draught a general one.

The Terrestrial line is always parallel to the horizon. Thus A B (*Plate* XLIV, *fig.* 25. in the Dictionary) is the Terrestrial line, being parallel to D C, the horizontal line. Its use is to determine the lengths and breadths. Thus the visual lines A E, B E, meeting in the point E, determine the dimensions of a figure equal in length or breadth to A B, when it is removed to any distance from A B towards the point E.

TER'TIUM *Sal*, a third salt, a term used in chemistry to express a salt resulting from the mixture of an acid and an alcali, which partakes so of the nature of both, as to be itself neither acid, nor alcali, but neutral.

TEST *Liquor*, a term used by our dealers in brandies, &c. for a liquor which they use as the Test of brandy, &c. to prove whether they be genuine, or mixed with home spirit.

The people who use this, place great confidence in it, but it is really a very vague and uncertain thing. They pretend, that this liquor will shew by the colour which it makes, on being poured into brandy, whether it be genuine and unadulterated; or, if not, in what proportion the adulterating spirit is mixed with it.

The whole fact is this: if a little common green or white vitriol be dissolved in some fair water, it makes a Test liquor; a few drops of which, being let fall into a glass of old French brandy, will turn the whole to a purple, or fine violet colour; and, by the strength or paleness of this colour, the dealer judge the brandy genuine or mixed, in different proportions, with home spirits.

Old French brandy, having long lain in the cask, takes a dilute tincture of the wood of the cask, that is, of oak; and this, being of the same nature with a solution or tincture of galls, naturally turns bluish or blackish with vitriol. A new distilled brandy, though wholly foreign, would not give this Test; and a common malt-spirit, with oak chips infused in it, will turn as dark as the finest brandy. While our distillers indeed had nothing in use for the colouring their spirits but burnt sugar, it was possible to make some guess at an adulteration with them, because the brandy, in this case, would not become blackish in proportion to its former colour, the sugar-colour not turning to ink with the vitriol like the other: but our distillers have of late found a way of using an extract of oak for the colouring of their spirits, and, since that, this Test liquor is of very little use, our common spirits, of any kind, turning as deep with it as the foreign brandies.

The very best way of making this Test liquor is with a calcined vitriol of iron, dissolved in a dilute or aqueous mineral acid. The liquor, when well made in this manner, is of a fine yellow colour, and will give, for a time, the finest blue to any spirituous tincture of oak.

The English were, at one time, very fond of high-coloured brandies, and it was then that the use of this Test-liquor was most esteemed; afterwards we, as well as other nations, finding that this colour was only owing to the cask, began to dislike it, and to favour the pale brandies; at length we fell into the use of such as were wholly limpid and colourless, and the redistilling of all the old brandies people were possessed of took place; on this, the Test liquor was found to be of no use at all, and accordingly rejected; but as we are of late again come into the esteem of coloured brandies, and that with great justice, as the colour, when genuine, is a certain mark of the age of the liquor, this Test liquor is again got into more credit than it deserves.

The famous Helvetian styptic depended wholly on this accident for its colour; and it was no small mortification to our chemists, when, some years ago, it was introduced into use among us, that they could not make it with our own spirits, but must be at the expence of true French brandy for it; our own spirits, though equally coloured, would never make that violet tincture, because their colour was owing to burnt sugar, not a tincture of oak. At length this mystery was explained, and a little scrapings of galls made all those quantities of this styptic, which had been set by as good for nothing, perfectly fine, and well coloured. *Shaw's Essay on Distillery.*

TETRADECARHO'MBIS, in natural history, the name of a genus of fossils, of the class of the selenitæ.

The word is derived from the Greek, τετρας four, δεκα, ten, and ῥομβος, a rhomboidal figure, and expresses a rhomboidal body consisting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly of the same form with the common selenitæ; but that in these each of the end planes is divided into two, and there are by this means eight of these planes, instead of four. *Hill's Hist. of Foss.*

TETRADYNA'MIA *, in botany, a class of plants, whose flowers have four of their stamina of more efficacy than the rest: these are always known by leaving the four efficacious stamina longer than the rest. See *Plate* XLIII. *fig.* 5.

* The word is formed of the Greek τετρας, four, and δυναμις, power. Of this class of plants are scurvy-grass, mustard, radish, &c.

TETRA'NDIA *, in botany, a class of plants which have hermaphrodite flowers, with four stamina or male parts in each. See *Plate* XL. *fig.* 4.

* The word is formed of the Greek τετρακις, four times, and ανηρ, male. Of this class of plants are the teasel, madder, plantane, &c.

TETRAPYRAMI'DIA *, in natural history, the name of a genus of spars.

* The word is derived from the Greek τετρας, four, and πυραμις, a pyramid.

The bodies of this genus are spars influenced in their shape by an admixture of particles of tin; and are found in form of broad-bottomed pyramids of four sides.

Of this genus there is only one known species, which is usually of a brownish colour, and is found in Saxony; as also in Devonshire, Cornwall, and other counties of England, where there is tin. *Hill's Hist. of Foss.*

TEU'CRIUM, *tree-germander* in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the labiated kind; the stamina supplying the place of the upper lip; the lower lip is divided into five segments, the middle one being largest and hollowed like a spoon; the others standing overagainst one another in the neck of the flower. The cup is bell-fashioned, and from it arises a pistil which is fixed in the manner of a nail to the hinder part of the flower, and is surrounded by four embryoes, which afterwards become four roundish seeds, and ripen in the bell-shaped cup of the flower.

TFU'OI, in the Chinese manufactory of porcelaine, a word used to express a particular sort of varnish for that ware with violet colour and gold. The usual method of doing this, at first, was by mixing gold with the common varnish, breaking the leaves very small, and then adding the common blue and the powder of calcined agate of a coarse kind, found in great plenty on the shores of their rivers. But they have since found, that the brown varnish called tsekin succeeds greatly better; for, when the blue is mixed with this, its brown colour is lost, and the gold lies on much better than it would any other way.

They had once a method of a varied varnish, which was very beautiful, but is much neglected now; this was the giving a vessel the brown varnish on the outside with a large portion of gold, and the common white varnish within. They also varied the degree of colour on the outside, by laying on more or less of the varnish; and gave this way a variety, even in the same colour. *Observ. sur les Coutumes de l'Asie.*

THA'LAMUS, in botany, a term used to express that part of the flower in the capitated, or flosculous flowered plants, where the embryo fruits of every separate floscule are lodged, and where afterwards the seeds are contained. This is the bottom of the cup, in the central part of which it adheres to the stalk.

THALI'CTRUM, *meadow rue*, in botany the name of a genus of plants. The characters of which are these: the flower is of the rosaceous kind, being composed of several petals arranged in a circular form. The pistil arises from the center of the flower, and is surrounded by a vast congeries of stamina. This finally becomes a fruit composed of several capsules gathered into a sort of head; these are sometimes alated, and sometimes plain, and each of them contains one oblong seed.

THALLO'PHORI, Θαλλοφοροι, in antiquity, the old men and women, who, in the procession of the festival Panathenæa, carried olive boughs in their hands. *Potter, Archæol. Græc.*

THALY'SIA, Θαλυσια, in antiquity, a sacrifice offered by the husbandmen after harvest. *Potter, Archæol. Græc.*

THA'PSIA, in botany, the name of a genus of plants, the characters of which are these: the flowers are disposed in umbels, and are of the rosaceous kind, being composed of several petals, disposed in a circular order on a cup, which afterwards becomes a fruit composed of two long striated seeds, surrounded with a foliaceous edge, and from both sides emarginated inwards.

THARGE'LIA, Θαργηλια, in antiquity, an Athenian festival, in honour of the sun, and his attendants the hours; or, as others think, of the Delian Apollo and Diana. *Pot. Arch. Græc.*

THARGE'LION, Θαργηλιων, in chronology, the eleventh month of the Athenian year. It continued thirty days, and answered to the latter part of our April, and the beginning of May.

THE'ATINES, an order of nuns, under the direction of the Theatins.

There are two kinds of Theatines, under the title of sisters of the immaculate conception, who form two different congregations, the one engaged by solemn vows, and the other only by simple vows. — Their common foundress was Ursula Benincasa. Those who make the simple vows are the most ancient, and are called absolutely Theatines of the congregation: they had their rise at Naples, in 1583.

The others are called Theatines of the hermitage: the whole business of these is praying in retirement, and an austere solitude, to which they engage themselves by solemn vows.

The Theatines of the first congregation take care of the temporal concerns of these last. Their houses stand together, and communicate by a large hall. Their foundress drew up their constitutions, and laid the foundation of their house at Naples, but died before it was finished.

Gregory the XVth, who confirmed the new institute under the rule of St. Augustin, appointed that they should be under the direction of the Theatins. Urban VIII. revoked this article by a brief in 1624, and subjected them to the nuncio of Naples; but Clement IX. annulled this brief, and submitted them anew to the Theatins by a brief in 1668.

THE'ATINS, a religious order of regular priests, thus called from their first superior Don John Pietro Caraffa, archbishop of Chiesi, in the kingdom of Naples, which was anciently called Theate.

The same archbishop was afterwards pope, by the name of Paul IV, after having been a companion of Gaëtan, a Venetian gentleman, the first founder of this order, at Rome, in 1524.

The Theatins were the first who assumed the title of regular clerks. They have not only no lands, or fixed revenues, either in common or in propriety; but they do not even ask or beg any thing; but wait for what providence shall send them for their subsistance.

They employed themselves much in foreign missions; and in 1627 entered upon Mingrelia, where they have an establishment: they have had the like in Tartary, Circassia, and Georgia, which they have since abandoned, by reason of the little fruit they perceived thereof.

Their first congregation appeared at Rome in 1524, and was confirmed the same year by Clement VII.—Their constitutions were drawn up at a general chapter in 1604. and approved by Clement VIII.—They wear the priests habit.

THE'MIS, in astronomy, a name given by some to the third satellite of Jupiter.

THEO'DOLITE, *(Dict.)*— This instrument is now commonly made use of by surveyors. One of the best of the kind seems to be Mr. Sisson's latest improved Theodolite.

In this instrument the three staves, by brass ferrils at top, screw into bell-metal joints, moveable between brass pillars, fixed in a strong brass plate, in which round the center is fixed a socket with a ball moveable in it, and upon which the four screws press that set the limb horizontal. Next above is such another plate, through which the said screws pass, and on which round the center is fixed a frustum of a cone of bell-metal, whose axis, being connected with the center of the ball, is always perpendicular to the limb by means of a conical brass ferril fitted to it, whereon is fixed the compass box, and on it the limb, which is a strong bell-metal ring, whereon are moveable three brass indexes, in whose plate are fixed four brass pillars, that joining at top hold the center-pin of the bell-metal double sextant, whose double index is fixed in the center of the same plate. Within the double sextant is fixed the spirit level, and over it the telescope.

The compass-box is graved with two diamonds for north and south, and with twenty degrees on both sides of each, that the needle may be set to the variation, and its error also known.

The limb has two flour-de-luces against the diamonds in the box, and is curiously divided into whole degrees, and numbered to the left hand at every 10°. to twice 180°, having three indexes (with Nonius's divisions on each for the decimals of a degree) that are moved by a pinion fixed below one of them without moving the limb, and in another is a screw and spring under, to fix it to any part of the limb: it has also divisions numbered for taking the quarter girt in round timber; to which a shorter index is used, having Nonius's divisions for the decimals of an inch; but an abatement must be made for the bark, if not taken off.

The double ſextant is divided on one ſide from under its center (when the ſpirit-tube and teleſcope are level) to above 60 degrees each way, and numbered at 10, 20, &c. And the double index (through which it is moveable) ſhews on the ſame ſide the degree and decimal of any altitude or depreſſion to that extent, by Nonius's diviſions; on the other ſide are diviſions numbered for taking the upright height of timber, &c. in feet, when diſtant ten feet, which at twenty muſt be doubled, and at thirty trebled; and alſo the quantities for reducing hypothenuſal lines to horizontal: it is moveable by a pinion fixed in the double index.

The teleſcope is a little ſhorter than the diameter of the limb, that a fall may not hurt it; yet it will magnify as much and ſhew a diſtinct object as perfect, as moſt of treble its length; in its focus are very fine croſs wires, whoſe interſection is in the plane of the double ſextant, and this is a whole circle, and turned in a lathe to a true plane, and is fixed at right angles to the limb; ſo that whenever the limb is ſet horizontal (which is readily done by making the ſpirit-tube level over two ſcrews, and the like over the other two) the double ſextant and teleſcope are moveable in a vertical plane, and then every angle taken on the limb (though the teleſcope be never ſo much elevated or depreſſed) will be an angle in the plane of the horizon; and this is abſolutely neceſſary in plotting an horizontal plane.

THE'RAPHIM or *Teraphim* (*Dict.*) — We meet with this word thirteen or fourteen times in ſcripture, where it is commonly interpreted idols: but the rabbins are not contented to have it ſimply ſignify idols, but will have it denote a peculiar ſort of idols or images for the knowledge of futurity, i. e. oracles.

R. David de Pomis obſerves, that they were called Theraphim, from רפה, raphah, to leave, becauſe people quitted every thing to conſult them.—He adds, that the Theraphim were in human ſhape; and that, when raiſed upright, they ſpoke at certain hours, and under certain conſtellations, by the influence of the celeſtial bodies. This is a rabbinical fable, which he has learned from Abenezra.

Others hold, that the Theraphim were brazen inſtruments which pointed out the hours and minutes of future events, as directed by the ſtars.—De Pomis corrects Abenezra, ſaying, that, the Theraphim being made under a certain conſtellation, the devil made them ſpeak under the ſame.

R. Eliezer tells us the reaſon why the rabbins will have the Theraphim to ſpeak, and render oracles: it is, ſays he, becauſe it is written, in the prophet Zachary, x. 2. The Theraphim have ſpoken vain things.

The ſame rabbin adds, that, to make the Theraphim, they killed a firſt-born child, clove his head, and ſeaſoned it with ſalt and oil; that they wrote on a plate of gold the name of ſome impure ſpirit, laid it under the tongue of the dead, placed the head againſt the wall, lighted lamps before it, prayed to it, and it talked with them.

Be this as it will, Vorſtius obſerves, that, beſides the paſſage of Zachary juſt quoted, it appears likewiſe from Ezekiel xxi. 22, that the Theraphim were conſulted as oracles.

De Pomis endeavours to ſhew, that the Theraphim, which Michol put in David's bed, were not of this kind, becauſe they were not in the figure of men; but R. Eliezer is of another ſentiment.

As to the manner of making the Theraphim, Vorſtius takes it to be a vain tradition of the rabbins, though R. Tanichuma and Jonathan, in his Targum, Gen. xxxi. 19, relate it after R. Eliezer.—The chief reaſon of his diſbelief is, that Laban who had not quite loſt all notion of the true God, as appears from Gen. xxxi. 53, could not be guilty of ſo great a cruelty: but Vorſtius does not conſider, that the cuſtom might not be leſs real, for its not having been eſtabliſhed ſo early as Laban: and that the Hebrews ſometimes burnt their children to Moloch.

F. Kircher directs us to ſeek the origin of the Theraphim in Egypt; adding, that the word is Egyptian.—Spencer, in his diſſertation on the Urim and Thummim, maintains the word to be Chaldee, and to ſignify the ſame with ſeraphim, the Chaldeans being frequently known to change the ש into ת, that is, *ſ* into *t*. He adds, that thoſe images were borrowed from the Amorites, Chaldeans, or Syrians; and that the Serapis of the Egyptians is the ſame thing with the Theraphim of the Chaldeans. See *Selden de Diis Syriis*, *ſynt.* 1. c. 2.

THESMOPHO'RIA, Θεσμοφόρια, in antiquity, a feſtival in honour of Ceres, which was celebrated by many cities of Greece; but eſpecially the Athenians obſerved it with great devotion and pomp.

THESMOTHE'TÆ, Θεσμοθέται, in antiquity, an appellation given to ſix of the nine Athenian archons; the firſt and chief of the nine was called, by way of eminence, archon; the ſecond in dignity was called baſileus, the third polemarchus, and the other ſix Theſmothetæ.

THE'TA, Θ, among the antients, one of the Greek letters. It was uſed as a mark on the ballots of judges, by which they condemned the perſon to death, it being the firſt letter of the word θάνατος, death. Whence it had the epithet of niger and infelix, thus: O multum ante alias infelix litera Theta.

THE'TES, Θῆτες, in antiquity, the loweſt claſs of people at Athens. Ariſtides repealed Solon's law, by which the Thetes were made incapable of bearing any office in the government. *Potter, Archæol.*

THE'VET, a name of one of the Hebrew months, anſwering to our December moon.

THIRD *Major*. The logarithm or meaſure *a* of the octave $\frac{1}{2}$ being 1.000000, the meaſure of the greater Third $\frac{4}{5}$ will be 0.321928.

The Third major is by practitioners often taken for the Third part of an octave; but this is a great error, ſince three greater Thirds fall ſhort of the octave by a dieſis: For $\frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} \times \frac{125}{128} = \frac{1}{2}$; or by logarithms $3 \times 0.321928 + \log.$ dieſis $= 0.965784 + 0.034215 = 0.999999$ or 1.000000 the logarithm of the octave.

THIRD *Minor*. The logarithm or meaſure of the octave $\frac{1}{2}$ being 1.000000, the meaſure of the Third minor $\frac{5}{6}$ will be 0.263034. Hence, it appears, that four leſſer Thirds exceed the octave. But practical muſicians are apt to ſuppoſe them equal to the octave, as they are apt to confound three greater Thirds with that interval. Three leſſer Thirds exceed the octave by a dieſis and a comma, as it is eaſily proved by logarithms. *Euler. Tent. Nov. Theor. Muſ.* See the article INTERVAL.

THI'STLE, *carduus*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the floſculous kind, being compoſed of ſeveral floſcules, which, at the upper end, are divided into ſegments, and ſtand upon the embryo ſeed. The general cup which contains theſe floſcules is of a prickly ſtructure, and the embryoes finally become ſeeds winged with down.

THISTLE *Fly*, in natural hiſtory, a ſmall fly produced from a fly-worm, hatching in the protuberances of the carduus hæmorrhoidalis. In the protuberances of this Thiſtle, while they are cloſed in all parts, the worm of this fly, from whoſe injuring it, at the time of depoſiting the egg from which it was hatched, the protuberances aroſe, undergoes its laſt transformation. It here makes of its own ſkin a ſhell, in form of an egg, within which it puts on the nymph ſtate. When this nymph becomes a living fly, the leaſt part of its difficulty is the finding its way out of this ſhell; it has a much ſtronger priſon than that, and before it can obtain its liberty, muſt force its way through the much more cloſely compacted fibres of the protuberance of the vegetable. It has, however, no other means of doing this difficult and laborious work, but that of inflating its head, and throwing out the bladder or muzzle with which all theſe creatures are, by bountiful nature provided in this ſtate.

This is a difficult operation, and many of the creatures periſh in the attempt; but, what much forwards the ſucceſs of it, in many caſes, is, that the ſtalk of the Thiſtle often becomes naturally half rotten before the time of the fly's egreſs. *Reaumur, Hiſt. Inſ.*

Order of the THISTLE (*Dict.*)—The legend is, that, a croſs of St. Andrew (the patron of that kingdom) appearing to him at the time of the engagement, he bleſſed the happy augury, took the figure thereof into his ſtandard in honour of his protector, and inſtituted an order of knights whoſe collar is of gold interwoven with Thiſtle flowers, and ſprigs of rue.

From the collar hangs a medal, on which is the image of St. Andrew with his croſs on his breaſt; with this motto, Nemo me impune laceſſet, Nobody ſhall provoke me unpuniſhed.

Others give a different account of its origin, and aſſure us, it was inſtituted after the concluſion of a peace between Charles VII. of France and the king of Scotland.

The abbot Juſtiniani goes up higher, and will have it to have been inſtituted by Achaius I, king of Scotland, in 809; who, after an alliance made with Charlemaign, took for his device the Thiſtle, with the words Nemo me impune laceſſet, which, in effect, is that of the order: he adds, that king James IV. renewed the order, and took St. Andrew for his protector.

The order only conſiſts of twelve knights, beſides the king, who is the chief, or ſovereign. Their ordinary badge is a green ribbon, to which hangs a Thiſtle of gold, crowned within a circle of gold, in which is the foreſaid motto.

Our Lady of the THISTLE, was alſo a military order inſtituted, in 1370, by Louis II, duke of Bourbon. — It conſiſted of 26 knights, whereof that prince and his ſucceſſors were the chiefs: their badge was a ſky-blue girdle; and, on ſolemn occaſions, a mantle of the ſame colour, with a gold collar, interwoven with flower-de-luces, among which was the word eſperance, hope, in capitals.

THI'MBLE-*making*. This art was brought from Holland, by Mr. John Lofting, a Dutchman, in 1695, who ſet up a work at Iſlington, and practiſed it with ſucceſs.

Thimbles are made of ſhruff, or old hammered braſs, the beſt being too dear, and the ordinary too brittle.

This they melt and caſt in a ſort of ſand, gotten only at Highgate, with which and red okre are made mould and cores, and in them they uſually caſt ſix groſs at a caſt, and about ſix or ſeven of theſe caſts in a day. They are caſt in double rows, and, when cold, taken out and cut off with greaſy ſhears.

Then boys take out the cores from the inſide with a pointed

piece

piece of iron, which cores were made by them, every core having a nail with a broad head in it, which head keeps it from the mould, and makes the hollow to caſt it in.

This done, they are put into a barrel as they do ſhot, and turned round with a horſe, till they rub the ſand one from another.

Thus far the foundery, in which are employed ſix perſons: firſt, the founder and two men make the moulds ready. Secondly, two boys make cores, for each Thimble one. Thirdly, one that blows the bellows. From hence they are carried to the mill to be turned.

Firſt, the inſide, which works with an inſtrument to the bottom, while its hold laſts, and flies back, when let looſe. Secondly, the outſide, which with a coarſer engine called a rough turning is made pretty ſmooth at one ſtroke; and afterwards with a finer engine both the ſide and bottom are at one ſtroke made very ſmooth.

Then ſome ſaw-duſt or filings of horn-combs are put half way into each Thimble, and upon it an iron punch, and then, with one blow againſt a ſtudded ſteed, the hollow of the bottom is made.

After this with an engine the ſides have the hollow made, and in this engine is their chief ſecret, and they can work off with it thirty or forty groſs in a day.

This done, they are again poliſhed on the inſide.

Then the rim, whether a ſingle or double one are turned at one ſtroke, and all theſe turnings are performed with five men and three boys.

After this, they are again turned in the barrel with ſaw-duſt or bran to ſcour them very bright, and ſo they are complete Thimbles.

Thus finiſhed, they are ſorted, and put ſix together one in another; and ſix of theſe ſixes are wrapped up in a blue paper, and four of theſe papers, making a groſs, are wrapped up in another blue or brown paper, and tied with a packthread, which makes them almoſt a ſquare, and are ſold by the firſt maker at four or five ſhillings the groſs.

The charge of this work per annum is much about 700 l. and there has been made, one week with another, about 140 groſs, which makes 7280 groſs, or 1048320 Thimbles, which at four ſhillings the groſs amounts to 1456 l. Out of this a great deal goes for the ſhruff they are made of, a groſs of Thimbles weighing about twenty-four or twenty-eight ounces.

THLA'SPI, *treacle muſtard*, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a roundiſh fruit, of a flatted ſhape, and uſually terminated all round with a foliaceous edge ſplit at the extremity, and divided by an intermediate membrane into two cells, which uſually contain a number of flat ſeeds. To theſe marks it is to be added, that all the Thlaſpi's have whole, not divided leaves, in which they evidently differ from the naſturtium, or creſs kind.

THLASPI'DIUM, in botany, the name of a genus of plants, the characters of which are theſe: the flower conſiſts of four leaves, and is of the cruciform kind. The piſtil ariſes from the cup, and finally becomes a ſort of double fruit, flat, and compoſed of two parts ſeparated one from the other by an intermediate membrane, and each containing uſually one long-ſhaped flatted ſeed.

THOUGHTS, in a boat, a name given by ſeamen to the benches on which the men ſit down to row.

THOWLES, in a boat, are thoſe pins in its gunnel, between which the men put their oars, when they row.

THRA'NITÆ, in the Roman trireme gallies, or thoſe which had three rows of rowers; thoſe of the upper row were called by this name, the ſecond the zygitæ, and the loweſt thalamitæ.

THRAUSTO'MICTHES *, in natural hiſtory, the name of a genus of compound earths.

* The word is derived from the Greek θραυστός, brittle, and μικτός, mixed.

The bodies of this genus are loams compoſed of ſand and a leſs viſcid clay, and are therefore of a friable or crumbly texture.

THREAD.—The Thread of the Laplanders is very fine, white, and ſtrong, but it is of a very different nature from ours; they know nothing of flax or hemp, nor of any other plant whoſe ſtalks might ſupply the place of theſe in making Thread, but theirs is made of the ſinews of the rain-deer. They kill of theſe animals a very great number continually, partly for food, partly for the ſkins which they uſe in cloathing themſelves, covering their huts, and on many other occaſions; the ſinews of all that they kill are carefully preſerved, and delivered to the women, whoſe province it is to prepare this neceſſary matter. They beat the ſinews very well, and after having ſteeped them a long time in water, and then they ſpin them out.

The Thread they thus make is of any degree of fineneſs they pleaſe; but it never is any longer than the ſinew from which it is made. They uſe this in ſewing their cloaths, ſhoes, gloves, &c. and the trappings of their rain-deer. The Threads of the ſame ſinew are laid up together, and are all of a length; and, as the different ſinews afford them of very different lengths, they accordingly pick out ſuch as the preſent uſe requires, both in regard to length and fineneſs. This ſort of Thread is made with much more labour than ours; but it is greatly ſuperior to it on many occaſions, where ſtrength is rather required than beauty.

Theſe people have, beſides this, a way of making a ſort of yarn of ſheep's wool, which they weave into garters, and a ſort of ribbons, uſed by way of ornament; but they place no value on it, becauſe of its want of ſtrength. *Scheffer's Hiſt. of Lapland.*

THU'YA, *tree of life*, in botany, the name of genus of trees, the characters of which are theſe: the embryo fruits are of a ſquammoſe ſtructure, and finally become a ſort of oblong fruit, between the ſcales of which there lie a ſort of marginated ſeed. To this it is to be added, that the leaves are ſcaly.

THY'IA, Θυΐα, in antiquity, a feſtival in honour of Bacchus, celebrated by the Eleans. *Potter, Archæol. Græc.*

THY'MALLUS, in ichthyology, the name of a fiſh of the truttaceous kind, called in Engliſh the greyling or umber.

It is of a long and flatted body, the belly is ſomewhat broad, and the back rigid and thin. It ſeldom exceeds a pound, or at the utmoſt a pound and half weight. Its back is of a duſky browniſh green, with a ſomewhat bluiſh caſt intermixed, and its ſides of a more ſhining gloſs with an admixture of gold colour. The ſcales are of a ſort of rhomboidal form, and the ſide-lines are much nearer the back than the belly. The ſides are variegated with black ſpots placed irregularly, but there are none of theſe near the tail. The back has two fins, and the tail is forked. The head is ſmall, the eyes large and protuberant; the mouth is moderately large, and the upper jaw larger than the under; it has no teeth, but the whole jaws are rough like a file.

It is caught in the freſh rivers in the mountainous counties of England, and in the like ſituations in Germany and other kingdoms, and is one of the fineſt-taſted of all the freſh-water-fiſh. It feeds on worms, and ſpawns in May.

THY'MBRA, in botany, the name of a genus of plants, the characters of which are theſe: the flowers and ſeeds are in all reſpects like thoſe of thyme, but that they are placed verticillately round the ſtalks.

THY'NNIA *, Θύννια, in antiquity, a ſacrifice offered to Neptune by the fiſhermen, after a plentiful draught.

* The word is derived from θύννος, a tunny, that being the ſacrifice offered.

THY'NNUS, in ichthyography, the name of a fiſh, called in Engliſh the tunny, or Spaniſh mackarel, common in the Mediterranean, and other ſeas, and ſometimes, though not frequently, caught on the Engliſh coaſts.

It is a very large fiſh, growing ſometimes to ſeven or eight feet long, and more than an hundred weight. It is of a rounded and thick body, growing gradually ſmaller towards the tail, until it is at length extremely ſlender. It very much reſembles the pelamis in its whole figure, but that it wants the oblong black ſtreaks which that fiſh has on its ſides, and is much larger. The back is black, or, if held in ſome lights, is of a ſhining bluiſh or greeniſh hue. Its belly and half its ſides are of a ſilvery whiteneſs. Its ſcales are very ſmall, its ſnout pointed. Its jaws both of equal length, and armed each with one row of teeth. The mouth is large and black within, except that part of the palate is red. The eyes are large. The larger black fins are two in number; the foremoſt placed near the head, and riſing out of a cavity in the back, and the other at a ſmall diſtance behind that; and, in ſome fiſh of this ſpecies, of a reddiſh or yellowiſh colour; and, behind this laſt, there are eight, nine, or ten ſmall fins running down the ridge of the back, at equal diſtances to the tail. The tail is very forked. The fins at the gills are black, ſmall, and terminate in a point. The belly fins are placed but at a ſmall diſtance behind theſe, and are alſo ſmall; and both theſe, and the gill-fins, have ſinuſes in the body of the fiſh, into which they may be depreſſed. Behind the anus is a fin like that on the back, and behind it eight more ſmall ones, anſwering to thoſe on the back alſo; and the ſkin of the ſides, near the tail, is extended into two fins; ſo that this part of the fiſh looks in ſome ſort ſquare. It is a good fiſh for the table, and is ſalted in vaſt quantities in Spain and Italy.

THY'OS, Θύος, in antiquity, an offering of fruits, leaves, or acorns, which were the only ſacrifices at firſt in uſe. *Potter, Archæol. Græc.*

TIBERIA'DES *Water*, the water of a hot ſpring near Tiberiades in Egypt. Dr. Perry, when on the ſpot, tried ſome experiments on this water, which give us a much better idea of its nature, than we have from any other accounts of it. Half a drachm of oil of tartar being mixed with an ounce and half of the water, it becomes turbid and muddy; and, after twelve hours, three parts of the whole appear like white wool, only leaving a ſmall portion of clear water at the top. This white woolly matter, dried, produced only a ſmall quantity of yellow ochre.

Spirit of vitriol added to the water in the ſame quantity, affords a large unctuous ſediment of a white colour. A ſolution of ſublimate being mixed in the ſame quantity, it became turbid and yellowiſh, and yielded an earthy ſediment in a ſmall quantity; whence it ſeems evident, that it contains a ſal murale.

Saccharum faturni being added in the fame quantity, the water depofited a lateritious fediment in a fmall quantity. Mixed with fpirit of fal armoniac, it turns to a bluifh green turbid liquor, and finally yields a woolly fediment. Sugar of violets, mixed with it, turned it to a yellowifh colour; and the fcrapings of galls, mixed with it, turned it to a deep purple; and on fhaking this became as black as ink.

It appears from thefe experiments, that the water contains a good deal of a grofs fixed vitriolic falt, fome alum, and a fal murale. It is too falt and naufeous for internal ufe; but it muft be of ufe as a bath in all cutaneous foulneffes, efpecially in fcorbutic and leprous cafes; for it will powerfully deterge, fcour, and cleanfe the excretory pores, and it may, by its weight and ftimulus, reftore them to their natural ftate and tone, and reftore the true ftate of the vitiated folids in general. *Philof. Tranf.* N°. 462.

TI'BICEN, in zoology, a fifh of the cuculous kind, called by many authors lyra, or the harp-fifh; and, in fome parts of England, the piper.

TIES, aboard a fhip, are thofe ropes by which the yards do hang; and, when the halliards are ftrained to hoife the yard, thefe Ties carry them up.

TI'FFE *de mer*, in natural hiftory, a name given by Count Marfigli to a fpecies of fea plant, commonly but erroneoufly reckoned among the fpunges, and called by authors a branched fpunge. This author has called it by this name from its refemblance to the heads of the typha paluftris, or cat's tail, when ripe in the month of September.

TI'GRIS, *the tyger or tiger*, in the Linnæan fyftem of zoology, makes a diftinct genus of the quadruped clafs; the characters of which are, that it has four paps placed near the navel, and feet adapted to climbing. The author takes in the panther to this genus, and diftinguifhes the tyger by the name of Tigris maculis oblongis, and the panther by that of Tigris maculis orbiculatis. *Linnæi Syftem. Naturæ.*

The tyger has its name from its fuppofed fwiftnefs, and has been defcribed by almoft all authors as one of the fwifteft of all the wild carnivorous animals; but this has been wholly contradicted by fuch authors as have feen the creature, who all declare that it is a flow and fluggifh animal, and is unable to overtake a man, or almoft any animal that has an opportunity of running away from it. It will give two or three large leaps; but, if it do not feize its prey in thefe, is but ill qualified to catch it afterwards. *Ray. Syn. Quad.*

It exceeds the lion in fize, and is of an unconquerable fiercenefs. It agrees with the panther in the variegation of its colours, but differs in the difpofition of them; for in the panther the colours are difpofed in round fpots or eyes, and in the tyger they are difpofed in long ftreaks.

The Tyger is found in the Eaft-Indies, in many parts of Afia, and in America: but there feems fome difference in fpecies between the Afiatic and American tygers, and poffibly fuller obfervation may prove, that the Afiatic are fwift as the ancients have defcribed them, and the American ones, of the flownefs of which we have accounts, may be a different fpecies.

The manner of carrying off the young brood of this animal is defcribed by Pliny as follows: The Hircanians and Indians bring up the Tyger, fays he, an animal of a dreadful fwiftnefs, which is moft put to the proof, when going to be taken. The whole brood, which is always very numerous, is carried off upon a horfe, as fwift as poffible, and often removed to a frefh one. When the mother tyger finds the neft empty, and the brood gone, for the males take no care of them, fhe traces the fcent with furious fpeed; and when fhe is arrived within hearing of the perfon who is carrying off her young, he throws down one of them; this fhe takes up in her mouth, and, as if made more fwift by the load, carries it back, and then, returning, is treated in the fame manner till the perfon gets on board a fhip, and leaves her to vent her rage on the fhore.

TI'LIA, *the lime-tree*, in botany, the name of a genus of trees, the characters of which are thefe: the flower is of the rofaceous kind, and is compofed of feveral petals, arranged in a circular form. The piftil arifes from the cup, and finally becomes an unicapfular hufk, containing oblong feeds.

TILLS, a name given by our farmers to the lentil, a kind of pulfe propagated in fome parts of the kingdom; they are the fmalleft of all pulfe. They require but an ordinary ground, but they produce a vaft quantity, though they lie in a fmall compafs. They make a fine fweet fodder, and are the beft of all things of this kind, for calves, or any other young cattle. They are alfo the beft of all forts of food for pigeons. *Mortimer's Hufbandry.*

TI'LLAGE. The term Tillage, in its proper fenfe, fignifies the opening, breaking, and dividing the ground by the fpade, the plough, the hoe, or other inftruments which divide it by attrition, as the addition of dung does by fermentation. See AGRICULTURE.

TIMBER (*Dict.*) — The ufes of Timber are fo many and fo great, that the procuring a fufficient fupply of it extremely well deferves the care of every ftate, as it muft be a great difadvantage to it to be obliged to have recourfe to its neighbours, and purchafe, at a very confiderable and continually renewed expence, what might, by an eafy œconomy, be fufficiently fupplied at home.

This œconomy, however, muft be applied in time; for natural indolence, our love to reap the advantages of every thing ourfelves, and our little care for pofterity, give great room to fear fucceeding ages will want wood, both for private and public exigencies. All our art fhould be employed on this fubject with two views: the one, to preferve and cherifh our growing wood; the other, to renew the trees which have been and are continually cut down.

The quantity of acorns, that the oak bears, has made many people fuppofe, that nature has taken care for a renewal for us, and that, of this vaft quantity of feeds which annually fall, there will be always an over-fufficient fupply of young trees, which will grow up in the place of the old ones: but experience proves, that this is by no means the cafe. The greater number of thefe fallen acorns are devoured by a number of different animals, for whofe nourifhent nature has provided that abundance of them: and, of thofe which efcape this fate, we are to confider how few can come to good, from the natural accidents they are unavoidably expofed to; they fall on a covered ground, where dead leaves, and decayed parts of branches of trees, ufually prevent their touching the earth, into which they are to fhoot; or, if they can fhoot here, it is merely from the furface, where they are, in their flow growth, liable, while very tender, to all the inclemencies of frofts; add to this, that it is very difficult for fuch tender plants, as the young feedlings of thefe, to find room for growth or nourifhment among the every-way-fpreading roots of other trees; and the continual fhade, and the want of free air, muft render them very weakly and irregular in their growth, even fuppofing them to get over all the other difficulties.

It is very certain, that Timber-trees of oak are frequently met with among the underwood of forefts; but we fhall always find this to be the cafe, not in the clofe places but on certain fpots where there has been a vacancy or opening; and that, ufually, where there are not, nor have at any time been, oaks in the neighbourhood of the fpot. The acorns that fall from the oaks ufually come to nothing, from the beforementioned accidents; and thefe trees, which grow at diftances, are owing to the acorns brought thither by birds, and accidentally dropped there. This is an inftance familiarly verified by obferving, that there are frequently little bufhes near woods, which, tho' of white-thorn, or other trees, are ufually furrounded and ornamented with young oaks; the jays and the like granivorous birds are the authors of this crop; for, bringing the acorns from the adjoining woods, to eat under thefe bufhes, they drop many by the way, which they do not trouble themfelves to look for on the ground, and which, having here a freer ground to take root, and an open air to grow in, feldom fail of coming to good, unlefs deftroyed, while young.

In order to the preferving our growing Timber-trees, it would be a very ufeful law, that all, who cut down any number of oaks, fhould alfo leave a given number in good condition for after-cutting; and that no Timber fhould be cut down, but at a proper age, in regard to the nature of the foil; fince it is certain, that trees grow to their perfection at very different periods of time, in proportion to the depth of foil they have to grow in; and that, as it is, on the one hand, not for the intereft of the ftate to fuffer trees to be cut, till at their perfection for fize and foundnefs, fo, after they are arrived at that perfection, it is equally certain, that they gradually decay.

The quality of the foil the tree ftands in may be neceffary to be obferved to this purpofe; but the quantity or depth of it is the great fubject of inquiry; and a great number of obfervations have proved, that the proper feafon for cutting oaks, in a foil of two feet and an half deep, is at fifty years old; thofe, which ftand in a foil of three feet and an half deep, fhould not be cut down before feventy years; and thofe, which ftand in a foil of four feet and an half deep, or more than that, will increafe in goodnefs, and in fize, till they are an hundred years old: and obfervation has proved, that, after thefe feveral periods, the trees begin to decay.

This feems the beft rule to eftablifh, in regard to the common foils; but thofe, which grow in a lighter or more fandy foil, may have their periods changed from thefe to forty, to fixty, and to eighty years at the greateft depth; and after thefe times it is always beft to fell the wood meant for public fervice, whether then wanted, or not; fince it is much better to keep it in public magazines, than to leave it to be daily decaying.

Heaths, and other uncultivated places, where there is no regular growth of wood, but where fern and ufelefs plants alone feem to flourifh, ufually afford alfo fome ftraggling trees of the oak. Thefe, probably, have had their origin from acorns dropped by birds; but thefe feldom grow tall or regular, fince, not having been defended from the injuries of cattle, they are ufually browfed on and ftunted, while young, and fo become crooked and fhort-trunked, or pollard trees. Thefe, though not of fuch value as the regular oaks, yet deferve care, both with regard to their prefervation and felling, fince they afford a number of trees naturally bent and formed for many parts of fhip-building.

The little care ufually taken of thefe trees, though on this occafion of great value, feems to threaten a general lofs of them; but, as trees, thus naturally crooked and bent, are of value, it is a laudable attempt to try at the finding a regular method of pro-

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producing such; and this is easily practicable, by following the same method by which these wild ones become so. They wholly owe their figure to the cattle's biting off their tops, while young, and afterwards biting off again the tops of the shoots from the first wound. In this manner, if a number of young trees, set apart for the experiment, have their tops cut off at two, four, six, eight, ten, and twelve feet from the ground, and, four years afterwards, the shoots from these stunted tops are again cut in the same manner, the trees will be found afterwards to grow up in all the irregularly crooked figures that can be conceived; and, by this means, a supply of naturally crooked wood may be raised for all the occasions of ship-building, with infinitely greater ease, and more certainty, than by the method, proposed by some, of bending them down with weights tied to their tops, while young.

As to the supply of young wood in the place of what is cut down, there are some circumstances, which have not had the attention paid to them which they deserve. The spring frosts, which come on at a time when the shoots, by which nature is to raise the supply for what is cut down, are just preparing to grow, are of prodigious injury, and do not less mischief to these, than to the young shoots of garden-plants, though the distant hope of the succession to the proprietor, and usually also the distance of the place, and want of repeated observations, occasions its not being perceived. This, however, may in a great measure be guarded against. Frequent experiments, and repeated observations, prove, that the mischief done by these frosts affects, in a much greater degree, those shoots which are exposed to the north, than those which face the south; and that it is greatly more powerful against such as are wholly exposed to the wind, than against such as are sheltered. These known circumstances may give the hint to a method of saving, at least, a great part of a wood to be felled, from this destruction, to its renewal, by the making it a rule to begin cutting down on the south side; and, as the whole felling is a work of some years, the standing wood of every season will defend the young shoots of the newly-cut stumps, the following spring, not only from the north exposure, but will shelter them also from the wind.

Many prudent managers have made fine estates of their coppice-woods, by regularly felling a certain portion every year, and providing for a renewal of the first cutting against the felling of the last portion, by proportioning the time of growth to the quantity to be cut every year; and there is great interest to be made of a true knowledge of the growth of wood in this manner. Whosoever observes the growth of young trees will find, that the second year's growth is much more considerable than that of the first; the third year's growth is much more considerable than that of the second, and so on for many years, the yearly growth of young wood greatly increasing every season, up to a certain time or age of the tree; after which, the increase in bulk, by growth, becomes gradually less. The great advantage to be made of coppice-wood would be by knowing this interesting period, and seizing on it, always to cut down the trees just at that time when they have arrived at the end of their quick growth, and so, setting nature to work with new shoots, to employ the same speed on inriching again the owner. Regular observation and experiment alone can ascertain this happy period; but any man, who has much coppice-wood upon his estate, may assure himself of it, by cutting a given quantity every year, for ten years successively, and then carefully reviewing the differences of the yearly produce.

Preserving of TIMBER.—When boards, &c. are dried, seasoned, and fixed in their places, care is to be taken to defend and preserve them; to which the smearing them with linseed-oil, tar, or the like oleaginous matter, contributes much.

The Dutch preserve their gates, port-cullices, draw-bridges, sluices, &c. by coating them over with a mixture of pitch and tar, whereon they strew small pieces of cockle and other shells, beaten almost to powder, and mixed with sea-sand, which incrusts and arms it wonderfully against all assaults of wind and weather.

Timber, felled before the sap is perfectly at rest, is very subject to the worms; to prevent or cure which, Mr. Evelyn gives us the following secret, as most approved: put common sulphur in a cucurbit, with as much aqua-fortis, as will cover it three fingers deep; distil it to a dryness, which is performed by two or three rectifications.

Lay the sulphur remaining at bottom on a marble, or in a glass, and, with the oil it dissolves into, anoint the Timber. This, he adds, not only infallibly prevents or cures the worminess, but preserves all kinds of woods, and even many other things, as ropes, nets, and masts, from putrefaction, either in air, water, snow, &c.

For such as would go a shorter way to work, two or three anointings with linseed oil may do very well. As to posts, &c. that are to stand in the ground, the burning the outsides to a coal is a great preservative.

As to the chops or clefts green Timber is liable to after working, a very great eye-sore in many fine buildings, they are closed by anointing, suppling, and soaking it with the fat of powdered beef broth, twice or thrice repeated.—Some carpenters use grease and saw-dust mingled for the same purpose.—

But the former method is excellent, only it is not to be used, while the Timber is green.

Seasoning of TIMBER, a term used by our husbandmen to express the preparing Timber after it is felled, for cutting and working up for use.

As soon as felled, it should be laid up in some dry airy place, but out of the reach of too much wind or sun, which, when in excess, will subject it to crack and fly. It is not to be set upright but laid along, one tree upon another, only with some short blocks between to give it the better airing, and prevent its becoming mouldy, which will rot the surface and produce mushrooms on it. Some persons daub the trees all over with cow-dung, which occasions their drying equally, and prevents their cracking, as they are otherwise very apt to do.

Some recommend the burying Timber in the earth, as the best of all ways of seasoning it; and others have found it a fine preservative to bury their Timber under the wheat in their grainaries; but this cannot be made a general practice. In Norway, they season their deal planks, by laying them in salt water for three or four days, when new sawed, and then drying them in the sun; this is found a great advantage to them; but neither this, nor any thing else, can prevent their shrinking.

The seasoning Timber by fire is the best way of all, for piles, and other pieces that are to stand under the earth, or water. The Venetians first found out this method, and the way they do it is this: they put the piece to be seasoned in a strong and violent flame, in this they continually turn it round by means of an engine, and take it out when it is every-where covered with a black coaly crust; by this means the internal part of the wood is so hardened, that neither earth nor water can damage it for a long time afterwards. This method is practised in many places for seasoning the posts for paling of parks, &c. and has this to recommend it, that in the very oldest ruins we have ever been acquainted with, there have been found many times pieces of charcoal, all of which has been found uninjured, though buried in the earth for ever so many ages. *Mortimer's Husbandry.*

TIN-*floors*, a contrivance used by our husbandmen who propagate hops to dry them after the gathering. The common way of doing this is either on a hair-cloth on a malt-kiln, or else by the oost.

In both these ways, however, the hops suffer very much; the best way is by the Tin-floor. It is thus done: let a square brick room be built, with a door on one side, and a long fire-place of a foot wide in the middle, reaching almost across it; let holes be made at the sides of this fire-place, to let out the heat into the room; and, at the height of five-feet above this, let a floor be made of laths of an inch thick, laid lattice-wise. Let this be covered with great plates of double Tin, taking care that the joinings of the Tin be well soldered, and lie upon the laths, not over the interstices, which may be about four inches wide. Let a row of boards be fitted round the edge of this floor, to keep the hops from falling off; then lay on a covering of hops of a foot thick; then make a small fire of charcoal in the mouth of the fire-place, and the hops will dry very quick and very regularly. They may be continually stirred about while drying, and, when enough, a part of the boarded edge of the kiln may be taken down, and the dried parcel thrust out, and a fresh parcel laid on in their place. A very small quantity of fuel is sufficient in this way, and any fuel will do, for the smoke never comes at the hops. There is a very great improvement still upon this method of drying hops, used by some people; this is the making a wooden cover, of the size of the Tin-floor; this is covered with plates of Tin nailed on, and is suspended over the kiln in such a manner, that it may be let down at pleasure, when the lower parts of the hops are dry. This is to be let down within ten inches of their surface, and there it acts as a reverberatory, and drives back the heat on the upper ones, so that they are dried as soon as the lower ones: thus all the trouble of turning is saved, and the hops are much better dried than in any other way. *Mortimer's Husbandry.*

TIN-*hatch*, in mining, a term used by the people of Cornwall, to express the opening into a Tin-mine. They also call it a Tin-shaft.

They make several openings in the sides of the hills where they suspect veins of ore to be. All these, except that which opens on the head of the mine, are called essay-hatches; but that which does so, is made their entrance afterwards, and changes its name to that of the Tin-hatch.

TIN-*plates*, an article of manufacture very common among us, and vulgarly called Tin. It is iron plated over with Tin. The French call it fer blanc, white iron, as we sometimes do in England. It was once known under a distinct name, latin. See the article LATIN.

TINCTURE (*Dict.*)—A general rule for the properly making light Tinctures may be taken from the following bitter: take half an ounce of Sevile orange-peel shaved thin, half a drachm of gentian-root thin sliced, a scruple of the tops of Roman wormwood, half a drachm of cardamom-seeds, and the same quantity of cochineal, each of them lightly bruised; put these ingredients into a pint of French brandy, let them steep for

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one night, and filtre the liquor the next morning, and thus you have a fine light bitter.

These bitters are of the number of many other ſubſtances, where the goodneſs of a Tincture does not more depend upon the choice of the ingredients, than upon the manner of their being infuſed; for, if ſuch be ſuffered to remain too long in the menſtruum, or, if heat be uſed in extracting the Tincture, the groſs terreſtrial and nauſeous parts of the ingredients will be fetched out, and the Tincture will thus be loaded with a heavy indolent matter of little virtue. *Shaw's Lectures.*

A great variety of Tinctures may be given to common water, and many remarkable things occur in their changes on the addition of common menſtruums: take a large ſpoonful of the ſyrup of pomegranate-flowers, mix it with five ſpoonfuls of water; the mixture will be of a very lively and brilliant red: for a violet colour, take the ſame quantity of ſyrup of violets, and the ſame of water. When the Tinctures are thus prepared, have at hand a phial in which is a ſmall portion of oil of tartar, which will only look like water remaining after the waſhing of the phial.

Pour the red or the violet Tincture into this phial, and it immediately becomes a fine graſs-green. Diſſolve the quantity of a walnut of crude ſal armoniac in a glaſs of water, pour all out except three or four drops at the bottom, and pour into this glaſs the fine red liquor, and it immediately becomes black as ink. In order to change the purple liquor red, only have a ſmall quantity of ſpirit of vitriol in the bottom of a phial, and pour it into this; the violet water, immediately on this, becomes of a florid red.

Steep Braſil wood in common water, or in white wine twenty-hours; the liquor will then look of the colour of red wine; pour this into a glaſs waſhed with vinegar, and it becomes of a fine yellow like ſack. If this experiment be made with white wine, the wood and the vinegar make ſo little alteration in it, that it may be drank afterwards, and the whole proceſs ſeems a way of turning red port into ſack. Into this liquor when yellow, drop a few drops of a Tincture of benjamin made in ſpirit of wine, and it immediately loſes its yellow colour and becomes white. Beat ſome galls to fine powder, and rub the powder on a towel; then put into a baſon of water, in which any perſon is going to waſh their hands and face, a ſmall piece of common green vitriol, or copperas; after the perſon has waſhed, let them have this towel to wipe on, and the hands and face will be as black as if waſhed with common writing-ink; the copperas in the water and the galls on the towel making real ink where they mix. This does no laſting injury to the ſkin, but will come off again upon waſhing with ſoap. *Philoſ. Tranſ.* N°. 238.

TINCTURE *of antimony*, tinctura antimonii, is thus made: take ſalt of tartar a pound, antimony half a pound, rectified ſpirit of wine a quart; reduce the antimony to a powder, and mix it with the ſalt by fuſion over a ſtrong fire. When it is cold, powder it, and pour on the ſpirit of wine; digeſt them together three or four days in a ſand heat, and then filtre off the clear Tincture for uſe. The ſalt of tartar yields a Tincture as well as the antimony.

TINCTURA *Fœtida*, the ſtinking Tincture, a form of medicine in the late London Diſpenſatory prepared in this manner: take aſſa-fœtida four ounces, rectified ſpirit of wine a quart, digeſt them together for ſome time, and then ſtrain off and filtre the Tincture through paper.

TINCTURA *Sacra*, a Tincture of aloes, called alſo hiera picra. The late London Diſpenſatory has ordered this to be made of only eight ounces of aloes, and two ounces of winter's bark powdered, and put into five quarts of white-wine, which is to be ſhook often, and kept in fuſion a week or more without heat, and then ſtrained off for uſe. *Pemberton's London Diſp.*

TINCTURA *Saturnina*, the lead tincture, a name given in the late London Diſpenſatory to the tincture before called Tinctura antiphthiſica.

It is made of ſugar of lead and green vitriol, each two ounces; of rectified ſpirit a quart. The ſalts are ſeparately to be reduced to powder, and then put into the ſpirit; then the whole is to ſtand ſome days without heat to extract the Tincture, and afterwards filtred through paper. *Pemberton's London Diſpenſatory.*

TINCTURA *Senæ*, a form of medicine preſcribed in the new London Pharmacopœa, and intended to ſtand in the place of the medicine commonly called elixir ſalutis, and Daffy's elixir. It is thus made: take ſtoned raiſins fixteen ounces, leaves of ſena a pound, carraway ſeeds an ounce and half, cardamom-ſeeds half an ounce, proof ſpirit a gallon; digeſt all together without heat, and, when the Tincture is well extracted, preſs off the ſpirit, and filtre it for uſe. *Pemberton's London Diſpenſatory.*

TINCTURA *Styptica*, a form of medicine made with very little trouble and apparatus, and ſerving to ſupply the place of that elaborate preparation the tincture of Helvetius; it is preſcribed in the late London Pharmacopœa, and is to be made by mixing a drachm of calcined green vitriol with a quart of French brandy, tinctured by the caſk; this is to be ſhook together that the brandy may turn black, and then ſtrained off for uſe. *Pemberton's London Diſpenſatory.*

TINCTURA *Thebaica*, a name now given to the tincture of opium, commonly called laudanum.

The method of making this is alſo much altered, as well as the name in the late London Diſpenſatory, where the ſaffron, being looked on as an uſeleſs ingredient, is wholly left out, and the medicine ordered to be prepared in the following manner: take of opium ſtrained two ounces, of cinnamon and cloves each a drachm, white wine a pint; infuſe without heat a week, and then ſtrain off the wine thro' rough paper. *Pemberton's London Diſpenſatory.*

TINCTURES, in heraldry, a word uſed to expreſs colours, red, blue, green, and the like.

TI'NGING *of marble.*—The art of doing this has in ſeveral people's hands been a very lucrative ſecret, though there is ſcarce any thing in it that has not at one time or other been publiſhed.

Kircher has the honour of being one of the firſt, who publiſhed any thing practicable about it. This author meeting with ſtones in ſome cabinets ſuppoſed to be natural, but having figures too nice and particular, to be ſuppoſed of nature's making, and theſe not only on the ſurface, but ſunk through the whole body of the ſtones, was at the pains of finding out the artiſt who did the buſineſs; and, on his refuſing to part with the ſecret on any terms, this author with Albert Gunter, a Saxon, endeavoured to find it out; in which they ſucceeded at length very well. The method is this:

Take aqua-fortis and aqua-regia of each two ounces, ſal armoniac one ounce, ſpirit of wine two drachms, about twenty-ſix grains of gold, and two drachms of pure ſilver; let the ſilver be calcined and put into a phial, and pour upon it the aqua-fortis; let this ſtand ſome time, then evaporate it, and the remainder will firſt appear of a blue, and afterwards of a black colour. Then put the gold into another phial, pour the aqua-regia upon it; and, when it is diſſolved, evaporate it as the former. Then put the ſpirit of wine upon the ſal armoniac, and let it be evaporated in the ſame manner. All the remainders, and many others made in the ſame manner from other metals diſſolved in their proper acid menſtrua, are to be kept ſeparate and uſed with a pencil on the marble, the ſeveral parts are to be touched over with the proper colours, and this renewed daily till the colours have penetrated to the deſired depth into the ſtone. After this, the maſs may be cut into thin plates, and every one of them will have the figure exactly repreſented on both the ſurfaces, the colours never ſpreading: the niceſt method of applying theſe, or the other Tinging ſubſtances, to marble, that is to be wrought into any ornamental works, and where the back is not expoſed to view, is to apply the colours behind, and to renew them ſo often till the figure is ſufficiently ſeen through the ſurface on the front, though it does not quite extend to it. This is the method that of all others brings the ſtone to a nearer reſemblance of natural veins of this kind. *Kircher's Mund. Subter.*

TINNU'NCULUS, in zoology, the name of one of the long-winged hawks, called by others cenchris, and in Engliſh keſtrel, ſtannel, or windhover.

It is about the ſize of a common pigeon. Its bill is ſhort, crooked, and very ſharp, and covered with a yellow ſkin at the top; near this the bill is white, elſewhere it is blue. Its tongue is bifid; its mouth very wide, and its palate blue. Its head is large and flatted, and is of an aſh-colour, with longitudinal ſtreaks of black. Its back and wings are brown, variegated with black ſpots; its rump is grey, with ſome tranſverſe black ſpots; and its breaſt and belly of a pale ruſt colour, with a few longitudinal ſtreaks of black. Its tail is long and pointed; its tip of a pale ferrugineous hue, with a broad tranſverſe ſtreak of black over it; and the reſt of the tail is a mixed grey and brown, with black ſpots and ſtreaks. Its legs and feet are of a fine yellow. It builds in hollow oaks, and lays four eggs, which are white, variegated with a number of ſmall red ſpots. It feeds on partridges and other birds. *Ray's Ornithol.*

TI'SRI, or TIZRI, the firſt Hebrew month of the civil year, and the ſeventh of the eccleſiaſtical or ſacred year.

The Hebrews call it roſh-haſhanna, that is, the beginning of the year. It anſwered to the moon of September. On the firſt day of this month was kept the feaſt of trumpets, becauſe the beginning of the year was then proclaimed by ſound of trumpets. On this day they refrained from all ſorts of ſervile buſineſs, and offered in ſacrifice a calf, a ram, and ſeven lambs.

TITHES (*Dict.*)—The cuſtom of giving or paying Tithe is very ancient: in Gen. xiv. 20. Abraham gives Abimelech the tenth of all the ſpoils he had taken from the four kings he had defeated: in Gen. xxviii. 22. Jacob makes a vow, at Bethel, to give the tenth of all the riches he ſhall gather, in that ſojourn, to God.

But theſe Tithes were free and voluntary; and, beſides, differed in divers other reſpects from what was afterwards called Tithe: what Melchiſedec received, was only the tenth of the ſpoils, not of Abraham's poſſeſſions; and this once, not annually; and beſides, not as maintenance, which Melchiſedec wanted not, but as homage: add, that this was only from one prieſt to another; for Abraham had not only a prieſt in his loins, but was a prieſt himſelf.—And as to Ja-

cob,

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cob, who was also a priest, what he did was the effect of a vow, voluntarily taken, to offer the tenth of all he should possess; not to any other priest, but to God himself upon an altar.

Under the new law, it is not Jesus Christ that established Tithes, as it was God himself did it under the old law by the ministry of Moses; the Christian priests, and the ministers of the altar of the new covenant, lived, at first, wholly on the alms and oblations of the devout.

In after times the laity gave a certain portion of their revenues to the clergy, but voluntarily, and not out of any constraint or obligation: the first instances we have of it, are in the IVth and Vth centuries.

This gift was called Tithe; not that it was really a tenth part of their income, or near so much: but only in imitation of the Tithes of the old law.

In the following age, the prelates in their councils, in concert with the princes, made an express law to the purpose; and obliged the laity to give a full tenth part of their revenues, their fruits, &c. to the ecclesiastics.

This the church enjoyed without disturbance for two or three centuries; but in the VIIIth century the laity got hold of part of these Tithes, either by their own authority, or by grants and donations of the princes; and appropriated them to their own uses.

Some time afterwards they restored them, or applied them to the founding of monasteries or chapters; and the church consented, at least tacitly, to this restitution.

In 1179, the third council of Lateran, held under Alexander III, commanded the laymen to restore all the Tithes they yet held to the church.

In 1215, the fourth council of Lateran, held under Innocent III, moderated the matter a little; and, without saying any thing of the Tithes which the laity already possessed, forbad them to appropriate or take any more for the future.

Fra. Paolo, in his treatise of Beneficiary Matters, is of opinion, that the custom of paying Tithes under the new law began in France; and affirms, that there are no instances of it before the VIIIth and IXth centuries: but he must be mistaken; for in the 2d council of Matiscona, held in 585, it is said expresly, that the Christians had a long time kept inviolate that law of God, whereby Tithe of all their fruits was enjoined to be given to holy places, &c.

In effect, Origen, Hom. XI. on Numbers, thinks, that the old laws of Moses, touching the first fruits and Tithes, both of cattle, and of the fruits of the earth, are not abrogated by the gospel; but ought to be observed on their ancient footing.

The Vth canon of the council of Matiscona orders Tithe to be paid to the ministers of the church according to the law of God, and the immemorial custom of the Christians, and that upon penalty of excommunication: which is the first penalty we find imposed on such as would not pay Tithe.—On which grounds it is that many among the modern clergy hold their Tithes to be jure divino.

Others, on the contrary, plead, that the recompence, to be given church ministers, is differently ordained by God, according to the differences he has put between his two great dispensations, the law and the gospel: under the law he gave them Tithes; under the gospel, having left all things in his church to charity and christian freedom, he has given them only what shall be given them freely, and in charity. That the law of Tithes is in force under the gospel, all the protestant divines, except some among the English, deny; for though hire to the labourer be of moral and perpetual right, yet that special kind of hire, the tenth, can be of no right or necessity, but to the special labour for which God ordained it: that special labour was the levitical and ceremonial service of the tabernacle, Numb. xviii. 21, 31. which was abolished: the right therefore of the special hire must be abolished too.

That Tithes were ceremonial, is evident from their not being given to the Levites till they had been first offered as a heave-offering to the Lord, ver. 24, 28.

He, then, who by the law brings Tithes into the gospel, brings in likewise a sacrifice, and an altar; without which, Tithes, by the law, were unsanctified and polluted, ver. 32. and therefore were never thought of in the first Christian times, till ceremonial altars and oblations had been brought back.

The Jews themselves, ever since their temple was destroyed, though they have rabbies and teachers of the law, yet pay no Tithes, as having no proper Levites to whom, nor altar whereupon, to hallow them; which argues, that the Jews themselves never looked on Tithes as moral, but merely ceremonial.

Add, that Tithes were not allowed to the priests and Levites merely for their labour in the tabernacle, but in consideration of this likewise, that they were not allowed to have any other part or inheritance in the land, ver. 20, 24. and who, by that means, for a tenth, lost a twelfth.

In effect, for the first three hundred years after Christ, no mention is made in all ecclesiastical history of any such thing as Tithes; though, in that time, altars and oblations had been recalled, and the church had miserably judaised in many other things. The churchmen confessedly lived all that time on free-will offerings; nor could the defect of paying Tithe be owing to this, that there were wanting civil magistrates to injoin it; since Christians, having lands, might have given out of them what they pleased: and the first Christian emperors, who did all things by advice of the bishops, supplied what was wanting to the clergy, not out of Tithes, which were never proposed, but out of their own imperial revenues. The first authority produced, setting aside the apostolical constitutions, which few of the patrons of Tithes will insist on, is a provincial synod at Cullen in 356, where Tithes are voted to be God's rent; but, before that time, divers other abuses and complaints had got ground, as altars, candles at noon, &c. And one complaint begot another; as its is certain that Tithes suppose altars.

It is alledged, that Tithes are of early and solemn force among us, having been paid by statute ever since the Saxon king Athelstan, anno 928: to which it may be answered, that Romescot, or Peter-pence, had been likewise paid to the pope by statute above 200 years longer, viz. from the year 725. And by the way it is to be noted, that these ancient Tithes, among our ancestors, kept a nearer analogy to their original in the Mosaic law; for the priests had but a third part, the other two thirds being appointed for the poor, and to adorn and repair the churches, as appears from the canons of Ecbert and Elfric.

TITHY'MALLUS, *spurge*, in botany, the name of a large genus of plants, the characters of which are these: the flower consists of one leaf, and is of the campaniform kind but globose, divided into several segments at the edge, and inclosed in two little leaves which seem to serve in the place of a cup to it. The pistil arises from the bottom of the flower, and is usually of a three-cornered shape; this ripens into a fruit of the same form, which contains many oblong seeds.

TOBA'CCO, (*Dict.*)—In the island of Ceylon, there are two kinds of Tobacco cultivated for profit. They call both kinds dunkol, which signifies a leaf, the use of which is to be smoaked. The one kind they call hingele dunkol, or singele dunkol; and the other dunkol kapada. The kapada Tobacco is much stronger and more intoxicating than the other; but both kinds are the produce of the same plant, only the single Tobacco has very little care taken of it, being, after the sowing, in a manner left to itself, while the other has great pains bestowed upon it during the whole time of its growth, and till it is fit for use, in the following manner: they clear a little piece of ground, in which they sow the seed of the Tobacco, and against the time that the young plants have got three leaves a piece, they chuse out another piece of ground into which to transplant them: this they hedge round, and turn their horned cattle into it, that their dung may fall upon it and sufficiently enrich it. The ground is then dug with a sharp hoe, or spade, in the form of a pick-ax, and the dung, by this means, thoroughly worked into it. When the earth is thus prepared, they take up the young plants, and set them in this new ground, at about a foot square distant from one another.

The manner of giving more or less strength to this Tobacco, is by suffering the plants to grow to a greater or less height before they top them, or cut off the stalk at the summit. The usual way is to cut off the top when the plant has fifteen leaves. If they intend the Tobacco to be a little stronger, they do this when it has only thirteen; and, when they would have it strongest of all, they do it when there are only eleven or twelve leaves. On the contrary, when they would have a milder Tobacco, they cut it not off till there be eighteen or twenty leaves; but, in this way of counting the leaves, they never reckon the three or four lowest, which do not grow so large and fine as the others. The cutting off the top prevents the juices of the plant from being wasted in flowers and seeds, which are of no value; and, in consequence of it, all being, after this time, employed to furnish the growth of the leaves, they grow four times as large and thick as they otherwise would do.

To prevent all unnecessary wasting of the sap, these plants are tended every day; and, as the young sprouts appear in the joining of the leaves and stalk, they are continually cut off: this is done once in three days, till the leaves have their full bigness, which is about that time when the flowers would have been ripe, had the plant been suffered to grow in its natural way: they are immediately to be gathered when they are full grown, otherwise they waste and decay. They cut down the whole plant, and bring them into their houses, laying them on a heap. When they have lain a little time together, they begin to sweat and grow hot: when they have been a little while fermenting, they turn them, bringing those which are in the middle to the surface, and placing those which were at the surface in the middle; by this means the whole quantity of leaves ferments equally. The longer they lie in this manner, the darker-coloured the Tobacco becomes. When they have left it thus to sweat as long as they judge necessary, they hang every stalk separately on cords; and, when the whole is thoroughly dry, they carefully take off the leaves, and lay them by in bundles, till they have occasion for them.

them. This is the manner of their preparing the kappada. The single Tobacco is sown in the same manner with this; but it is never transplanted nor tended, it grows as it pleases, and, when the flowers are ripe, it is cut down, and laid carelessly in heaps, where some of it ferments too much, and some too little. This is much weaker therefore than the kappada; and, as both kinds are common in the place, the natives smoak them either separately or together, mixed in different proportions, as they like. Some of the Ceylonese chew this strong Tobacco with their beetle, and some, who smoke it alone, use no pipe, but, taking a long leaf of it, they roll it up into a long form, and cover it with the leaf of the wattukan-tree; they then light one end of it, and smoak by the other, till the whole is consumed. *Philos. Trans.* N°. 278. *Plate* XLIII. *fig.* 4. represents the Tobacco plant; *a* is the flower, *b* the calyx, and *c* the seed vessel.

Adhesions of the TOES. It is a frequent thing to meet with new born infants with their fingers or Toes cohering or grown together, either by a strict adhesion of the flesh, or else by some loose productions of the skin, as in the feet of ducks and geese; and a disorder of the same kind is also sometimes found in adults, from accidents; as when the fingers and Toes have been neglected, after an excoriation of them by burns or wounds. In both these cases the surgeon's assistance is necessary, partly to remove the deformity, and partly to restore the proper use of the fingers.

These adhesions, according to the nature of the disorder, are to be separated two ways, either by cutting out the intermediate skin with a pair of scissars, or else barely by dividing them from each other with the same instruments. When this is done, to prevent their cohesions again, each finger must be invested separately with a spiral bandage about an inch broad, dipped in lime-water and spirit of wine.

Sometimes the fingers, instead of adhering to each other, grow to the palm of the hand, from wounds or burns, so that they cannot be by any means extended, or drawn back to open the hand. The method of relieving this disorder is first very carefully to separate the fingers from their adhesions to the palm, without injuring their tendons; then dress them with a vulnerary balsam, and scraped lint, and extend them on a ferula or thick pasteboard; and let them remain in this extended posture, separately to be dressed till they are perfectly healed; but at every dressing they must be gently moved, to prevent a rigidity or stiffness of the joints. *Heister's Surgery.*

TO'KENS, in pestilential cases, those livid spots, which appear in the several stages of the disease, and are certain forerunners of death.

TONGUE-*tied*, the popular name for a distemperature of the Tongue in children, when it is tied down too close to the bottom of the mouth, by a ligament connected all along its middle, and called its frænulum, which requires to be divided, to give the Tongue its proper motion.

This is sometimes the case in adults, but oftener in children, who cannot then exert their Tongues to suck. This is, however, by no means so common as the women usually imagine; not so much as one child in a thousand being afflicted with it; nor is the operation in cutting it of little consequence, since often bad accidents follow it, and sometimes the loss of a child's life. When the infant can put its Tongue out of its mouth, the frænulum wants no incision; but, when the Tongue cannot be extended beyond the teeth, the operation is necessary. *Heister's Surgery.*

TON'SÆ, among the Romans, the blades of oars, or that part of them which beats against the water. *Pitisc. in voc.*

TOP *of a ship*, a round frame of boards lying upon the crosstrees near the head of the mast; here they furl and loose the top-sail, &c.

TOP-*armours*, in a ship of war, are a kind of cloths hung about the round-tops of the masts for shew; and also to hide the men which are on top in a fight, who lie there to fling stinkpots, &c. or to fire small shot down on the enemy in case of boarding.

TOP-*masts*, in a ship, are four, which are made fast and settled unto the heads of the main-mast, fore-mast, mizzen-mast, and bow-sprit respectively.

TOP-*gallant-masts*, in a ship, are two, viz. main-top-gallant-mast and fore-top-gallant-mast, which are small round pieces of timber, set on their respective Top-masts; on the Top of which masts are set the flag-staffs, on which the colours, as flags, pendants, &c. hang.

TOP-*ropes*, in a ship, are those with which the Top-masts are set or struck; they are received through a great block which is seized on one side under the cap, and then are reeved through the heel of the Top-mast, where is a brass shiver placed athwart ships; after this they are brought up and fastened on either side the cap with a ring: the other part of them comes down by the ties, and so is reeved into the knight-head; and, when it is to be heaved, it is brought to the capstan. These Top-ropes belong only to the main and fore-mast.

TOP-*sails* and Top-gallant-sails, in a ship, are those belonging to the Top-masts and Top-gallant-masts.

TOP-*a-starboard*, on board a ship, a word of command to hale upon the larboard lift.

TOP *the yard-arms*, on board a ship, a word of command to make the yards hang higher or lower.

Counterfeit TOPAZ. To counterfeit the oriental Topaz in paste, take crystal prepared two ounces, ordinary minium or red lead seven ounces; put these into a crucible luted, and bake them twenty-four hours in a potter's kiln. If the mass is not sufficiently clear and fine, cover it up again and give a second baking, and it will come out of a fine Topaz-colour. *Neri's Art of Glass.*

TORCH-*thistle*, *cereus*, in botany, a species of plants belonging to the cactus genus.

This plant consists of a single stem or body, twenty, thirty, or more feet high, and about five inches diameter. It is of an angular figure, and armed with clusters of sharp firm spines, growing from tubercles placed along the ribs. The flowers, when open, are of the size of a large rose and consist of forty or more petals; the outer ones purplish, or greenish; the inner ones white.

It is a native of Surinam, and many parts of South America. It has gotten the name of Torch-thistle, from its being much used for Torches.

The propagation of all the kinds of this remarkable plant is by cuttings, which must be laid in a dry place ten days or a fortnight before they are planted, or, if it be three weeks, there is less danger of their miscarrying.

They are to be planted in small pots, filled in a light sandy earth, with a mixture of lime rubbish, laying some stones at the bottoms of the pots to drain off the moisture. The pots are then to be placed in a gentle bed of tanner's bark, and once a week are to have a gentle watering; this is best done in June or July: towards the middle of August, they must have air given them by degrees, and at the end of September they must be removed into the stove, where they are to remain the winter. They should always have a dry situation, and should never be exposed to the open air, even in the midst of summer. When the top of an old plant has been cut off for propagating, it always throws out several young shoots from its angles, which may be easily propagated in the same manner, that there will be a continual supply even from one stock. They may be brought in small pieces from the West-Indies packed up in straw, and will grow when planted here, as well as if cuttings from our own plants. *Miller's Gard. Dict.*

TORDY'LIUM, in botany, the name of a genus of umbelliferous plants, the characters of which are these: the flowers are of the rosaceous kind, being composed of several heart-fashioned petals of irregular sizes disposed in a circular order on a cup which afterwards becomes a fruit nearly of an orbicular figure, being composed of two flattish seeds with a high and usually denticulated margin which easily deposit their covering.

TORME'NTILLA, *tormentil*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, consisting of four leaves disposed in a circular form; the cup is of the shape of a bason, consisting of one leaf, divided into several segments; the pistil arises from this cup, and finally becomes a globose fruit composed of several seeds closely laid together, and covered by the cup.

TOU'CAN, in zoology, the name of a very remarkable Brasilian bird, a kind of magpie, of a middle size between our common magpie and the thrush, but having a beak, prodigiously thick and longer and finely variegated; this beak is hooked at the end, and is of a very thin substance, not exceeding the thickness of a membrane, and very light and hollow, yet bony in substance, and the colours very bright. It has a sort of toothed edge, which prevents its shutting closely, and, giving passage for the air, enables the bird to live without nostrils.

It is covered with a sort of scaly substance easily scraped off with a finger at the edge. Its head is large in proportion to its body, and is black on the crown; but the representation of this curious bird, *Plate* XLIII. *fig.* 6. will give a better idea of it than the most prolix description. The figure is taken from Mr. Edward's History of Birds: and as that ingenious gentleman drew it from nature, it may be depended upon as very correct. It is said that it feeds on pepper, and Thevet affirms that it devours it greedily and returns it again undigested, and that the natives gather up that pepper, and use it in their food, as less hot and acrid than the fresh pepper. *Ray's Ornithology.*

TOUCH-*hole*, or vent, in gunnery, is the small hole at the end of the cylinder of a gun or musquet, by which the fire is conveyed to the powder in the chamber. In a firelock, carabine, or pistol, it is called the Touch-hole, but in a piece of cannon it is more properly called the vent.

TOUCH-*needles*, small masses of gold, silver, and copper, each pure and simple, and, in all the different combinations, proportions, and degrees of mixture, prepared for the trying gold and silver by the Touch-stone, by comparison with the mark they leave on it.

The metals usually tried by the Touch-stone, are gold, silver, and copper, either pure, or mixed with one another in different degrees, and proportions, by fusion. In order to find out

out the purity, or quantity of baser metal in these various admixtures, when they are to be examined, they are compared with these needles, which are mixed in a known proportion, and prepared for this use. The metals of these needles, both pure and mixed, are all made into laminæ or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickness, and an inch and half long; these being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it.

The manner of making the Touch-needles is by the proportions of the mark, a weight of half a pound, or eight ounces, being divided into sixteen half ounces, the half ounces each into four drachms, the drachm into four penny-weights, and this into two half penny-weights.

Silver TOUCH-*needles*, these must be only tempered with copper, and the proportion determined by the mark divided into half ounces and grains.

You must use therefore for this purpose one mark of such a weight that it may constitute a sufficient mass of metal for the making one needle, let it weigh for instance one drachm, then weigh such a mark of the purest silver, wrap it up in a small paper and upon this write sixteen half ounces, which will signify that the whole mark of this metal is the purest silver; make the first needle of this mass.

Next weigh fifteen half ounces of pure silver, and one half ounce of pure copper, wrap these both in a paper, and write on it fifteen half ounces, which will signify that there are in that small mass fifteen parts of pure silver, and one part of pure copper; make of this the second needle. In the same manner go on with the rest, add two half ounces of copper to fourteen half ounces of silver, mark it fourteen half ounces, make the third needle of this, and in the same manner proportion the small masses of silver and copper for making the other needles, and put inscriptions upon every one in the following manner:

For the needle	half oz. of silver	half oz. of copper.
1.	16	0
2.	15	1
3.	14	2
4.	13	3
5.	12	4
6.	11	5
7.	10	6
8.	9	7
9.	8	8
10.	7	9
11.	6	10
12.	5	11
13.	4	12
14.	3	13
15.	2	14
16.	1	15

When you have gone thus far, and have the metals in each of these proportions, wrapped up in its separate paper; put each separately into a new crucible never used for any operation, and adding a little borax melt them together in a very quick fire, which must be well kindled before with bellows; or, what is yet better, throw them suddenly into a hot crucible, and, as soon as they melt, stir them with a dry wooden peg, burnt at the end, and pour them immediately into an ingot. When this is done, wrap up each mass, when cold, in its own paper again, and weigh them singly, in a nice balance. If they still weigh a whole mark they are good; but, if there is any considerable deficiency in their weight, it is a sign that your fire having been of too weak, or of too long duration, has consumed as much copper as is wanting in the weight; therefore this mass must be esteemed useless, and another made in its place in the same proportion.

When this is all finished, make with a hammer, out of each these small masses, a needle, heating them a little; then engrave, on each of these needles, the number of half ounces it contains, as before marked on its paper; that is, upon the first 16, upon the second 15, and so on, and then pierce them at one end, and, running a silver wire through their eyes, collect them in order according to their different numbers. These are the silver Touch-needles, made of the different allays of silver and copper.

In Holland they make use of the mint mark, divided into grains for the making their needles. The first needle made of pure silver is said to be of twelve penny-weights. The second is made of eleven penny-weights and eighteen grains, by the addition of six grains of copper. The third is made of eleven penny-weights and twelve grains, by the addition of twelve grains of copper; and so on, the proportion of silver decreasing always six grains, that is, one quarter of a penny-weight at a time, and that of the copper being always increased in the same proportion, till at last the weight of the silver is reduced to one penny-weight, and that of the copper increased to eleven penny-weights, which proportion constitutes the last needle.

It is needless, however, to go through the whole series of the needles, by so small progressions to the very last, for very delicate proportions cannot be very accurately distinguished in the operation.

Gold TOUCH-*needles*. These must be mixed either with silver alone, or with silver and copper, variously intermixed. This mixture is called allaying or carracting, and is determined with a mark divided into carracts or weights of two sixth parts of an ounce. There is nothing to be observed about the making of these needles, besides what has been already said in regard to the silver needles; except that the proportions of the weights are determined in another manner. These needles are made according to the following division and order; and they all weigh one mark.

The first is entirely of pure gold.

	pure gold	pure silver.
2.	23 Car. 6 Gr.	6 Gr.
3.	23 Car.	1 Car.
4.	22 Car. 6 Gr.	1 Car. 6 Gr.
5.	22 Car.	2 Car.
6.	21 Car. 6 Gr.	2 Car. 6 Gr.
7.	21 Car.	3 Car.
8.	20 Car. 6 Gr.	3 Car. 6 Gr.
9.	20 Car.	4 Car.
10.	19 Car.	5 Car.
11.	18 Car.	6 Car.

The decrease goes on thus, by whole carracts, till the weight of the gold is arrived at one carract, and that of the silver at twenty-three; for after the ninth needle you cannot make so exact a distinction of the half carracts.

This mixture of gold and silver is called the white allay; but, when copper together with silver enters into the mixture of the gold, then it is called a mixed allay. The needles, for trial of pieces thus debased, are made of mixtures analogous to the former, except only that those portions which in the first case were pure silver, here consist of copper and silver mixed. Therefore you have a double series; for the mixture is either of two parts of silver, and one of copper, or of two parts of copper, and one of silver. For instance,

The first is of pure gold.

	of pure gold.	of pure silver.	of pure copper.
2.	23 Car. 6 Gr.	4 Car.	2 Gr.
3.	23 Car.	8 Gr.	4 Gr.
4.	22 Car. 6 Gr.	1 Car.	6 Gr.
5.	22 Car.	1 Car. 4 Gr.	8 Gr.
6.	21 Car. 6 Gr.	1 Car. 8 Gr.	10 Gr.
7.	21 Car.	2 Car.	1 Car.
8.	20 Car. 6 Gr.	2 Car. 4 Gr.	1 Car. 2 Gr.

and so on as in the foregoing.

If in this table you take pure copper instead of pure silver, and silver instead of copper, this gives you a third series of golden needles. And you may have a fourth by mixing with gold equal quantities of silver and copper in the same proportion. These allays of gold are much in use, but workmen may easily employ a multitude of other variations, which, compared with the already mentioned, will be distinguished in a thousand different ways by an experienced person, so that it is neither possible, nor necessary, to imitate them all.

But that these golden needles may not be too expensive, they may be made much shorter than those of silver, and afterwards soldered to plates of copper, that may be sufficiently long for use.

The use of these needles is by means of the Touch-stone; and arises hence, that every metal when pure must have its specific colour, that distinguishes it from the rest: but, metals being the most opake of all known bodies, the specific colour of every one appears most distinctly, when you rub it against a very black hard stone; and if the colours of two or more metals are expressed by large lively spots, made near each other on the same plane, by rubbing them against the surface of the stone, you will by that means easily discern their difference, or their likeness.

The stone adapted to this use, and called from its office the Touch-stone, must have the following qualities. It must be of the deepest black, lest the tincture of the metal should be altered by spurious rays of light shining among it: it must be capable of being pretty well polished, for, when too rough, the colours of the metals rubbed against it cannot be neatly or regularly distinguished; and, if it is too smooth, the metals are but faintly, and too slowly abraded or scraped by it, especially when gold is tried. It must also be neither too hard, nor too soft. Tripoli, coal-dust, and tin ashes are used in rubbing off the thin metalline crusts, and in a short time the stone, when very hard, is apt to acquire too smooth a surface; and, when it is too soft, it easily wears, throws off a dust, and contracts furrows.

The black rough marbles, and the softer black pebbles from the beds of rivers, are most proper for this use, and are to be made into the form of a quadrangular prism, about an inch thick, and two or three inches long.

The method of using your needles and the stone is this: when you meet with a piece of metal to be tried, first wipe it very well with a clean towel, or piece of soft leather, that you may the better see its true colour; for from this alone an experienced person will in some degree judge before-hand what the principal metal is, and how, and with what debased. Then chuse a convenient not over large part of the surface of the metal, and rub it several times very hardly and strongly against

against the Touch-stone, that, in case a deceitful coat or crust should have been laid upon it, it may be worn off by that friction. This however is done more readily by a grindstone or small file, if you have them at hand. Then wipe a flat and very clean part of the Touch-stone, and rub against it, over and over, the just mentioned part of the surface of the piece of metal, till you have on the flat surface of the stone a thin metallic crust, an inch long and about an eighth of an inch broad: this done, look out the needle that seems most like to the metal under trial, wipe the lower part of this needle very clean, and then rub it against the Touch-stone as you did the metal by the side of the other line, and in a direction parallel to it. When this is done, if you find no difference between the colours of the two marks, made by your needle, and the metal under trial; you may with great probability pronounce that metal, and your needle, to be of the same allay; which is immediately known by the mark engraved on your needle. But, if you find a difference between the colour of the mark given by the metal, and that by the needle you have tried; chuse out another needle, either of a darker or a lighter colour than the former, as the difference of the tinge on the Touch-stone directs; and by one or more trials of this kind you will be able to determine which of your needles the metal answers, and thence what allay it is of, by the mark of the needle; or else you will find that the allay is extraordinary, and not to be determined by the comparison of your needles.

But, if the metal under trial has been altered by tin, arsenic, zink, or other such admixtures, the workmen may be deceived by the colour, so as to take for pure gold, or silver, that which is not by any means such. Deceits of this kind however are found out by the assistance of acid menstrua. Aqua-fortis answers this purpose, when the mass is of the colour of gold, and aqua-regia, when it is of the colour of silver; for the first of these menstrua dissolves all metals except gold, and the latter all metals except silver. In this case then you are to pour, upon your metallic streak on the stone, one small drop of either of these liquors, and extend it gently over it with a feather. If it is neither gold nor silver, the whole streak will be obliterated and consumed; but, if there is any gold or silver in it, this remains undissolved, and shews another colour, because the other parts have been separated from it by the solution. When these menstrua are used, great care must be taken that there is no oil in the way; for that would spoil and destroy their effects.

Besides, these the following particulars are to be observed: gold and silver when pure, whether separate or both mixed together, without the addition of any other matter, when made hot in the fire, not only preserve their colour, but, if they were tarnished before, they recover their splendor there, not losing the least part of their weight: and, by this quality in these two metals, the caratura alba, or white allay, made by the mixture of gold and silver alone, is distinguished from all the others. If you have not liberty to try the whole mass in the fire, you may make this experiment on a small piece of it with a blow-pipe.

If you find a needle of the same allay with the metal under trial, the streaks made by both upon the Touch stone must undergo exactly the same changes when aqua-fortis is poured on them; and this ought always to be made a part of the trial by the Touch-needles, that no fraud may be at the bottom.

All gold rendered brittle, when compared with the Touch-needles by the stone, will appear less pure than it really is; and on the contrary all silver, rendered brittle, has the whiteness of silver in a higher degree: nor is there any wonder in this, when rightly considered, since the bodies which make gold and silver brittle are only a few metals, and semi-metals, all of a very bright white colour, and necessarily adding to the whiteness of silver, and taking from the yellowness of gold; such are tin, lead, regulus of antimony, bismuth, zink, and arsenic. These dilute the yellow colour of gold or copper into a whiteness, so that the colour of copper mixed with the silver is hidden by admixtures of this kind, whereas gold on the contrary appears by them to have much more silver in it than it really has.

In a white allay, aqua-fortis does not discover the presence of silver from twenty-three to seven carracts, because aqua-fortis does not separate silver from gold, unless the mass contains three times more silver than gold.

Metallic streaks or crusts which have been left some time upon the Touch-stone, cannot be compared with fresh ones, with any degree of use, because their remaining long on the stone always alters their colour.

Silver when tempered with brass appears whiter than it would do with a like quantity of copper, and, as it may then be rendered sufficiently ductile by a proper operation, you will hardly be able to find out the fraud with the Touch-stone, unless you make a second time the same comparison with the streak of a needle of the same colour, having previously poured aqua-regia upon the metallic crust laid by rubbing on the Touch-stone; nor are Touch-needles, tempered with brass, of any great use on this occasion, since this artificial metal is sometimes more and sometimes less yellow.

Lastly, if the metal laid upon the Touch-stone by rubbing does not appear neat or distinct enough, lick it over with spittle that is not frothy; and the colours will be by that means more distinctly and livelily reflected. *Cramer's Art of Assaying.*

TOUCH-*stone* (*Dict.*)— The Irish Touch-stone, called basanes Hibernicus by Molyneux and some others, is a black marble found in the county of Antrim in that kingdom, in angular columns, forming that amazing pile called by the vulgar the giant's causeway.

This marble has the property of trying metals by the Touch beyond any other known stone; but it is not easily wrought into form, being so hard that it turns the edges of all the tools used to cut stones. Were it not for this, it is admirably calculated for building, and for ornamental works; but nobody has attempted to use it in this manner, any where, except in the church of Ballywellan in the neighbourhood; and here the trouble of cutting is avoided, for the joints are taken as they found them, and the church is built of these in their natural shape, piled one upon another. The outer surface of this stone is of a whitish colour like lime-stone, but this is only the effect of the weather upon it; for where-ever it is broken it is found to be of a fine iron grey, and when polished appears of a true and deep jetty black.

TOW-*chain*, in husbandry, a name given by our farmers to a chain, that makes a part of the structure of the plough, fastening the plough-tail to what they call the plough-head.

This is an iron chain of few links, and very strong; it is fixed at one end to a collar fastened to the middle of the beam of the plough, and at the other end passes through that part of the plough-head called the box, which is the timber through which the spindle of the two wheels run. The stake of the plough, which is an upright piece running parallel with the crow-staves, pins this in at the bottom, running through the link which comes out by the box; this stake is fastened by wyths or cords in two places to the left crow-staffs, and the chain is thus kept firm. *Tull's Husbandry.*

TOXICODE'NDRON, *poison-wood*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, being composed of several leaves disposed in a circular form. The pistil arises from the cup, and finally becomes a fruit of a roundish shape, dry, not juicy, and usually of a striated structure.

TOXO'TÆ, τοξόται, among the Athenians, bowmen, a sort of inferior officers, or rather servants, who attended the lexiarchi.

TRACHU'RUS, in zoology, the name of a fish of the cuculus kind, called in English the shad, and by several authors suro, saurus, and lacertus marinus.

TRA'CING, in husbandry, a term used by our planters in the method of preserving the maize or Indian corn. This, being a large grain, is apt to spoil, if not carefully preserved.

Some thrash out the corn as soon as the ears are gathered, and lay it up in holes of the earth, which are their granaries: but those who have not opportunities of doing this, trace it, that is, they leave it in the ear, and weave or fasten together a great number of ears by the ends of the husks: these traces of corn they hung up within doors, on such supports as will keep them from one another; and they will, in this manner, keep good the whole winter.

This is a method of our introducing; but their own of burying the clean corn was at least as good, and was the same practised by the Ægyptians of old, and by all the wisest nations of the East at this time. But whether we have improved their husbandry in this particular, or not, it is certain that we have greatly assisted them in the planting this corn, which we do by the plough, instead of the troublesome method they had of doing it with the hoe. The manner of our planting it is this: we plow single furrows the whole length of the field, and at about six feet distance one from another; we then plow others a-cross at the same distance, and then, wherever the furrows meet, the corn is thrown in; it is then covered either by the hoe, or by running another furrow behind it with the plough; and when the weeds begin to overtop the corn, they plow the spaces again, and by this means destroy and turn in all the weeds, and give the earth stirring that greatly assists vegetation.

TRA'INING, or TRACING, in minerology, a term used by our miners, to express the tracing up the mineral appearances on the surface of the earth to their head or original place, and there finding a mine of the metal they contain.

The principle on which this practice depends, is the change wrought in the face of the earth by the deluge, of the effects of which these remains are a very great proof. The superficial or upper part of veins, or loads of ore, is always the poorest, the richer ores lying deeper down, the poor ones only serving to lead the way.

TRANSPORTA'TION *of plants.* In the sending plants from one country to another great cautions are necessary. The plants, sent from a hotter country to a colder, should be always put on board in the spring of the year, that the heat of the season may be advancing as they approach the colder climates; and, on the contrary, those which are sent from a colder country to a hotter, should be sent in the beginning of winter.

The best way of packing up plants for a voyage, if they be such as will not bear keeping out of the earth, is to have boxes with handles,

handles, filling them with earth, and planting the roots as close together as may be; the plants should be set in these boxes three weeks before they are to be put on board, and in good weather they should be set upon the deck, and in bad removed and covered with a tarpaulin.

If they are going from a hotter country to a colder one, they must have very little moisture; if, on the contrary, they are going from a colder to a warmer, they may be allowed water more largely, and being shaded from the heat of the sun, they will come safe.

Very many plants, however, will live out of the earth a great while; as the sedums, euphorbiums, ficoides, and other succulent ones. These need no other care than the packing them up with moss in a close box; and there should be a little hay put between them, to prevent them from wounding or bruising one another, and holes bored on the boxes to keep them from heating and putrifying. In this manner they will come safe from a voyage of two, or three, or even four or five months.

Several trees also will come safely in the same manner, taking them up at a season when they have done growing, and packing them up with moss. Of this sort are oranges, olives, capers, jasmines, and pomegranate-trees. These and many others are annually thus brought over from Italy; and, though they are three or four months in the passage, seldom miscarry. The best way of sending over seeds, is in their natural husks, in a bag, or packed up in a gourd-shell, keeping them dry, and out of the way of vermin. *Miller's Gard. Dict.*

TRANSFORMA'TION *of insects.* It is well known that flies are not produced in that form, from the eggs of their parent fly, but undergo a change like that of the butterfly, and the like winged insects; the egg hatching into a worm; and this after eating, and performing all the operations of animal life for a certain time, enters into a state of rest, and thence is changed into a fly.

Though the general course of nature is the same in this respect in flies and butterflies, yet the means and manner of it are different; the butterfly makes its coat for this Transformation; the fly-worms of many kinds have only a shell of their own proper skin to undergo this change in.

All the fly-worms of the first and second, and many of those of the third class, have their case thus made only of their own skin; the different species afford indeed some varieties in the manner of this, but a general idea of the work may be had from observing the worm or maggot of the common flesh-fly in its several stages.

When this creature has arrived at its full growth, it finds it not convenient any longer to remain among the food it has till then lived upon; it quits it and now goes in search of a place where it may wait for its metamorphosis. To this purpose it creeps into the earth, where it remains two or three days without any change; at the end of this time, instead of its pointed figure, its white colour, and soft fleshy substance, it acquires the figure of an egg, and becomes of a chesnut colour, or somewhat reddish, and looks opake and crustaceous: it is in this state perfectly stiff, and destitute of motion, and the creature seems not only to have lost its form, but wholly to have lost its life also.

This however is not the case; all that is done, is that the creature has absolutely quitted its skin, which is now become hard and of a determinate figure, and is within it compleating all its changes. *Reamur's Hist. of Insects.*

TRA'NSUM, in gunnery, is a piece of wood which goes a-cross the cheeks of a gun-carriage, or of a gun, to keep them fixed together; each Transum in a carriage is strengthened by a bolt of iron.

TRAPE'ZIUM, in geometry, a plain figure contained under unequal right lines.

TRA'VERSE-*table*, in navigation, is the same with the table of difference of latitude and departure; being only the difference of latitude and departure ready calculated to every degree, point, half-point, and quarter-point of the quadrant; and for any distance under a hundred miles, though it may conveniently serve for more.

This table is one of the most necessary things a navigator has occasion for; for by it he can readily reduce all his courses and distances, run in the space of twenty-four hours, into one course and distance; whence the latitude he is in, and his departure from the meridian, may be found.

TREME'LLA, *laver*, in botany, the name of a genus of small and seemingly imperfect plants, the characters of which are these: they are a kind of plants seemingly of a sort of middle nature between the alga and conferva. These produce no flower, nor seed, so far as has been yet observed, but are throughout of one uniform and tender texture, pellucid and membranaceous, and frequently gelatinous; they, for the most part, live in the water, and consist of flat and plain leaves, often very broad, and sometimes tubular. *Dillen's Hist. Musc.*

TREE.—Heat is so essential to the growth of Trees, that we see them grow larger and smaller in a sort of gradation as the climates in which they stand are more or less hot. The hottest countries yield in general the largest and tallest trees, and those also in much greater beauty and variety than the colder do; and even those plants which are common to both arrive at a much greater bulk in the southern, than in the northern climates; nay, there are some regions so bleak and chill, that they raise no vegetables at all to any considerable height. Greenland, Iceland, and the like places, afford no trees at all; and what shrubs grow in them are always little and low. In the warmer climates, where Trees grow to a moderate size, any accidental diminution of the common heat is found very greatly to impede vegetation; and, even in England, the cold summers we sometimes have, give us an evident proof of this; for though the corn and low plants have succeeded well enough, and goosberries, currants, raspberries, and other low shrubs, have brought forth fruit in sufficient plenty, yet the production of taller Trees has been found very much hurt; and walnuts, apples, and pears, have been very scarce among us.

Heat is heat, be it from what cause it will, and acts as well upon vegetation one way as another. Thus the heat of dung, and the artificial heat of coal fires in stoves, is found to supply the place of the sun.

Great numbers of the Indian Trees in their native soil flower twice in a year, and some flower and bear ripe fruit all the year round; and it is observed of these last, that they are at once the most frequent and most useful to the inhabitants; their fruit, which hang always on them in readiness, containing cool juices, which are good in fevers, and other of the common diseases of that hot country.

Plantations of useful Trees might be made to very great advantage in many places in every country, and the country greatly enriched by it, while the public would be also benefitted by it, since it would raise a continual supply of timber used in ship-building, and on other public as well as private occasions.

We have, in many places, heaths, and other barren and uncultivated lands, of very great extent; and how great an advantage would it be to the public to bring these to be truly valuable? Many, if not all of these heaths, would be found on trial capable of producing Trees; and some of them are truly the remains of destroyed forests; and, though the profits to be reaped from the planting these would come late, yet the expence of doing it would be very trifling in comparison of that profit, and the means easy.

The authors who have given rules for planting, having employed themselves only about small spots of ground, the establishing orchards, or parks, are by no means to be supposed proper guides in attempts of this kind; and Monsieur de Buffon, who had a great opinion of the knowledge of our Evelyn and Miller, who seem to speak of every thing from their own experience, found, when he set about large plantations, that their opinions and rules were erroneous; and was obliged to have recourse to experiments only; which he varied a thousand ways: and, though many of them proved unsuccessful, yet they all gave hints towards others, by which the attempt might afterwards be brought to succeed.

This sagacious enquirer into the operations of nature in the growth of vegetables, having set apart a considerable quantity of land for the trial, and procured a number of young Trees, first divided the whole quantity into a number of small squares, and, having made a plan of it, examined the nature, depth, and other circumstances of the soil in each, and minuted the whole down on a proper part of the plan: that himself or whoever succeeded him might judge, from the different growths of a number of Trees planted in the same state in the different soils, the different advantages and disadvantages of every circumstance in the depth and nature of the ground, in regard to the growth of useful Trees. Different numbers of labourers were employed about different spots of this ground, and the acorns for the young growth planted at different seasons; but the result in general was, that what should seem the best methods succeeded the worst; and those pieces where many labourers were employed, and the acorns planted before winter, were much thinner of young oaks, than those where the least labour had been bestowed upon the ground, and where the acorns had been planted in the spring; but those places which succeeded best from the sowing, were those which had the acorns planted in holes made by a pickax, without any preceding culture of the ground. And those where the acorns had only been laid upon the earth, under the grass, afforded a great number of vigorous young Trees, though the greater part had been carried away by birds, and other devouring animals. Those spots of ground where the acorns were set six inches deep, were much worse furnished with young shoots, than those where they had been buried but at an inch deep; and in some places where they were buried at a foot deep not one shoot appeared, though in others where they had been buried at nine inches there were many.

Those acorns which had been steeped for eight or nine days in wine lees, and in the water of the common sewers, appeared out of the ground much earlier than those which were put in without this previous management.

But the most succesful of all the trials was that of planting in the spring such acorns as had been sown together in another place, and had time to shoot there; of these scarce any failed, and the plantation was perfectly flourishing, though the growth of these young shoots was not so quick and vigorous as those

of

of the acorns which had remained, when firſt ſown; which was probably owing to the injury the tender radicles received in tranſplanting.

Thus ſucceeded the experiments by ſowing, while, of thoſe made by planting young Trees, ſuch as had been brought out of woods, and places under covert, ſucceeded much worſe than thoſe which had grown in more expoſed places.

The young Trees of the ſeveral parts of the plantation kept on their growth in the manner they had begun to ſhoot, thoſe of the more laboured parts continuing more weak, and lower than thoſe of the leſs laboured.

Thus were a number of neceſſary experiments carefully tried, and the reſult of the whole was, that to make a plantation of oaks, on a ſoil of the common clayey or loamy kind, the moſt ſucceſsful method is this: the acorns muſt be preſerved during the winter in the earth in this manner: let there be made a bed of earth ſix inches deep, on this place a layer of acorns two inches deep, over theſe lay a bed of another half foot of earth, over that another layer of acorns, and ſo on ſucceſſively, till as many are employed as there will be occaſion for; the whole is then to be covered with a foot depth of earth, to preſerve all from the froſt. In the beginning of March, theſe beds are to be opened, and the acorns which will by that time have ſhot out, and are then in reality ſo many young oaks, are to be planted out at a foot diſtance each, and the ſucceſs of a plantation of this kind need not be feared. This is a manner of planting that is done at a ſmall expence, and even that might be in a great meaſure ſpared, were it not for the birds and other devouring animals; ſince, could the acorns be defended from theſe, they might be only laid on the ſurface of the ground under the graſs in autumn, and they would infallibly ſhew themſelves in ſo many young oaks the ſucceeding ſpring.

It is eaſy to continue the carrying the acorns, when taken out of their winter's bed, to the place where they are to be planted, without doing them much injury; and the ſmall ſtop the tranſplanting puts to their growth, is in reality rather an advantage than an injury; ſince it only retards the young ſhoots for about three weeks, or leſs than that: and by that means ſecures them from the few cold mornings that may be expected about the time of their natural appearance.

TRE'NCHING-*plough*, in huſbandry, the name of an inſtrument uſed to cut out the trenches, drains, and carriages, in meadow and paſture ground. It is alſo uſed for cutting the ſides of turf even, which are to be laid down again, either in the ſame, or in ſome other places.

It conſiſts of a long handle, with a knob or button at the end, and at the other end it turns upwards like the foot of a plough, to ſlide in the ground. In this part is placed a coulter of the length proportioned to the depth to the cut, and with a ſharp edge: this has two wheels to make it run eaſy, and does a great deal of buſineſs in a little time. *Mortimer's Huſbandry.*

TRIA'NDRIA *, in botany, a claſs of plants which have hermaphrodite flowers, with three ſtamina or male parts in each.

* The word is derived from the Greek τρεῖς, three, and ἀνὴρ, male. Of this claſs of plants are the valerian, ſaffron, a great many of the graſſes, &c. See *plate* XL. *fig.* 3.

TRIANGLE (*Dict.*) — Plutarch informs us, that Xenocrates the philoſopher reſembled the Deity to an equilateral Triangle, the genii to an Iſoſceles, and men to a ſcalenum. A Triangle has been ſince applied by Chriſtians to repreſent the Trinity, ſometimes ſingle, and at other times with additional lines, expreſſing a croſs. Thus we find them variouſly combined upon the medals of the popes publiſhed by Bonanni. And nothing was more frequent formerly with printers than to place theſe figures in the front of their books; at firſt, doubtleſs, with a religious intent, till at length, by common uſe, they became only preſs marks, and badges of diſtinction among the trade; as they now are with merchants, who mark their goods with them both here and abroad. *Phil. Tranſ.* N°. 474.

TRICHE'RIÆ *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the fibrariæ, the characters of which are, that they are not elaſtic, and are compoſed of ſtraight and continuous filaments.

* The word is derived from the Greek τρίχες, capillaments or fibres.

TRICHE'STRUM *, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but differing extremely in figure and ſtructure from the common kinds.

* The word is derived from the Greek τρίχες, hairs or filaments, and ἀστὴρ, a ſtar; and expreſſes a ſet of bodies compoſed of filaments arranged into the form of a ſtar.

The ſelenitæ of this genus are compoſed of filaments ſcarce any where viſibly arranged into plates or ſcales, but diſpoſed in form of a radiated ſtar, made of a number of disjunct ſtriæ. *Hill's Hiſt. of Foſſ.*

TRIEDRO'STYLA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek τρὶς, thrice, ἕδρα, a ſide, and στῦλος, a column.

The bodies of this genus are ſpars, in form of trigonal columns, adhering by one end to ſome ſolid body, and terminated at the other by a trigonal pyramid.

TRIE'MERUS, *the three-day fly*, in natural hiſtory, a fly ſomewhat like the butterfly; it has four large yellowiſh wings, and a long body, with a head furniſhed with long antennæ, large eyes, and a ſpiral trunk. It is found among the nettles and mallows.

TRIEXAHÆ'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek τρὶς, thrice, ἓξ, ſix, and ἕδρα, a ſide.

The bodies of this genus, are perfect, and pellucid cryſtalliform ſpars, conſiſting of thrice ſix planes, being compoſed of an hexangular column, terminated at each end by an hexangular pyramid.

TRIFO'LIUM, *trefoil*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of a papilionaceous kind: the piſtil which ariſes from the cup finally becomes a capſule, which remains covered with the cup, and uſually contains kidney-ſhaped ſeeds. To this it is to be added, that the leaves grow three on every ſtalk; though there are ſome inſtances of theſe plants truly of this genus, which have four or five on the ſtalk. See CLOVER.

TRIGONO'METRY (*Dict.*)—In ſolving the firſt caſe of oblique-angled plane triangles, the proportion is, as any one ſide is to the ſine of its oppoſite angle, ſo is any other ſide to the ſine of its oppoſite angle.

For take A *b* = C B (*plate* LVII. *fig.* 8. in the Dictionary) and upon A C let fall the perpendiculars B D, *b d*; which will be the ſines of the angles A and C, to the equal radii A *b*, C B. Now the triangles A B D, A *b d*, being ſimilar, we have as A B : B D (ſine of the angle C) :: A *b* (B C) : *a b* (ſine of the angle A.)—Alſo, in caſe 4, the proportion is, as the ſum of any two ſides is to their difference, ſo is the tangent of half the ſum of the two oppoſite angles to the tangent of half their difference.

For let A B C (*plate* LVII. *fig.* 9. in the Dictionary) be the triangle, and A B and A C the two propoſed ſides; and from the center A, with the radius A B, let a ſemi-circle be deſcribed, interſecting C A produced, in D and F; ſo that C F may expreſs the ſum, and C D the difference, of the ſides A C and A B: join F, B, and B, D, and draw D E parallel to F B, meeting B C in E.

Then, becauſe 2 A D B = A D B + A B D = C + A B C, it is plain that A D B is equal to half the ſum of the angles oppoſite to the ſides propoſed. Moreover, ſince A B C = A B D (A D B) + D B C, and C = A D B — D B C, it is plain that A B C — C is = 2 D B C; or that D B C is equal to half the difference of the ſame angles.

Now, becauſe of the parallel lines B F and E D, it will be C F : C D :: B F : D E; but B F and D E, becauſe D B F and B D E are right angles, will be tangents of the foreſaid angles F D B (A D B) and D B E (D B C) to the radius B D.—Likewiſe, in caſe 6, the proportion is, as the baſe is to the ſum of the other two ſides, ſo is their difference to the difference of the ſegments of the baſe.

For, let A B C (*plate* LVII. *fig.* 13. in the Dictionary) be the triangle; then on B as a center, with the radius B C deſcribe the circle C D E F, produce A B to D, draw the right-line B F, and let fall the perpendicular B G. Then, becauſe B is the center of the circle C D E F, therefore B E, B C, and B D are equal, and A D = A B + B C, and A E = A D — B C; and, becauſe the point A is without the circle, A C × A F = A D × A E (*by* 36 *of Euc.* 3.) which, being turned into an analogy, will be, as A C : A D :: A E : A F. Which was to be proved.

The meaſure of a ſpherical angle C A D (*plate* LVII. *fig.* 11. in the Dictionary) is an arch of a great circle intercepted by the two circles A C B, A D B, forming that angle, and whoſe pole is the angular point A. For let the diameter A B be the interſection of the great circles A D B and A C B, and let the plane, or great-circle D E C, be conceived perpendicular to that diameter, interſecting the ſurface of the ſphere in the arch C D; then it is manifeſt that A D = B D = 90°, and A C = B C = 90°, and that C D is the meaſure of the angle D E C (or C A D) the inclination of the two propoſed circles.

The firſt theorem for the ſolution of right-angled ſpherical triangles in the Dictionary may be thus demonſtrated:

Let A D L and A E L (*plate* LVII. *fig.* 10. in the Dictionary) be two great circles of the ſphere interſecting each other in the diameter A L, making an angle D O E, meaſured by the arch E D; the plane D O E being ſuppoſed perpendicular to the diameter A L, at the center O.

Let A B be the baſe of the propoſed triangle, B C the perpendicular, A C the hypothenuſe, and B A C (or D A E = D E = D O E) the angle at the baſe: moreover, let C G be the ſine of the hypothenuſe, A K is tangent, A I the tangent of the baſe, C H the ſine of the perpendicular, and E F the ſine of the angle at the baſe; and let I, K, and G, H, be joined.

Becauſe C H is perpendicular to the plane of the baſe (or paper) it is evident, that the plane G H C will be perpendicular to the plane of the baſe, and likewiſe perpendicular to the diameter A L, becauſe G C, being the ſine of A C, is perpendicular to A L. Moreover, ſince both the planes O I K and A I K are perpendicular to the plane of the baſe (or paper) their interſection

tion I K will alſo be perpendicular to it, and conſequently the angle A I K a right angle. Therefore, ſeeing the angles O F E, G H C, and A I K, are all right angles, and that the planes of the three triangles O F E, G H C, and A I K are all perpendicular to the diameter A L, we ſhall, by ſimilar triangles,

have { O E : E F : : G C : C H
{ O E : O F : : A K : A I }

that is, { Radius : ſine of E O F or (B A C) : : ſine of A C : ſine of B C.
{ Radius : co-ſine of E O F (or B A C) : : tang. A C : tang. A B. *Q. E. D.*

Hence it follows that the ſines of the angles of any oblique ſpherical triangle A D C are to one another, directly, as the ſines of the oppoſite ſides.

In the Philoſophical Tranſactions, Vol. XLVII. p. 441, & ſeq. the learned Francis Blake, eſq; F. R. S. has given us the following method of reducing ſpherical Trigonometry to plane.

It is obſervable, that the analogies of ſpherical Trigonometry, excluſive of the terms co-ſine and co-tangent, are applicable to plane, by only changing the expreſſion, ſine or tangent of ſide, into the ſingle word, ſide, ſo that the buſineſs of plane Trigonometry, like a corollary to the other, is thence to be inferred. And the reaſon of this is obvious; for analogies raiſed not only from the conſideration of a triangular figure, but the curvature alſo, are of conſequence more general; and, though the latter ſhould be held evaneſcent by a diminution of the ſurface, yet what depends upon the triangle, will nevertheleſs remain. Theſe things may have been obſerved, I ſay; but, upon reviſing the ſubject, it further occurred to me, and I take it to be new, that from the axioms of only plane Trigonometry, and almoſt independent of ſolids, and the doctrine of the ſphere, the ſpherical caſes are likewiſe to be ſolved.

Suppoſe, firſt, that the three ſides of a ſpherical triangle, *a b d* (*plate* XLI. *fig.* 5.) are given to find an angle, *a*; which caſe will lay open the method, and lead on to the other caſes, in a way, that to me appears the moſt natural. It is allowed, that the tangents, *a e*, *a f*, of the ſides, *a d*, *a b*, including an angle, *a*, make a plane angle equal to it; and it is evident, that the other ſide, *d b*, determines the angle made by the ſecants *c e*, *c f*, at *c* the center of the ſphere; whence the diſtance, *e f*, between the tops of thoſe ſecants, is given by caſe the fifth of oblique plane triangles (ſee Heynes's Trigonometry) which, with the aforeſaid tangents, reduces it to caſe the ſixth of oblique plane triangles alſo: and thus this eleventh caſe of oblique triangles, ſo intricate hitherto, becomes perfectly eaſy. The twelfth caſe is reducible to the eleventh, and the reſt, whether right-angled, or oblique, we are authoriſed to look upon as reducible to right-angled triangles, whoſe ſides are not quadrants, but either greater or leſs than ſuch. Conceive therefore, now, in a right-angled ſpherical triangle, *g k b* (*fig.* 7.) that the tangent, *g m*, and ſecant, *c m*, of either leg, *g k*, is already drawn; and in the point, *m*, of their union, draw a perpendicular, *m l*, to *c m*, the ſecant, directly above the other leg, viz. a perpendicular to the plane of the ſecant and tangent, that it may be perpendicular to both (Eucl. 4. 11.) for then will the tangent, *g l*, of the hypothenuſe, *g b*, drawn from the ſame point, which that of the leg was, conſtantly terminate in the perpendicular line, that the radius and tangent may make a right angle (Eucl. 18. 3.) Whence theſe tangents, *g m*, *g l*, and the perpendicular line, *m l*, together with the ſecants, *c m*, *c l*, will evidently form two right-angled plane triangles, *g m l*, *c m l*; and to one or other of theſe the ſpherical caſes are eaſily transferred. Thus, if in the ſpherical triangle, *g k b*, the hypothenuſe, *g b*, baſe, *g k*, and angle, *g*, at the baſe, be the parts given and required, when any two are given, the third may be determined by means of a plane triangle, and at a ſingle operation. We have, for inſtance, in the right-angled plane triangle, *g m l*, formed as above, the baſe, *g m*, and hypothenuſe, *g l*, to find, by caſe the fifth of right-angled plane triangles, the angle included, which is the ſame as on the ſphere. And then, if the baſe, *g k*, the angle, *g*, at the baſe, and perpendicular, *k b*, be the ſpherical parts given and required; or, if the angles, *g* and *b*, and the hypothenuſe, *g b*, be the parts given and required; we have only that former proportion of the hypothenuſe and baſe, and angle at the baſe, in the triangles, P N D, D F G, (*fig.* 6.) obtained by the complements, to transfer to the plane. But, ſecondly, ſuppoſe the ſpherical proportion is of the three ſides, any two being given, the third may be alſo found at a ſingle operation, in the ſecond right-angled plane triangle, *c m l*, formed as above. We have, for inſtance, the hypothenuſe and baſe, *c l*, *c m*, viz. the ſecant of the ſpherical hypothenuſe and baſe *g b*, *g k*, to find, by the fifth of right-angled plane triangles, the angle, *c*, at the center, which is the meaſure of *k b*, the ſide that was ſought. And then again, if the hypothenuſe, one leg, and the oppoſite angle be the ſpherical parts given and required; or, if the two angles and a leg be the parts given and required; we have only the former proportion of the three ſides in the triangles, P N D, D F G, obtained by the complements, to transfer to the plane. Whence, the ſix proportions of right-angled ſpherical triangles being comprehended in this method, it is fully demonſtrated, that all the caſes of theſe triangles are ſo to be reſolved.

The ſame might be deduced without the method of complements, but neither in ſo ſhort nor ſatisfactory a way, and it ſhall therefore be omitted. I have communicated this upon account of its perſpicuity, and ſuppoſing, that in an age ſo greatly advanced in mathematical learning, the leaſt hint of what is new would not be unacceptable.

TRILL-*hooks*, thoſe uſed to hold the ſides of a cart up to the horſe.

TRILLE'TO, in the Italian muſic, a little ſhort ſhake or quaver; it differs from trillo, only in point of continuance being its diminutive.

TRI'LLO, in the Italian muſic, is often found marked with a ſingle T, or tr, and often alſo by a ſmall t, as well in vocal as inſtrumental parts. It is deſigned to intimate, that you beat quick upon two notes in conjoint degrees, as *e f*, or *d e* alternately; beginning with the higheſt, and ending with the loweſt.

TRI'NGA, in the Linnæan ſyſtem of zoology, the name of a diſtinct genus of birds, of the order of the ſcolopaces: the diſtinguiſhing character of this are, that the feet have each four toes, and the beak is ſhorter than the toes. *Linnæi Syſtema Naturæ.*

TRINGA *minor*, in zoology, a name by which ſome authors called the bird commonly known in England by the name of the ſandpiper.

TRIPENTAHE'DRIA *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek, τρὶς, thrice, πέντε, five and ἕδρα, a ſide.

The bodies of this genus are ſpars compoſed of thrice five planes; being made of a pentangular column, terminated at each end by a pentangular pyramid. Of this genus we only know one ſpecies; this has a moderately long column, and very ſhort and broad pyramids; it is found in Derbyſhire, Yorkſhire, and Cornwall, and is very frequent about Goſſelaer in Saxony. *Hill's Hiſt. of Foſſ.*

TRI'POLI (*Dict.*)—The yellowiſh white kind is called by authors alana gleba, tripolis, and terra tripolitana; this is the produce of Germany, Saxony, and France; there is alſo ſome of it in the neighbourhood of Venice, but it is found in greateſt plenty in many parts of Africa. It is a dry hard earth, of a very pale yellowiſh white, of a firm texture, and moderately heavy; it is ſometimes found of itſelf, conſtituting a ſtratum; but is more frequently met with in detached pieces among ſtrata of other matter. It is of a rough, irregular, duſty ſurface; it adheres ſlightly to the tongue, is dry, hard, and harſh to the touch, is not to be broken between the fingers, and ſlightly ſtains the hands: it makes no efferveſcence with aqua fortis, and makes a ſlight hiſſing noiſe on being thrown into water. The reddiſh Tripoli is of our own production, though not peculiar to ourſelves; it is found in great abundance on Mendip-hills in Somerſetſhire, nor leſs plentifully in many parts of Germany. This is well known in the ſhops as a ſubſtance of great uſe in poliſhing braſs, but is not applied to any of the other uſes of the yellowiſh kind: this, like the former, is moſt frequently found in detached maſſes, and, while in the earth, is tolerably ſoft, and eaſily falls into flakes. When dry, it becomes of a conſiderable hardneſs; and is of a fine pale reddiſh white, of a looſe open texture, compoſed of a multitude of extremely thin plates or flakes laid evenly on one another, and conſiderably heavy; it is of a ſmooth and ſomewhat gloſſy ſurface; it adheres very firmly to the tongue, is dry and harſh to the touch, too hard to be broken between the fingers, and does not ſtain the hands: it makes no efferveſcence with acids, and burns to a paler colour, with ſome additional hardneſs. *Hill's Hiſt. of Foſſ.*

TRIPYRAMI'DES *, in natural hiſtory, the name of a genus of ſpars.

* The word is derived from the Greek, τρὶς, thrice, and πυραμὶς, a pyramid.

The bodies of this genus are ſpars, compoſed of ſingle pyramids, each of three ſides, ſtanding on no column, but affixed by their baſes to ſome ſolid body.

TRO'CHUS, in natural hiſtory, the name given by authors to a genus of ſhells; ſome of the ſpecies of which reſemble the figure of the Trochus, or top which boys play with. As there are many ſpecies of this ſhell, however, which are flatted and have nothing of this form, the whole ſeries are much better named, by a denomination taken from the ſhape of the mouth, which is of an oval figure, and is alike in all theſe ſpecies, and different from all other ſhells. They are therefore aptly charactered by a late French writer under the name of cochleæ ore depreſſo.

TROIS-*cinque*, in French diſtillery, a term uſed to expreſs their brandy when of a peculiar ſtrength, conſiſting of five parts alcohol, and three parts phlegm.

The method of diſtilling the wines into brandy, in France, is exactly the ſame with that uſed with us to draw the ſpirit from our waſh or fermented liquor of malt, treacle, ſugar, or whatever other kind. They only obſerve more particularly to throw a little of the natural lee into the ſtill, along with the wine; and the pooreſt wines are found to ſucceed beſt on the trial, making by much the fineſt brandies. We are apt to wonder, that we cannot from the wines of particular countries diſtil their particular brandies; but the whole myſtery conſiſts in this, that they do not ſend us over the ſame wines which they uſe in diſtilling, becauſe theſe latter would not be liked as wines, nor would keep in the bringing over. Sometimes, in Scotland, they meet with the poor and pricked wines, the ſame that the French diſtil their brandies from; and from theſe they diſtil a ſpirit, not to be known from the brandy diſtilled in France.

The lee, which the French add in the diſtillation, gives the brandy that high flavour for which we ſo much eſteem it; but they themſelves like it much the worſe for it. The French notion of a proof ſtrength, determined by the chaplet or crown of bubbles, is the ſame with ours; and all their fine ſpirits are found of this ſtrength.

But they have one particular expedient for thoſe brandies which prove foul and feedy, or retain the taſte of certain weeds which grow among the wines; they draw them over again, with a deſign to free them from that adventitious flavour. In this operation they always leave out the faints, or rather they change the receiver as ſoon as ever the ſtream comes proof; then mixing together all that run off before, they make a brandy ſtronger than the ordinary kind, and this is what they call Trois-cinque.

The diſtillers in France ſcarce ever bring their brandies higher than this; for they have the art to perſuade the foreign merchant, that the phlegm of French brandy is natural and eſſential to it: but the truth is, that the ſpirit alone contains the flavour and excellence of the brandy, and it might as well be reduced to half its bulk for exportation, and ſent over in the ſtate of alcohol, and then lowered with common water, to the proof ſtrength.

The French uſe no art in colouring their Trois-cinque, any more than their common proof-brandy, nor do they add any thing to give them an additional flavour. The thing which they principally value themſelves upon, both in regard to brandies and wines, being to make them perfectly natural: ſo that all the colour we find in their brandies, is acquired from the caſk, and the time they are left in it. This is often twelve or eighteen months, ſometimes two or three years; in this time they acquire a brown colour, and loſe their acrid taſte.

The greateſt adulteration of brandies is in England; the French have no temptation to do it, they having no cheaper ſpirit, ſince the prohibition of moloſſes in their country. The Dutch are in the ſame condition, having no moloſſes ſpirit; and only a very coarſe and nauſeous ſugar-ſpirit, and yet a worſe malt-ſpirit of their own manufacture; a ſingle gallon of which would ſpoil a whole piece of brandy. The French brandy alſo, paying no duty in Holland, is as cheap, or nearly ſo, there, as in France itſelf. The duties being high upon brandy, it is greatly adulterated, and that with all ſorts of ſpirits, &c. as malt, moloſſes, cyder, and ſugar-ſpirits; and, when this is done in a dexterous and ſparing manner, the cheat is not eaſily found out. *Shaw's Eſſay on Diſtillery.*

TRO'PHY, in architecture, an ornament which repreſents the trunk of a tree, charged or encompaſſed all round about with arms or military weapons, both offenſive and defenſive.

TROUT, a very valuable river-fiſh, the diſtinguiſhing characters of which are theſe: its body is long; its head ſhort and roundiſh; the end of its noſe or ſnout obtuſe and blunt; its tail is very broad; its mouth large; and each jaw furniſhed with one row of ſharp teeth; and in its palate there are three parcels of teeth, each of an oblong figure in the congeries, and all meeting in an angle near the end of the noſe; and the tongue has ſix, eight, or ten teeth alſo on it, and its ſides are beautifully variegated with red ſpots.

This delicious fiſh is obſerved to come in and go out of ſeaſon with the ſtag and buck; the time of its ſpawning is remarkable: moſt other fiſh do this in warm weather, but the Trout in October or November. Among the ſeveral kinds of Trout the red and the yellow are the beſt for the table; and, in the ſame ſpecies, the female has always the preference to the male; the head of the female is ſmaller, and the body deeper than in the male. They are known to be in ſeaſon by the bright colour of their ſpots, and by the largeneſs and thickneſs of their backs; which laſt is a general rule in regard to all fiſh, to know when they are in ſeaſon.

In winter the Trout is ſick, lean and unwholeſome, and very often is louſy. The louſe, as it is called, of the Trout, is a ſmall worm with a large head, which ſticks very faſt to the ſides of the fiſh; they live upon the juices of the fiſh all the time of the cold weather, while he is poor and lies quiet in the deep waters; but when the warm weather in the ſpring comes on, and the fiſh leaves his lazy life at the bottom, and comes up to the ſhallow gravelly places, where the ſtream is ſwift, he ſoon ſhakes them off.

The Trout, at his firſt coming into the ſhallow waters, may be ſeen to rub his body continually upon the ſharp gravel at the bottom; it is by this means he gets off theſe worms or lice, as they are called. From this time he begins to feed on flies; but, in May, the peculiar fly that he is fond of is produced, and, after feeding that whole month on this inſect, the fleſh of the fiſh becomes more red and firm, and its higheſt ſeaſon begins.

The general baits for a Trout, are a worm, a minnow, or a fly, whether natural or artificial: among worms, there are ſeveral kinds which this fiſh is fond of; ſuch are the earth-worm and dung-worm in particular; the lob-worm and brandling-worm are alſo eſteemed: but the beſt of all is the ſquirrel-tail-worm, which has a ſtreak down the back, a red head, and a broad tail. The brandling is commonly found in an old dung-hill, or under cow-dung, or elſe among tanners bark; the others are found in the earth, and under large ſtones or ſtumps of trees: whatever worm is uſed, the longer it is kept to ſcower firſt, the better the Trout will take it: they are to be kept in an earthen pot among moſs, which is to be ſhifted once in three or four days, or oftener, if the weather be very hot.

To take the Trout with a ground-bait, the angler ſhould have a light taper rod, with a tender hazel top; and may angle with a ſingle hair of three links, the one tied to the other, for the bottom of the line; and a line of three-haired links for the upper part: with this ſort of tackle, if the ſportſman have room enough, he will take the largeſt Trout in the river. Some fiſh with three-haired links at the bottom of the line, but there is very little ſport to be expected this way, for the Trout is very ſuſpicious, and very quick-ſighted. The angler muſt always keep out of ſight, and the point of the rod muſt be down the ſtream. The ſeaſon for fiſhing for the Trout with a ground-bait begins in March, and the mornings and evenings in general are the beſt times; but, if the weather be cloudy, the ſport may be followed all day long: there muſt be a plummet at ten inches from the hook, which the angler muſt feel always touching the ground, and this muſt be heavier, the ſwifter the ſtream is. The common worm is a good bait.

The minnow is a very good bait for the Trout, and with this the tackle need not be ſo ſlight, for the Trout will make at this bait with leſs conſideration, and ſeize it as ſoon as it comes in ſight; the upper part of the line with this bait may be of three ſilks and three hairs for the upper part, and two ſilks and two hairs for the lower; and the hook may be moderately large. The whiteſt minnows and thoſe of the middle ſize are the beſt bait for the Trout, and they ſhould be ſo fixed on the hook, as to turn round when they are drawn up againſt the ſtream.

The beſt way of baiting this fiſh is to put the hook in at the mouth and out at the gills, then drawing it through about three inches, to put it again in its mouth, and let the point and beard come out at the tail, and then to tie the hook and his tail with a fine white thread, letting the body of the minnow be almoſt ſtraight down to the hook; by this means it will turn, as it is pulled againſt the ſtream; and, the more and quicker it turns, the better: for want of a minnow, a ſmall loach or a ſtickleback will ſerve.

The moſt agreeable manner of fiſhing for Trout is, however, with the fly, when the ſportſman has found the true method of doing it; the rod in this caſe muſt be light and pliable, and the line long and fine; if one hair be ſtrong enough, as it may be made, by proper ſkill in the angler, there will be more fiſh caught, than where a thicker line is uſed; and the fly-fiſher ſhould have the wind at his back, and the ſun before him.

TRU'MPET-*flower, bignonia*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is compoſed of only one leaf, of a tubular form, wide open at the mouth, and ſeeming as if bilabiated: from the flower-cup ariſes a piſtil, which is fixed in the manner of a nail to the hinder part of the flower; this afterwards becomes a fruit or pod, divided into two cells by a longitudinal membrane, and containing flatted and uſually alated ſeeds.

TRU'MPET-*ſhell, buccinum.* See the article BUCCINUM.

TRU'MPETER, in zoology, a name given in England, to a particular ſpecies of pigeon, called by Moore the columba tibicen.

This ſpecies is of the middle ſize of the common pigeon, and made conſiderably like it; but it is pearly-eyed; is of a mottled black, and is feathered down to the legs and feet, and is turn-crowned like the nun, and ſome of the other ſpecies; ſometimes like the finnikin, but much larger: this ſeems to be the beſt ſort, as being the moſt melodious. The beſt character, to know them by, is a tuft of feathers growing at the root of the beak; and, the larger this tuft is, the more they are eſteemed. The reaſon of their name is, that they imitate in their cooing the ſound of the trumpet; but, to be often entertained with their melody, it is neceſſary to feed them frequently with hemp-ſeed. *Moore's Columbarium.*

TSIN, in natural hiſtory, the name given by the Chineſe to a ſtone which they make great uſe of in their manufacture of porcelain ware. It is of a deep blue colour, much reſembling Roman vitriol in appearance, and is found in lead mines, and ſuppoſed to contain ſome particles of lead; its effects being the ſame in the porcelain manufacture as thoſe of ceruſs or white lead, in making the other colours penetrate into the ſubſtance of the veſſels. The deep violet colour that we ſee

ſo

so beautiful on the China ware, is usually made with this stone. They find it about Canton and Peking; but the latter place affords the best, and it sells at greatly the best price. The painters in enamel melt this stone in their way, and use it very much; they form many beautiful works by laying it upon silver; but it is apt to come off in time.

When the Tsin is used in the porcelain manufacture, it it only used to the vases that pass a second baking, and are intended as the best kinds.

The Tsin is prepared by only beating it to powder, not roasting it in the common way. They mix the powder with large quantities of water; and, stirring it together, they let it subside a little to separate any earthy or extraneous matter that might be among it. They then let the powder subside. The water which is thrown away has no colour from this matter; and the powder itself is not of that fine blue it was in the lump, but of a pale ash-colour; but this recovers all its beauty, when it is laid on the China and baked.

The settlement taken from the water is dried and preserved in powder, and, when it is to be used, they only mix it up with gum-water, or a solution of glue, and lay it on with a pencil. *Observations sur les Coutumes de l'Asie.*

TU'BBER, or TUBBLE, in mining, a name given in Cornwall to that mining instrument, which is in other parts of England called a beele.

It is an iron instrument, pointed at each end, and having a hole in the middle for the handle.

TU'BEROUS, or TUBEROSE *roots*, among the botanists, such as are large and fleshy, thicker than the stalk of the plant, of an irregular figure, and wanting the characters of the bulbous.

TU'BERA, *truffles*, in botany, the name of a genus of plants, the characters of which are these: they are of a fungous fleshy structure, and are of a roundish figure, growing sometimes single, sometimes many together, and always remaining under ground. See TRUFFLE in the Dictionary.

TU'BULATED *Flower*, *tubulatus flosculus*, in botany, a term used by authors to express those smaller flowers, a great number of which go to compose one large compound flower. These are called Tubulated in distinction from another kind of them, which are, from their shape, called ligulated. The Tubulated floscules generally compose the disk, and the ligulated ones the radius of the compound flowers. The Tubulated ones are formed into a hollow cylinder, which expands into a mouth at the top, and is divided into five equal segments, which stand expanded, and in some measure bent backwards.

TU'BULUS *marinus*, or *canalis*, in natural history, the name of a genus of univalve shell-fish, the characters of which are these: it is of an oblong figure, terminating in a point, and hollow within; so that it resembles a tube of horn. They are also called by the older writers dentalia, for their resembling the tooth of a dog.

TUCK *of a ship*, the trussing or gathering up the quarter under water; which, if she lie deep, makes her have a broad, or, as they call it, fat quarter, and hinders her steering, by keeping the water from passing swiftly to her rudder; and, if this trussing lie too high above the water, she will want bearing for her works, unless her quarter be very well laid out.

TU'GUS, in botany, the name of a sweet aromatic plant, much esteemed in the eastern parts of the world, and supposed by father Camelli, who very strictly compared it with the accounts given by Dioscorides and the antients of their amomum, to be that very plant. The clustered manner of growing of the fruit, together with its oblong shape, and the aromatic taste of the seeds, seem greatly to countenance this opinion.

TU'LIP, *tulipa*, in botany, a large genus of plants, the characters of which are these: the flower is of the liliaceous kind, and is composed of six leaves, and somewhat of the form of a pitcher; the pistil occupies the center of the flower, and finally becomes an oblong fruit divided into three cells, which contain flat seeds, arranged in a double order; the root is tunicated, and the fibres grow from its bottom. The characters of a good Tulip are these: 1. It must have a tall and strong stem. 2. The flower should consist of six leaves, three within and three without; and the former should be larger than the latter. 3. The bottom of the flower should be proportioned to the top, and the ends of the leaves should be rounded, not pointed. 4. The leaves, when opened, should neither turn inward, nor bend outward, but stand erect; and the whole flower should be of a middling size, neither too large nor too small. 5. The stripes must be small and regular, and should all arise from the bottom of the flower: the chives also should not be yellow, but of a brown colour.

Tulips are generally divided into three classes, according to their times of flowering; the early, the middling, and the late.

The early ones are not near so high as the late, but they are valued for their earliness, as they flower in February.

The roots of these are to be planted in the beginning of September, under a warm pale or hedge. The proper soil for them is pasture land with the turf rotted among it, and a mixture of one-fourth part sand; this should be laid about ten inches deep, and should be renewed every year. If the weather is very severe when they first appear, they should be covered with mats; as also at nights, when they are in flower, if it be very frosty. When their flowering is over, and their leaves decay, the roots should be taken up, and laid in a dry place, and afterwards cleaned and laid up in a safe place from vermin, till the September following.

The late blowers are propagated from what they call breeders, which are plain flowers, brought over principally from Flanders, which is the great mart for flower-roots; and these, by culture, are changed into striped and variegated ones. They are also propagated by sowing the seeds; but this requires great care, as in the raising all the other fine flowers from their seeds.

The seeds must be saved from the choicest flowers, and sowed in shallow pans or boxes of earth, in September. The spring following they appear like the leaves of grass or young onions, and after standing two or three months those decay. The boxes are to be kept clear of weeds, and removed to different situations where they may enjoy the morning sun, and be defended from sharp winds and frosts; at the Michaelmas of the following year they are to be removed out of the boxes into beds, where they should be planted two inches deep, and at two inches diameter from one another. In October, an inch depth of new earth should be sifted on them, and they are to remain two years in these beds; at the end of this time they will flower, and the best of them must be marked with sticks, that their roots may be distinguished, when the leaves are decayed.

But there is no judgment to be passed either on Tulips, or any other flowers, on their first flowering; because, the next year, the good ones are often found to have degenerated, and the bad to have improved: after this, however, they may be concluded good or bad.

The breeders, as they are called, being thus raised, are to be shifted every year into fresh earth, and they will in time break out into very fine stripes. The earth they are planted in should be every year of a different kind, and the best general soil is made of a third part pasture land with the grass rotted in it, a third part of fine sea-sand, and a third part of lime-rubbish; these should be mixed half a year before they are used, and often turned. The beds must be laid eighteen inches deep with this earth. This should be laid in first ten inches thick, and on this the roots should be placed in regular order and at even distances; and then the other eight inches should be laid over these, the top of the bed being a little rounded to throw off the wet. Thus they are to remain till the buds appear, and then, if the nights are very severe, they are to be sheltered by covering them with mats. The flowers which break out into fine stripes here, should be separated afterwards from the rest, and if they hold on their beauty to the last, which the florists call dying well, they will never return to plain flowers again; and the off-sets from the roots of these will always produce such flowers, and often more beautiful than those of the parent-root.

When the Tulips have flowered, their heads should be broken off to prevent their seeding, which would make them flower much the worse the next year. *Miller's Gard. Dict.*

TULIP-*tree*, a very beautiful American tree, which produces flowers, supposed like those of the Tulip. These trees used to be kept in tubs, and housed in winter with great care; but, some of them having been planted out in the open air at Lord Peterborough's at Fulham, they throve much better than those which were so carefully nursed up, and soon produced abundance of flowers.

The tree is commonly found wild in all the northern parts of America, where its timber is of very great use. The flowers are not in reality much like those of the Tulip, though vulgarly said to be so. The flowers are succeeded by cones, which are often sent over from America; and the trees are frequently raised, with us, from the seeds contained in them. The seeds must be taken out of the cones in the spring, and sown in pots of light earth, which must be placed in a bark bed, and covered with mats, and frequently refreshed with a little water. When the young plants appear, they should be placed, during summer, in a shady situation; and in winter they should be put into a frame, where they may have the benefit of the open air, in mild weather, and be sheltered from the severity of frosts. In the spring following, the plants should be transplanted into small pots, and taken the same care of for four years, as while they were in the seed-pots; after this they will be strong enough to transplant finally into the places where they are to remain: it should be planted on a light loamy soil, near other trees, but not overshaded by them. Some raise them from layers, but they are two or three years before they take good root, and then never make such straight and regular trees. *Miller's Gard. Dict.*

TU'MBLER, a name given to a particular species of pigeon, called by Moore the columba revolvens.

It has its name from its peculiar property of tumbling, when it is in the air, which they are very fond of doing; and effect, exactly in the same manner as our posture-masters do it, by throwing themselves over backwards. It is a very small pigeon, and is always short-bodied, full-breasted, thin-necked, narrow-beaked, and has a small short head; the iris of the eye, in this species, is usually of a bright pearl-colour.

The English Tumbler is usually of one plain colour; black, blue, or white: the Dutch is much of the same make, but has different colours, and is feathered on the legs sometimes; it has also a larger head, and thin skin round the eye. Some of the finest pigeons of this sort are bred from a mixture of the Dutch and English kinds. These pigeons are remarkable for the height they fly to; they never ramble far from home, but will rise almost perpendicularly, till they appear no larger than a sparrow, or become quite out of sight; they will often keep at this height five or six hours, and then come gradually down again: they will never tumble when they are at any great height, but only as they ascend or come down again. There are particular times also, at which those birds will take much higher flights than at others; but they ought to be kept by themselves, and practised to it by the company of one of their own species; for if they mix, while young, with other pigeons, they will learn to fly as they do: a flight of a dozen of these birds sent out together will keep so close as to be all in a compass that might be covered with a handcherchief; but they should never be turned out in foggy weather, or in high winds; in the first case they lose sight of their home, and perhaps never find it again, and, in the others, they are blown away; and, if they return, it is not till another day: in the mean time, lying out, they are in danger of cats, and other accidents.

Lastly, the hen should never be turned out with egg, for she is then sick, and not fit for flying; and, besides, often drops her egg, and the breed is lost by it. *Moore's Columbarium.*

TU'NICATED *Roots*, among botanists, such as are formed of a multitude of coats surrounding one another.

TU'NNY, a name given by us to the Spanish mackarel, a larger fish of the scomber kind, called by authors thynnus and arcynus, by Salvian limosa, and pelamys by Aristotle, Ælian, and the other old writers.

It is properly a species of the scomber, and is expressively named by Artedi the scomber with eight or nine fins in the hinder part of the back, rising out of a furrow; and a furrow at the place of the belly-fins.

TU'RBAN-*shell*, *cidaris*, in natural history, the name of a genus of the echinodermata, which are of the hemispheric or spheroidal figure, and have their name from the Latin, cidaris, a Persian Turban, as in some degree resembling that head-dress.

TURBINI'TÆ, fossil shells of the turbo kind, or stones found in those shells. Among the people who have objected to the shells found buried in the earth being the remains of real animals, it has been alledged by some, that these, in particular, are always of a blackish or ash-colour, when found in chalk or clay, and white from the rocks, or when they have been bedded in stone.

TU'RBIT *pigeon*, a particular species of pigeon remarkable for its short bill, and called by the Dutch cort-bek, that is, short-beak. Moore calls it, in Latin, columba fimbricata: and its English name seems no other than a bad pronunciation of its Dutch one. It is a small and short-bodied pigeon, and has a beak no longer than that of a partridge; the shorter this is, the more the pigeon is esteemed: it has a short round head, and the feathers upon the breast open and reflect both ways, standing out like the frill of the bosom of a shirt. This is called by many the purle, and, the more the bird has it, the more it is esteemed. The tail and back are generally of one colour, as blue, black, red, yellow, or dun, and sometimes chequered. The flight feathers, and those of all the rest of the body, are white. They are a light nimble pigeon, and, if trained to it, will take very high flights in the manner of the tumblers. *Moore's Columbarium.*

TU'RBO, *the screw-shell*, in natural history, the name of a genus of shell-fish, the characters of which are these: they are univalve shells, with a long, wide, and depressed mouth, in some species approaching to a round shape, and in some having teeth, in others not. They all grow narrow towards the base, and are auriculated, and terminate in a very long and sharp point.

TU'RBUT, in ichthyology, a name given by us to the fish called by authors the hippoglossus, passer major, and passer Britannicus.

According to the new system of Artedi, this is a species of the pleuronectes, and it is distinguished by him by the name of the wholly smooth pleuronectes with the eyes on the right side.

TU'RNING (*Dict.*)—The lathe, or principal instrument used in turning, is composed of two wooden cheeks, or sides parallel to the horizon, having a groove, or opening between them; perpendicular to these are two pieces, called heads or puppets, made to slide between the cheeks, and to be fixed down at any point at pleasure: these have two points or center pins, between which the piece to be turned is fastened by the help of a screw. There is also a square piece of wood called a rest, which bears up the tool, and keeps it steady. The piece is turned round backwards and forwards, by means of a string put round it, and fastened above to the end of a pliable pole, and below to a treddle or board moved by the foot. This is the common lathe; but there is another used in hollow Turning, &c. very different from it.

This lathe is composed like the other of two cheeks, and has also two heads fitted to slide between them; but has no pole, being turned by means of a wheel and a pulley. The pulley is fastened on a kind of spindle called a mandrel, one end of which is pointed, and received into the center of the back-screw, which goes through one of the heads; and near the other end called the verge it moves in a piece called the collar; the end of the mandrel passes through the collar, and on it the piece to be turned is fastened. These descriptions will be rendered abundantly more easy from the two perspective views on *Plate* LIV, which represent both these kinds of lathes in so conspicuous a manner, that a full idea of both may be easily attained.

Fig. 1. is the lathe used by hollow turners, &c.

1. The lathe. 2. The groove. 3, 3. The heads or puppets. 4. The pulley. 5. The mandrel. 6. The collar. 7. The back-screw. 8. The rest. 9. The wheel. 10. The crank. 11. The treddle.

There are several kinds of mandrels, adapted to the different kinds of work; as

Flat mandrels which have three or more little pegs or points, near the verge, and are used for turning flat pieces on.

Pin mandrels, which have long wooden shanks, to fit into round holes in the work to be done.

Hollow mandrels, which are hollow of themselves, and used for Turning hollow work.

Screw mandrels, which are used in Turning screws.

There are a great variety of other instruments used in Turning, as chissels and gouges of different kinds, perspective views of most of which are represented in the figure. Thus, 12. Is a tool called a holdfast. 13. A point tool. 14. A broad chissel called a firmer.

Fig. 2. is a perspective view of the common lathe.

1. The lathe. 2, 2. The heads or puppets. 3. The pole. 4. The treddle. 5, 5. screws which fix the rest at a proper height. 6, 6. The rest. 7. The back-screw.

The workman stands, or is seated in his lathe, having one of his feet on the treddle to give the motion, which must be very moderate and equal; he places his tool on the rest, and approaches the edge of it gently to the piece, performing his work gradually, without leaving any ridges; and, when he meets with a knot, he must go on still more gently, otherwise he would be in danger both of splitting his work, and breaking the edge of his tool.

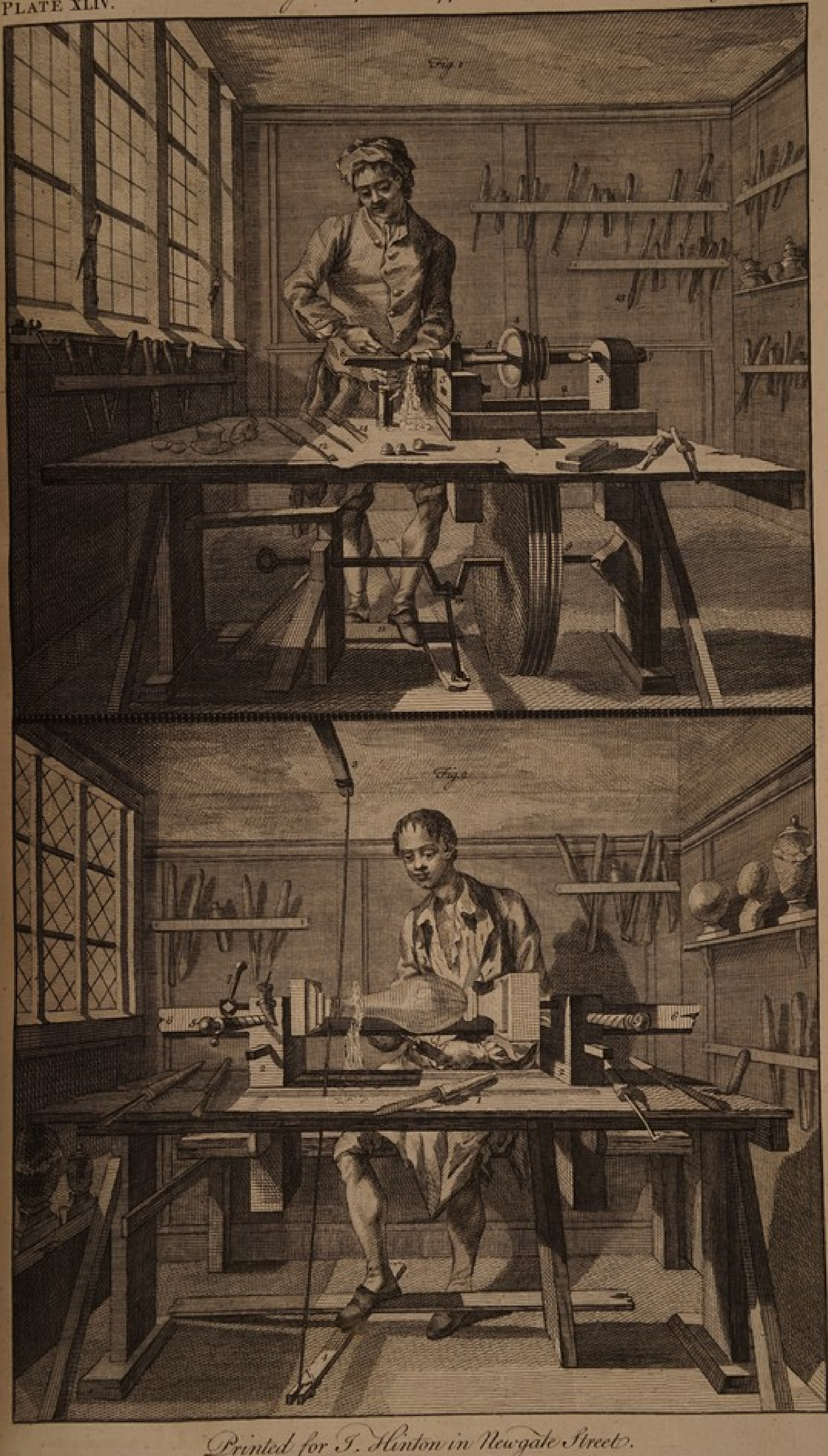
The two perspective views on the plate will give a better idea of the nature of Turning, than is possible to be conveyed by words. The first figure shews the nature of hollow Turning, and the second that for common work.

TUR'NSOL, a plant of considerable use by the colour prepared from it, and known under its name. The root of these plants is long and white; the leaves resemble in shape those of the xanthium, or lesser bur-dock; they grow on long pedicles, and are of a whitish or ash-coloured green. The flowers form a sort of cluster, and grow out of the alæ of the leaves; they are of two kinds on the same plant, barren and fruitful, or, as botanists express it, male and female.

The barren, or male flowers, occupy the top of every cluster, and are placed each in a cup, divided into five segments, and themselves consist each of five small yellowish leaves with a bundle of stamina in the middle. The female, or fruitful flowers, are placed at the bottom of the cluster, and are surrounded each by a cup, divided into ten segments; they are composed of five stamina, which surround a pistil which is furnished with three forked filaments. This pistil, which is fixed in the bottom of the cup, finally becomes a round fruit, of a rough surface, and green colour, its protuberances only appearing a little whitish. This fruit is divided into three cells, and each of these contains one round seed. The whole fruit is attached to the cup by a very long pedicle, so that when the flowers are withered, and it has arrived at its maturity, it is found hanging from the alæ of the leaves, and seems to have been produced without any flower; and this is what has led some writers into the error of imagining that the flowers and fruit of this plant grow on different stalks. Some have translated Turnsol by the English word sun-flower, which has led many to suppose, that the great yellow sun-flower which we keep in gardens, was the plant that afforded the Turnsol colour: but this is a mistake; and it is to be observed, that the true Turnsol plant here described is very common in the fields of France and Germany, but does not grow wild with us in England.

The juice of the berries of the Turnsol, rubbed upon paper or cloth, at the first appears of a fresh lively green, but presently changes into a kind of bluish purple. The same cloth, afterwards wet in water, and wrung out, will turn the water into a claret-colour: and it is to be observed, that these are the rags of cloth usually called Turnsol in the druggists shops. *Boyle's Works.*

TU'RNSTONE, in zoology, the English name of a bird called



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called by authors the morinellus marinus, or sea-dotterel. It is a little larger than the blackbird; its head moderately thick, and its body of a longish shape; its beak a finger's breadth long, thick at the base, and sharp at the point; and its head, neck, shoulders, wings, and the upper part of its breast, are of a brownish colour; its throat and belly are snow-white: the middle of its back has a very large white blotch, and its rump is variegated by a broad transverse streak of black; its legs are short, and of a reddish yellow or orange colour. *Ray's Ornithol.*

TU'RTUR, *the turtle-dove*, in zoology, a very beautiful little bird of the pigeon kind. The head, neck, and back, are of the bluish grey colour of the common pigeon, with some mixture of a reddish brown near the rump, and at the bottom of the neck. Its breast and belly are white; but its throat of a fine bright purple; and the sides of the neck are variegated with a sort of ringlet of beautiful white feathers, with black bases.

It feeds on hempseed, and other vegetable matters. *Willughby's Hist. Avium.*

TURTUR, *the turtle-shell*, in natural history, the name given by the collectors of shells to a very beautiful species of murex, common in the cabinets, but not found any where on the shores. This is owing to its having greatly altered its appearance in the polishing; for it is no other than the white and brown mouthed murex, which is common in its rough state, with its outer coat taken off. See the article MUREX.

TUSSILA'GO, *colts-foot*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind. The disk is composed of floscules, and the outer circles of semi-floscules; these stand upon the embryo seeds, and are all contained in a scaly cup. These embryo's finally become seeds winged with down, and adhering to the thalamus of the flower. To this is to be added, that the flowers appear before the leaves. *Tourn. Inst.*

The common colts-foot stands generally recommended as a very great medicine in coughs, and all disorders of the breast and lungs. It is also sometimes used externally in inflammations.

TU'TTI, in the Italian music, is used to signify that all the parts are to play together, or to make a full concert.

In this sense Tutti stands opposed to soli or solo; which signifies one part playing alone.

V.

VA'NNING-*Shovel*, among miners, an instrument used for washing the ores of any metal, after being reduced to powder, thereby to discover the richness and other qualities of the ore. See the article SHOAD.

VA'POUR (*Dict.*) — *Fiery* VAPOURS, *halitus ignei*, a term used by some to express those exhalations from the earth, which either take fire of themselves on the bursting forth into the air, or are readily inflammable on the bringing a candle to them. Many of the supposed burning lakes are owing to these fumes bursting up through the water, and not to any quality of the water itself. Our famous burning well at Wigan, in Lancashire, is of this kind. The common people affirm, that the water of this spring burns like oil; but there is nothing of truth in this. There thrusts up a vapour through the earth in this place, which keeps the water bubbling, as if boiling over the fire, though it is not warm; and the stream of this breath may be felt issuing up in these places like a strong wind. This breath alone is inflammable, and takes fire at the approach of a candle, burning with a considerable violence for some time.

There are coal-pits in the neighbourhood, and the air is certainly of the same kind with that inflammable vapour, often met with in those places, and which may also be prepared from iron dissolved in a proper menstruum. The water itself, taken from the place, does not burn; and, if the bottom be made dry, the vapour which ascends from it will burn as strongly as if the water were there. The flame is not discoloured like that of sulphureous bodies, nor has it any bad scent; and the fumes, as they are felt bursting out of the earth, by the hand held over the place, are not hot. *Phil. Trans.* N°. 20.

VARI'ETIES, in natural history, a word used to express an accidental change in some body which is not essential to it, and therefore does not constitute a different species.

The naturalists of former ages have run into great errors, in mistaking the accidental varieties of plants, animals, and minerals for distinct species. Many of them have called a plant a new species, because its flower, which should have been blue or red, is white on account of the poorness of the soil, or some other such reason. Mr. Ray has established a very good test for Varieties in botany; he allows every thing to be a distinct plant which will propagate itself in its own form by its seeds, but such, as when sown, lose their difference, and run back to the old standard, he accounts Varieties, however great their distinctions may appear. In the history of fishes as much confusion has been introduced by mistaking Varieties for distinct species as in botany. Artedi is the only author who has rationally attempted to bring this part of natural history into order in this respect, and to settle regularly the rules by which to distinguish real and essential from accidental differences.

The principal grounds of the error of supposing Varieties distinct species of fish have been these: the variable and inconstant colour of fishes has been mistaken for a specific difference; in this manner Rondeletius has described many Varieties of the turdi, labri, and other fishes, under the names of distinct genera.

Others have paid the same too great regard to the more constant Varieties of colour; which are found only to differ in degree, in the several individuals of the same species; and their differences to be only in the degrees of the same colour, which is much more intense in some, and more remiss in others. These differences can only make Varieties of the same fish, the species remaining always the same. Of the same kind are the mistakes of those who esteem size or magnitude a specific character; and thus, out of the Varieties of the same fish, occasioned by scarcity or plenty of food, or other such occasions, make larger or smaller species. The place where fish are caught, is also another occasion of making new species, with this sort of authors; thus though the perca fluviatilis of Bellonius, and the perca marina of other authors, be the same fish, yet they are pretended to be different species. The time of spawning is also with some made a distinction of species; and thus we find the common pike divided into three species, according to its spawning in spring, summer, and autumn, which it does according to the heat or coldness of the climate.

All these differences are false and frivolous, and the utmost they can do, is to make what are properly called Varieties, though few of them are sufficient even for that. A salmon, caught at sea, is not different from one of the same brood caught in a river: and if the perca marina, falsly so called, be a little different from the perca fluviatilis, yet, if its spawn will produce regular percæ fluviatiles, its difference can only amount to a variety, not a distinct species.

The trifling nature of distinction by colour is seen by the Varieties we daily see in the colours of some of our most common fish; as the tench, the eel, the salmon, and some others, which vary more or less, from every change of the water; all the other distinctions, of size and place, are as frivolous; and the giant and the dwarf, the black and the white man, the Asiatic and the European, may as well be called distinct species of men, as these of fishes.

Finally, the time of spawning is no essential difference; for we daily see the change of climate make changes of that kind in all creatures; and even in the same climate, and under the same circumstances, the same species of birds will afford some individuals much earlier, or later, in laying their eggs than others.

China-VA'RNISH. The China Varnishes have been always famous; the manner of making which is said to be as follows: take crude Varnish sixty ounces, common water the same quantity, mix them well together till the water disappears; afterwards put this into a wooden vessel five or six palms long, and two or three broad; mix them together with a wooden spatula, for a whole day in the summer's sun, for two days if in winter, and afterwards keep it in an earthen vessel covered with a bladder. The water will not unmix itself again: this is called the sun-Varnish. The oil of wood, called by the Portuguese azeile de Pao, is made in the following manner; take twenty ounces of that oil, which they call oil of wood, and ten drachms of the oil of the fruit; boil these a little together, and the oil will look yellow; then let it cool, and add to it five drachms of quick-lime powdered. To make the first grounds called camiseca, take swine's blood and quick-lime powdered, of each an equal quantity; spread this mixture upon the wood, and, when it is dry, smooth it with pumice-stones.

To make the black Varnish, take of the Varnish prepared in the sun sixty ounces; stone black alum (supposed to be a sort of copperas) dissolved in a little water, three drachms; and seventy drachms of lamp-oil, called, by the Portuguese, azeile de Candea. These things are all to be mixed together in a wooden vessel, putting the lamp-oil in at twice, and stirring the whole together with a wooden spatula.

The pitch-coloured Varnish is made in the following manner: take oil of wood, crude, forty drachms, called de Pao; of the lamp oil, called de Candea, crude, forty drachms; mix them together in the sun in a wooden vessel, in the same manner as the common Varnish, and water are ordered to be mixed in the first process.

To make the red Varnish, take ten drachms of cinnabar, twenty drachms of prepared Varnish, and a little lamp oil; mix them all together; and,

To make a Varnish of a musk colour, take of the red Varnish ten drachms, and of the black Varnish four drachms; mix them all together. *Philos. Transf.* N°. 261.

These are the accounts sent to the great duke of Tuscany, by the jesuits in China. Dr. William Sherard communicated them to the Royal Society; and to render the accounts useful to the world, he presented with them the several substances mentioned; these are deposited in the Musæum of the society, and may serve as instructions to all who are curious in this art.

VARNISH *for porcelain.* The Chinese have of late years discovered a new kind of Varnish for their ware: they call this tsekinyeou, that is to say, the brownish gold Varnish; it is of the colour of the brown images, or of what we call coffee colour. The novelty of this has made it much esteemed: it is made in the manner of all their other Varnishes, by dissolving the finer part of an earthy substance in water. The substance which they make it of is a common yellow earth; this they dissolve in water, and, letting the coarse parts settle, they pour off the yet thick liquor, and what afterwards subsides from this, is the pure and fine part, which they keep in form of a soft paste, or thick cream. They use this only to the thinnest and most delicate porcelain ware.

The manner of using it is this: they mix a quantity of this fine sediment with so much water as renders it thin and liquid, like to the common Varnish; this and the common kind are to be used together, so that care must be taken that they are nicely of the same degree of thickness; this the workmen try by dipping a petunse or brick of their earth into both, and seeing which comes out most covered; that which lies on the thickest, is to be diluted with more water, or the other to be heightened with more of the earth, to bring them to the same standard. They are both judged to be sufficiently liquid, when they enter the pores of the petunse. They then mix some of the oil of fern ashes and lime (*see the article* FERN-*oil*) along with the brown Varnish, and add as much of this mixture to the common Varnish as they find upon trial will give such a colour as is required. The common proportion for the brown colour, most esteemed at present, is two pints of the brown Varnish to eight pints of the common; and to four pints of this mixture they add one pint of the Varnish or oil of fern. It might puzzle a stranger to their terms to understand what these people meant by oil; but it is a word with them in use for any thing liquid; and they call all their Varnishes so, though made of the powders of earths and stones mixed with water. They apply this Varnish to the vessels by dipping them into it, and so completely covering them inside and out before they put them into the oven; and the baking gives a great brightness to the colour. This is the nicest part of the whole manufactory of the porcelain, and other wares of that kind. The Varnishes used by the Chinese are two; the one they call the oil of stones, the other, oil of Fern; which see. They mix these together, and with great caution and delicacy, for it requires an experienced artist, apply them to the vessels all over equally, with a steady hand and a fine pencil.

When the porcelain is very thin and fine, they give it two beds of the Varnish, the one over the other, when dry; these are to be very thin, and they answer to the single covering of Varnish given to the common good China, that is thick and strong. They give these coats by dipping, and use the foot of the vessel to hold it by; after this they hollow the foot, and paint the circle that we see round it, or mark it with some Chinese character.

The Varnish they lay on is so thick, that it often hides the colours, till the baking afterwards brings them out again: this is the case with the fine deep blues; we see none on the best China, it is all hid under the coat of white, and the vessel appears plain, till it has passed through the fire again; but then the colour appears deeper than when at first laid on. *Observ. sur les Coutum. de l'Asie.*

VAU'NING, in minerology, a term used by our miners to express a coarse and expeditious way of washing ores, for the examination of their nature and richness.

This instrument, called the vaun, is a long and moderately deep wooden shovel; into this they put the earthy or stony matter, which they suspect to contain the metal in powder; they then add water many times, and, shaking and stirring it thoroughly about, they throw out the water, and add fresh, till at last the matter is separated; the earthy part is washed away, and the stony and mineral matter only remain, the one at the hinder part, the other at the point of the shovel. This last is collected separate; and, on being examined either by the eye or test, they are able to judge very nearly of the general profit of the mine.

This method is often used with the stones and earths found in the shoads, or trains of mines. *Phil. Transf.* N°. 69.

VEGETA'TION (*Dict.*) — The great attention of all who study botany, is at present placed on the discovery of new plants; but we are yet unacquainted with many peculiarities in the most common ones, which may prove not a less worthy employment for our thoughts.

The irregularities in the Vegetation of the several parts of plants seems a subject well deserving our attention; and Mr. Marchand has laid before us an instance of this in one of our most vulgar plants, the common garden radish.

In the month of July, this gentleman observed a plant of this species, which had accidentally fixed itself in an open place, and was then full of flowers and pods. Towards the end of one of the branches, he observed a kind of tuberosity of an oblong shape, which looked somewhat like one of the pods of the plant, but that it was too long, and was very oddly twisted and contorted; this daily increased in size, and in a week was come to its full growth, which was, in the whole, about two inches and a half in length, and three quarters of an inch thick. It was of a very rough and knotty surface, and, like the rest of the stalk, had several pedicles of flowers growing on each side from it; it terminated in a smooth end, divided into three parts, which all turned upwards.

The longest of these points terminated in a green cartilaginous flower of the same substance with the protuberance which produced it; in this were all the regular parts of the flowers of the more perfect kind; there were four leaves which served for a cup; four more within these, which represented the petals; six other small bodies there stood in the middle of the flower, which represented the stamina; and among these another body which represented the pistil; so that here was, in this irregular Vegetation, a representation at large of every part of the perfect flower of the radish, excepting only the apices; but these were all very different, in their nature and structure, from their similar parts in the natural flowers, being all of a hard, thick, and tough cartilaginous substance, and in colour of a greenish brown.

The shortest of the three points which terminated this tuberosity, had also at its end a resemblance of a flower composed of all the parts mentioned in the former, and of the same colour and substance with it, only differing in being a little smaller: and the third point had no regular resemblance of a flower, but was of the same cartilaginous substance, and of a semi-circular figure, and had its upper surface ornamented with several irregular protuberances. This irregular Vegetation remained in vigour till October, when it gradually faded away, and there was no appearance of seeds in any part of it.

The radish, when its stalks are wounded by the pucerons, or other insects, will often throw out a protuberance of some irregular figure; but the resemblance of flowers, in this, was a singularity never before observed.

To explain this, it will be necessary to observe, that every organised part of a plant contains in it a number of invisible seminal principles, capable of producing plants like that to which they have owed their origin; and this is a truth of which the succeeding instances will all bring very familiar and obvious proofs.

The graft of a tree, which, from only one single bud, produces a tree like that from which it was taken, certainly acts upon this principle; for the whole tree is quite different from the stock on which it is grafted, which serves for no other purpose but merely to convey to it a proper nutritive juice from the developing its parts.

We very well know, that there are many roots, which being cut into little slices of only a quarter of an inch thick, each of these will propagate its species, and send up new plants like that which the root belonged to; and, some roots being split longitudinally into four quarters, each of these will in the same manner grow and flourish, and shoot out roots from one part, and stalks from another, so as to furnish perfect plants the same year: and how can this be, but by their having been seminal points in all these pieces and sections of roots, which being dilated, and put in action by the humidity of the earth, have grown into perfect plants. Several of the bulbous-rooted plants produce off-sets from the several scales of their roots, and from the sides of their stalks; these in three years time produce perfect plants with their flowers; and what are these but so many seminal points ready upon occasion to be developed?

Nothing is so obvious, as that the slips or cutting of trees, when planted in the ground, produce roots in one part, and buds for branches from another, and so finally become trees, like those from which they were cut; and this, though the piece that is planted, has no visible appearance of any bud in any part of it.

We also know, from daily experience, that many plants shoot out roots from their stalks as they grow, and that, though this usually happens in places where there is some solid substance for these new roots to fasten themselves to, yet it happens also in some plants where there is no such use for them; and what are these roots in a new part of a plant, but the

the effect of so many seminal points, ready to grow, both into roots and into branches, in all those places?

Among the thick and fleshy-leaved plants, as the opuntia, and other of the succulent plants of the Indies, there needs no more to produce a new plant, but to cut off a part of a leaf, and stick it into the earth, where it will at once take root, and produce a new plant in a very short time. A thousand other instances of this kind might be given; but these may be sufficient to prove, that there are, in almost all parts of plants, certain seminal points, which, like the plantula seminalis, inclosed in the perfect seed of each, need only humidity, and a proper degree of warmth, to develope and unfold themselves into perfect plants.

We are not therefore to wonder at the imitation of perfection in any irregular productions of vegetables, since it appears that there are numbers of perfect plants contained in every part of a growing plant, of the same kind. *Mem. Acad. Par.* 1709.

VEIN, among miners, is that space which is bounded with woughs, and contains ore, spar, canck, clay, chirt, croil, brown-hen, pitcher-chirt, cur, which the philosophers call the mother of metals, and sometimes soil of all colours. When it bears ore, it is called a quick vein; when no ore, a dead vein. *Houghton's Compl. Miner, in the Explan. of the Terms.*

The Veins of mines differ greatly from one another in depth, length, and breadth; some stretch obliquely, from the surface toward the central parts of the earth; and these the miners call deep Veins; others lie shallow and circular, so as to encompass a large space, and these are termed spreading Veins; others possess a great part of the space they lie in, both in length and breadth, and these are called accumulated Veins, being no more than a space possessed by a large group of fossils of one kind. To give the complete history of Veins and fibres, which are smaller Veins, their differences, their directions, their interstices, their discontinuations, their risings and fallings, and their goodness, would be a large work. Let it be observed, however, that these things seem all to proceed in a certain order, though that order, and the laws and rules of it, are not perfectly understood, so as to afford sure directions for practice; whence it sometimes happens, that, after a Vein has been successfully traced for some time, it dips, breaks off, or takes a different course, leaving the workmen as it were at a fault.

When the Vein is found, a pit is to be sunk upon it, and a crane fixed at the top of the pit for craning up the ore. Burrows, or adits, are also to be cut horizontally through the hill in one or more places, reaching to the mine, and serving to wheel out the ore, instead of craning it up. *Shaw's Lect.*

VELO'CITY (*Dict.*) — In the doctrine of fluxions it is usual to consider the Velocity with which magnitudes flow or are generated. Thus, the Velocity with which a line flows is the same as that of the point, which is supposed to describe or generate the line. The Velocity with which a surface flows, is the same as the Velocity of a given right line, that, by moving parallel to itself, is supposed to generate a rectangle, always equal to the surface. The Velocity with which a solid flows, may be measured by the Velocity of a given plain surface, that, by moving parallel to itself, is supposed to generate an erect prism, or cylinder, always equal to the solid. The Velocity with which an angle flows, is measured by the Velocity of a point, supposed to describe the arc of a given circle which subtends the angle, and measures it. See *Mac-Laur. Fluxions, B. I. ch.* 1.

All these Velocities are measured at any term of the time of the motion, by the spaces which would be described in a given time, by these points, lines, or surfaces, with their motions continued uniformly from that term.

The Velocity with which a quantity flows, at any term of the time, while it is supposed to be generated, is called its fluxion.

VEL'VET (*Dict.*)— *Colour of black* VELVET. The manner of giving this deep and fine colour to glass is this: take of crystalline and pulverine frit, of each twenty pounds; of calx of lead and tin four pounds; set all together in a pot in the furnace, well heated; when the glass is formed and pure, take steel well calcined and powdered, scales of iron that fly off from the smith's anvil, of each an equal quantity; powder and mix them well; then put six ounces of this powder to the above described metal while in fusion; mix the whole thoroughly together, and let all boil strongly together; then let it stand in fusion twelve hours to purify, and after this work it. It will be a most elegant Velvet black.

There is another way of doing this, which also produces a very fair black. It is this: take an hundred weight of rochetta frit; add to this two pounds of tartar, and six pounds of manganese, both in fine powder; mix them well, and put them to the metal while in fusion, at different times, in several parcels; let it stand in fusion after this for four days, and then work it. *Neri's Art of Glass.*

VENE'TA *Bolus*, a fine red earth used in painting, and called, in the colour-shops, Venetian red.

It is improperly denominated a bole, being a genuine species of red ochre. It is of a fine bright and not very deep red, approaching, in some degree, to the colour of minium, or red lead; and is moderately heavy, and of an even and smooth texture, yet very friable, and of a dusty surface; it adheres firmly to the tongue, is very smooth, and soft to the touch, easily crumbles to pieces between the fingers, and very much stains the skin in handling. It has a slight astringent taste, and makes no fermentation with acids. It is dug in Carinthia, and sent from Venice into all parts of the world, being an excellent colour, and very cheap; our colour-men, however, find too many ways of adulterating it. *Hill's Hist. of Foss.*

VENTILA'TOR (*Dict.*)— The noxious qualities of bad air have been long known, though not sufficiently attended to in practice; but it is to be hoped, that the indefatigable pains taken by Dr. Hales, to set the mischiefs arising from foul air in a just light, and the easy remedy he has proposed by the use of his Ventilators, will at length prevail over that unaccountable sloth or obstinacy, which, where particular interests are not immediately concerned, seems to possess the generality of mankind, and which rarely allows them to give due attention to any new discovery.

The Ventilator invented by that ingenious author consists of a square box of any size; in the middle of one side of this box a broad partition, or midriff, is fixed by hinges, and it moves up and down by means of an iron rod, fixed at a proper distance from the other end of the midriff, and passing through a small hole in the cover of the box. Two boxes of this kind may be employed at once, and the two iron rods may be fixed to a lever moving on a fixed center; so that, by the alternate raising and pressing down of the lever, the midriffs are also alternately raised and depressed, whereby these double bellows are at the same time both drawing in air, and pouring it out through apertures with valves made on the same side with, and placed both above and below the hinges of the midriffs. For a farther account of this machine we refer to the author himself, who gives a full detail of it, and of its manner of working. See *Description of Ventilators, by Stephen Hales, D. D. Lond.* 1743, 8vo.

VER-*puceron*, in natural history, a name given to a kind of insects which are fond of eating the puceron, and destroy them in vast numbers.

They are thus called, as the ant-eater is formicalis, from their destroying great numbers of them.

These Ver-pucerons are a sort of worms produced from the eggs of flies; and are of two principal kinds; the one having legs, the other none.

VER-*polype*, in natural history, a name given, by Reaumur and some other authors, to a species of water-worm, by no means to be confounded with the creature called simply the polype, and which is so famous for its reproduction of parts cut off, and for many other singular properties. See the article POLYPE.

This Ver-polype is a species of water-worm, produced from the egg of a tipula; and had its name given it from some remarkable productions, placed at the anterior and posterior parts of the body, which are supposed to have some analogy with the parts of the sea-fish called the polypus.

These worms are found in muddy ditches, usually either crawling upon, or buried in the mud. They are of various sizes, from more than an inch in length to a fifth of an inch, and are smooth and even on their surface; they are composed of several rings, as other insects of this kind, and have a brown scaly head, of a regular figure, and much harder than the rest of the body. Just below the head, on the under part of the body, there are placed two membranaceous productions which seem fragments of arms; they are considerably thick, and are cut off obliquely at the ends, and furnished with many hairs. At the other extremity of the body there are placed four other productions, resembling four pieces of cords; two of these are affixed to the middle of the lower side of the last ring but one, and the other two, at the joining of this, to the last ring. The anterior pair serve the creature greatly in its moving, and these hinder ones have their use in fixing that part of the body in the earthy case the creature sometimes makes for itself, while the head is at liberty to move every-where about in search of prey. These hinder ones are broadest at their insertion, and somewhat narrower at the point, and are very flexible and moveable every way.

The anus of the creature is placed near the end of the last ring of the body, and is of a square figure; it is surrounded with a number of rigid hairs or spines, and at each corner has a fleshy tubercle, which stands out a considerable way from the level of the body; the two under ones are much larger than the other two, and the creature evidently uses them to push itself forward in its moving about. Probably, however, these parts have some other more important use. The taking in of air or water is likely enough to be the use they are assigned for.

The cells which these creatures usually live in, are composed principally of fragments of a light and spungy earth, and to this they add the broken pieces of sticks and leaves, and other such substances as are just heavy enough to sink in water. Mr. Reaumur suspects that they have a method of spinning some glutinous fluid out of their bowels, to fix these things together with. But, though they usually reside in these cases, they

they often quit them, and are found swimming about the water, or with their tails at the top, and playing about with their bodies; or at the bottom, crawling on the surface of the mud.

When the creature has lived its destined time in this state, it changes into a nymph, in the case in which it had lived to the time of this change; it throws off the head, and the productions that served as arms, and to fasten it at the bottom of the case. Nature has generally made the nymph and crysalis state of animals a time of rest and incapacity of motion; but in this, as in the great worms, has given even the nymph a locomotive power, and that a very brisk one. The creature, in this state, had sufficient need of it, and could never arrive at its last change without it. When the time of this final change comes on, the nymph rises to the surface of the water, and, a crack opening on the back the winged insect begins to appear. The getting thoroughly out is a work of time; and this is the most perillous period of the creature's life; for, if the weather be windy, it is commonly blown into the water and drowned before the hinder parts are loose. *Reaumur. Hist. Inf.*

VERBA'SCUM, *mullein*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of a single leaf, rotated, and divided, into many segments at the edge. From the cup there arises a pistil, which is fixed in manner of a nail to the middle part of the flower, and finally becomes a fruit or case of an oval pointed figure, divided by an intermediate septum into two shells, which usually contain a number of small angular seeds fixed to a placenta.

VER'DETUM, the name of a green substance, used as a colour in painting. It is a very pure kind of verdigrease, being an ærugo of copper, produced by the vapour of vinegar.

VERO'NICA, *speedwell*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is rotated and divided into segments at the end. From the cup there arises a pistil, which is fixed in the manner of a nail to the middle part of the flower, and afterwards becomes a membranaceous fruit, divided into two cells, and containing usually small, but sometimes larger seeds.

VE'RVAIN, *verbena*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the labiated kind. The upper lip is erect, and divided into two segments, the lower into three; and these are so disposed, that, at first sight, the flower has not at all the appearance of a labiated one, but seems only divided into five segments. The pistil arises from the cup, and is fixed in the manner of a nail to the lower part of the flower: it is surrounded by four embryo's, which afterwards become four slender oblong seeds, which ripen in the cup, and fill it almost wholly up. To these marks it may be added, that the flowers of the Vervains grow in spikes, or sometimes in short heads, but never verticillately.

VESPERTI'LIO, *the bat*. In the Linnæan system of zoology, this animal makes a distinct genus; but that not as a bird, as the vulgar esteem it, but as one of the quadruped class. The characters of the genus are these: that the creature is viviparous, whereas all the birds are oviparous: that it has two paps: its feet have five toes on each; and the four feet are expanded into a sort of wings; Under this class, the author takes in canis volans and glis volans; the flying dog and flying dormouse, as they are called by other authors. *Linnæi System. Nat.*

VIBU'RNUM *Galls*, in natural history, the name of a species of galls, or small protuberances, frequently found on the leaves of the Viburnum. These are of a very singular nature, and seem to be composed of a different substance from that of the leaf. They appear in form of brown circular spots, of which there are sometimes forty or more on one leaf. These are about a fifteenth of an inch in diameter, and they rise a little above the surface of the leaf, as well on the under as the upper side; each of these has also a small prominence in the center, on each side of the leaf, looking like a nipple standing on the breast.

VI'CES, a term used by the dealers in horses to express certain faulty habits or customs in that creature, which render him troublesome to the rider, and are never to be worn off, but by attention to regular methods.

VI'CIA, *vetch*, in botany, the name of a large genus of plants, the characters of which are these: the flower is of the papilionaceous kind: and the pistil, which arises from the cup, finally becomes a pod, furnished with roundish or angular seeds; to this it is to be added, that the leaves stand in pairs on the rib, and that terminates in a tendril.

VIGORO'SO or *vigorosamente*, in the Italian music, is used to direct a performer to sing or play with vigour, strength, and firmness.

VINE (*Dict.*)— All the sorts of Vines are propagated either from layers or cuttings. The former is the method usually practised with us, but the latter seems much the better.

In order to propagate them by cuttings, let such be chosen as are strong and well ripened shoots, of the last year's growth, and should be cut from the old Vine, just below the place where they were produced, taking a knot of the two years wood, which should be pruned smooth.

The upper part of the shoot should then be cut off, so as to leave the cutting about sixteen inches long. These cuttings are to be placed with their lower part in the ground, in a dry place, laying some litter about their roots to prevent them from drying. In this place they should remain till the beginning of April, which is the time to plant them. They are then to be taken up and wiped clean, and, if they are very dry, they should stand with their lower parts in water six or eight hours. Then, having prepared the beds for them, they are to be set at about six feet distance from each other, and making their heads slant a little towards the wall. The cutting is to be so buried in the ground, that only the uppermost bud be upon a level with the surface; the earth is then to be well closed about the plant, and a little mould heaped up over the eye of the bud, to keep it from drying. After this, there is no more trouble necessary, but to keep the ground clear from weeds, and to nail up the shoot, as it grows, to the wall, rubbing off all the side-shoots.

The Michaelmas following, if the cuttings have produced strong shoots, they should be pruned down to two eyes. In the spring following the ground is carefully to be dug up about the shoots, and the stalks to be earthed up to the first eye. During the summer all the lateral shoots must be rubbed as they appear, and only the two from the two eyes which were left, must be encouraged; these, as they grow, are to be nailed up against the wall; and in the middle of July these should be shortened, by nipping off their tops, and this will greatly strengthen the shoots. At the Michaelmas following these should be pruned, leaving them each three eyes, if they are strong; but, if they are weakly, only two. The next summer there will be two shoots from each shoot of last year's wood; but if there should be two from one eye, which is sometimes the case, then the weaker is to be rubbed off. At Midsummer the ends of the shoots are to be pinched off, as before; all the weak lateral shoots are to be displaced, as in the preceding summer; and the whole management is to be the same. This is all the culture necessary to young Vines.

As to the management of grown Vines, it is to be observed that these rarely produce any bearing shoots, from wood that is more than one year old; the great care must therefore be always to have plenty of this wood in every part of the tree. The bearing shoots for the following year should be left at the pruning with four eyes each. The under one of these does not bear, and consequently there are only three which do. Many leave more eyes on the shoots, that they may have more fruit, which is the consequence; but then the fruit is much poorer; and this is so well known in the wine countries, that there are laws to direct that no more than such a number of eyes are to be left on each shoot, for the grapes would else be of a poor juice, and destroy the reputation of their wine. Each of the three eyes, left, will produce two or three bunches; so that each shoot will give six or nine bunches, which is as much as it can bring to any perfection. These shoots must be laid in at about eighteen inches asunder on the wall; for, if they are closer, when the side-shoots are produced, there will be no room to train them in upon the wall: and the largeness of the leaves of the Vine requires also that the shoots should be at a proportionable distance.

The best season for pruning Vines is the end of September or beginning of October. The cut is always to be made just above the eye, and sloped backwards from it, that, if it bleed, the juice may not run upon the bud; and, where there is an opportunity of cutting down some young shoots to two eyes to produce vigorous shoots for the next year's bearing, it should always be done. In May, when the Vines are shooting, they should be looked over, and all the shoots from the old wood should be rubbed off, as also the weaker, whenever there are two produced from one eye. During the month of May, the branches must be nailed up against the wall as they shoot, and towards the latter end of this month, the ends of the bearing branches should be nipped off, which will greatly strengthen the fruit. Those, however, which are to bear the next year, should not be stopped before the beginning of July.

When the fruit is all gathered, the Vines should be pruned, whereby the litter of their leaves is all removed at once, and the fruit will be the forwarder for this the succeeding year. *Miller's Gardener's Dict.*

The Vine is one of the trees most liable to be injured by frosts with us; its trunk is often split in frosty weather, and that most frequently when it stands in the warmest aspects. In the year 1683, the great frost split almost all our timber-trees; but this was owing to defects in them, by which the sap was detained in very large quantities in particular places, from their being wind-shaken, coltie, or otherwise distempered; but the Vines suffered the same accident, seemingly, from another cause. Those Vines were most split this year which were exposed to a south aspect, and planted against the warmest walls. The sun, their usual friend, now proved their enemy, and, daily thawing the sap in the trunk, it was again frozen every night. This, often bending and unbending, softening and hardening the

the vivid ſpirituous juice of this plant, deſtroyed it; and the ſap being the ſame year diſordered, and not gradually ſeaſoned, but even ſtopped before Michaelmas-day, and the freſh ſap wholly detained by the ſucceeding froſts from ariſing, the frozen and hard earth alſo denying its juices, even though the veſſels of the plant had been in a condition to receive them; the trunks and branches of the Vines were filled only with a thin, watery, and mortified ſap, and, this moſt of it extravaſated by the burſting of the veſſels it was frozen in, many of them ſuffered as much as if cut off from the root. Thus periſhed the greater part of the Vines expoſed to the ſun's action; while the other which ſtood in more ſhady places, not having their juices thawed and frozen daily, ſuffered but one change, and often eſcaped. It was alſo obſerved this year, that the red grape-trees eſcaped in general much better than the white, being hardier than they.

Other wall-trees, containing viſcous juices, eſcaped very well, while the Vines thus ſuffered, even though expoſed in the ſame manner. Among others, the plums, apricots, peaches, and wall cherries, had very little damage. It is eaſy to conceive why plants with viſcous juices ſhould ſuffer leſs by froſt, than thoſe with more thin ones; and we ſee that this is the caſe between theſe two ſorts of trees, the plums, &c. often exſudating their juices in form of gum-arabic; but the Vines, when they throw out any, ſhew that theirs is as thin as common water. The different kinds of trees have, doubtleſs, all their different conſiſtences, in their juices; and it may have principally been owing to that diverſity in others, as well as in the plum and Vine, that ſome eſcape, while others periſh by froſts. *Philoſ. Tranſ.* N°. 165.

VINE *Gallinſect*, an inſect of the gallinſect claſs principally found on the Vine, though capable of living on ſome other trees, and ſometimes found on them. It is much of the ſame ſhape, figure, and manner of life with the other animals of this claſs; but differs from them in this, that, as they lay their eggs all under their body, and continue abſolutely to cover them, till they are hatched, theſe protrude them from their body, and thus are found in prodigious abundance, lodged in a ſort of cottony or ſilky bags all over the ſtalks and branches of the Vines; the dead animal is ſometimes found covering them in part; but more frequently they are abſolutely naked, and often are ſo numerous as to appear like thin cobwebs hung one over another all over the Vine.

VINE *Grubs*, in natural hiſtory, a name given by ſome authors to the pucerons, or little inſects, which are uſually of a green colour, and are found often in prodigious numbers, ſticking to the leaves of trees and plants, and to their young ſtalks. Mr. Reaumur has been very curious in his inveſtigation of the nature of this inſect; but its manner of propagating its ſpecies was never clearly obſerved, till Mr Bonet diſcovered it.

VINEGAR (*Dict.*)— It is plain that the original component matter of Vinegar is ſugar, which, in the art of rectification, ſeems wholly converted into a fluid tartar; and, if the aqueous liquor be ſeparated from Vinegar, we find the Vinegar is thereby made the ſtronger, inſomuch that, if Vinegar were to be highly concentrated by congelation, it would become almoſt ſolid, or a kind of actual tartar.

Whence the rule is eaſy, that, in order to make an almoſt ſolid Vinegar, we ſhould endeavour to diſſolve tartar in an aqueous liquor, whence to perfect the art of acetification. The diſſolving of tartar largely with ſugar or treacle, and the ſtrongeſt Vinegar, by repeated imbibitions, that and a proper management is much to be recommended to the perſons concerned in this trade. *Shaw's Lectures.*

It is very well known that a large quantity of water, or mere inſipid phlegm, is contained in Vinegar, and that what we call Vinegar, would be infinitely ſtronger, if cleared of that. It is for this reaſon, that a great quantity of Vinegar will ſaturate but a very ſmall portion of an alkaline ſalt; and a great deal of this aqueous acid is, for the ſame reaſon, required to diſſolve a ſmall portion of metal. A pint of the ſtrongeſt Vinegar will ſcarce diſſolve more than two drachms of iron, and will not ſaturate more than the ſame quantity of pure ſalt of tartar.

It has been wiſhed by many, that ſome method could be contrived of concentrating Vinegar, ſo as to give it more ſtrength; this muſt depend alone on the extracting the aqueous humidity; and this has been attempted ſeveral ways. Of all others, however, that ſucceeds beſt which we find recommended by Stahl, which is by freezing. This method ſo far deprives Vinegar of its ſuperfluous water, and ſo far collects its acetous penetrating ſharpneſs, as to render it an extremely powerful menſtruum, throwing out five or ſix parts of phlegm, which ſcarce taſtes at all ſour, and having one ſixth or one ſeventh part poſſeſſed of all the virtues of the whole. Dr. Shaw aſſures us, that he has repeated this experiment, and found it to anſwer perfectly upon the trial.

This condenſed Vinegar, towards the end of the operation, or in the laſt congelations, lets fall a white ſhining powder, which is a tartar that, though diſſolved in great quantity in the whole aqueous fluid, could not be retained in this concentrated one. *Stahl, de Condenſat. Vini.*

The thicker Vinegar is, the leſs fit it proves for diſtillation, as there is always the greater danger of an empyreuma, or burnt ſmell, which would ſpoil the whole proceſs, and as it uſually in this caſe comes over oleaginous. And the pureſt white ſalt of tartar, ſaturated with this diſtilled Vinegar, being afterwards ignited, turns black, and yields a ſmell extremely like that of crude tartar in the calcination. *Shaw's Chemical Eſſays.*

Portable VINEGAR, a name given by the chemiſts to a ſort of Vinegar-powder, or Vinegar in a dry form. It is a preparation of tartar with Vinegar, and is made in this manner: take white tartar, half a pound; let it be carefully waſhed, then dried and powdered; infuſe this powder in the ſtrongeſt wine-Vinegar, then dry it, and infuſe it again, repeating this operation ten times. After this, the dry powder is to be kept for uſe; at any time a ſort of extemporaneous Vinegar may be made by diſſolving a ſmall quantity of this powder in any proper liquor.

VINOUS *Liquors* (*Dict.*)— All ſorts of Vinous and fermented liquors, both before and after the fermentation, conſiſt not of ſimilar, but heterogeneous parts, which are joined together in one certain and determinate order; thus, the action of fermentation being a ſeparation and deſtruction of the former connection of the ſubject, and tranſpoſing its parts anew, there muſt of neceſſity have been a kind of firm or durable texture in the ſubject ſo disjoined, ſeparated, and new ranged. For example:

Grapes being laid upon dry ſtraw, in a cold place, will, for ſome time after they are ſeparated from the Vine, preſerve that texture, which gives them their ſaline, unctuous, and ſlimy ſweetneſs; which the juice alſo retains after preſſing, and becomes a clear and tranſparent muſt, without ſeparating itſelf into parts, but continuing regularly and uniformly mixed, ſo as to preſerve the different matters it conſiſts of, intimately connected among themſelves. In this firmly connected ſtate they may be kept many months, if a caſk be filled with this juice, and ſet in a cool place, as we evidently ſee in ſtum. *Shaw's Eſſay on concentrating Wines.*

Wine, in the preciſe chemical or philoſophical notion of it, is a ſaline, clammy, oleaginous matter, diluted with a large proportion of water, whereby it is expanded, or ſet at diſtance from itſelf, while the ſaline parts are ſaturated with and interſperſed among the ſubtile earthy ones that make the ſliminess; thus, they together imbibe, detain, and hold the groſſer parts; beſides which there are other oily parts vaſtly more ſubtile, which, by means of the highly attenuated ſaline portion adhering cloſely to them, remain as much connected with the water as the reſt; and theſe are what we call the ſpirituous parts; but the connection of them all together is ſo ſtrong and durable, that they move for a long time as one body, without ſeparating, if carefully preſerved. An acquaintance with the true nature, hiſtory, and effects of Vinous fermentation, will fully explain and juſtify theſe poſitions.

If the ſpirituous part be once ſeparated and drawn away from the wine by diſtillation, though it were immediately to be returned back to the remaining maſs from whence it came, and ever ſo well ſhook again with it, the whole by no means retains its former taſte, odour, and durability, but turns to a confuſed turbid mixture, of a different and nauſeous taſte, and a diſagreeable ſmell; and, on the whole, approaches nearly to a ſtate of vapidity. The only objection to this general rule is, that if a new fermentation, or even but a fret be raiſed, when the ſpirit is newly joined to the remainder in the ſtill, the ſpirit may be thus reinſtated, and the wine rendered perfect. The proceſs is difficult and uncertain; but a nice management, and a proper intermedium, will bring it about.

If an inflammable ſpirit diſtilled from the ſame, or any other wine, be put to a parcel of wine which is too ſaline, or not ſufficiently ſpirituous, the bare addition, or tumultuous admixture thereof, very far from giving the fine and intimate ſoftneſs of a good wine, will rather manifeſt its own burning acrimony and nidorous flavour to the ſmell and taſte, and will add a nauſeous bitterneſs to the former tartneſs or acidity. This is an obſervation of Stahl's, and is allowed by Dr. Shaw to be true in general; but he obſerves, that, under a nice and proper management, a fine and taſteleſs ſpirit may be prepared and introduced into wines, and will, after a time, become intimately mixed with their other part, and remain abſolutely undiſcoverable to the taſte or ſmell, unleſs by the excellency and the ſtrength it gives. *Stahl's Schediaſma de Concentrat. Vini.*

VINI *Oleum*, *oil of wine*, a very precious liquid, kept as a ſecret in the hands of ſome dealers in ſpirits, and uſed to give the brandy flavour to ſpirits of leſs price. It is certain, that all the ſpirits we uſe take their flavour from the eſſential oil of the ſubſtance they are made from; that of malt is very nauſeous and offenſive, and renders the ſpirit horribly diſagreeable, if not carefully kept back in the diſtillation of it; that of the grape, on the other hand, is extremely agreeable, and is what gives the delicious flavour to French brandy: this, therefore is to be carefully brought over among the ſpirit in diſtillation.

This is that oil of wine ſo much celebrated among our diſtillers, and is for their uſe made ſeparate, being of ſuch effect, that half an ounce of it will determine a pure and clear malt ſpirit to be French brandy, ſo as to ſtand the teſt of the niceſt palate; and all the trials that can be invented, provided the oil and the ſpirit have both been carefully made.

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The manner of making the oil is this: they take the cakes of dry wine lees such as are used by our hatters, and, dissolving them in six or eight times their weight of water, they distil the liquor with a slow fire, and separate the oil by the separating glass, reserving for this nice use only that which comes over first, the oil that follows being coarser and more resinous. To render this business perfectly successful, there must be several things observed: First, the lee must be of the right kind, that is, of the same nature with the French brandy proposed to be imitated. Secondly, The malt spirit must be extremely pure. Thirdly, the dose of the oil must be very well proportioned: and, fourthly, the whole must be artificially united into one simple and homogene liquor. These cautions all regard only the taste, and besides these, in order to come up to a nice counterfeit, several other particulars must be attended to; such as the colour, proof, tenacity, softness, and the like; so that, in short, the operation has too much nicety in it to be bit off by every ordinary dealer. When this fine oil of wine is procured, it may be mixed into a quintessence, with pure distilled alcohol, or the totally inflammable spirit of wine, to prevent its growing distasteful, rancid, or resinous; and thus it may be long preserved in full possession of its flavour and virtues.

The still bottoms, or remaining matter after the distillation of this oil, will yield many productions to advantage, particularly tartar, and salt of tartar, as also an empyreumatic oil, and a volatile salt, like that of animals. Some kinds of lees afford all these in much greater quantity than others; the lees of canary and mountain wines yield very little of them, and, indeed, scarce any tartar or fixed salt at all; but the white French lees of those thin wines, that afford the ordinary brandies, yield them all very copiously, insomuch that sometimes a single hogshead of dry and close-pressed lees will afford, by this process, three gallons of this oil, forty pounds of clean tartar, a large proportion of empyreumatic oil, and volatile salt, besides full four pounds of good salt of tartar. It is not to be expected, however, that every parcel of this lee should yield fully in this proportion. *Shaw's Essay on Distillery.*

VI'NUM *extemporaneum*, a name given by Dr. Shaw and others to a sort of extemporaneous vinous liquor, made, without fermentation, from the melasses spirit, lemons, water, and sugar, in the following manner: some good sound lemons are to be cut into slices, rind and all, and put into a quantity of pure fine melasses spirit; when they have stood in fusion three or four days, the liquor is to be strained clear off, and filtred; and having before a very thin syrup of the finest sugar dissolved in spring-water, the two liquors are to be mixed together. The proportions of this liquor must be discovered by repeated trials, but, when once found, it will be easy to continue them; and a vinous liquor will thus be prepared not inferior to many foreign wines.

VI'OLA, *the violet*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the polypetalous, anomalous kind, much resembling the papilionaceous ones. The pistil arises from the cup, and finally becomes a seed vessel, usually of a trigonal form, which opens in three places when ripe, and contains roundish seeds.

Violet flowers, fresh gathered, are emollient and gently purgative. They are greatly recommended by authors in fevers, head-achs, pleurisies, and peripneumonies. A syrup of them, made in a strong infusion in water, is the only preparation kept in the shops: it is given to children as a gentle evacuant, and serves as a test to distinguish acids from alkali's, the former turning it immediately red, and the latter green.

VI'RGA *aurea*, *golden rod*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the radiated kind; its disk is composed of floscules, and its outer circle of semi-floscules. These are all placed upon the embryo fruits, and are contained in a common scaly cup: these embryo's finally ripen into seeds, winged with down. To this it is also to be added, that the flowers usually stand in long series towards the tops of the stalks.

The common golden-rod is an astringent, and its root is given in powder with great success in diarrhœas, dysenteries, and in hæmorrhages of all kinds; particularly in spittings of blood.

VI'RGIN'S-*bower*, *clematitis*, in botany, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, and usually consists of four leaves arranged in a circular form, and without a cup. The pistil arises from the center of the flower, and finally becomes a fruit composed of several seeds arranged into a sort of head, and each ending in a long plume.

The several species of this plant make a very fine ornament in the quarters of gardens allotted to flowering shrubs. They are all propagated, by laying down their branches in spring, as is practised in vines and other such shrubs; and in a year's time they will have taken sufficient root, and may be taken up and removed to the places where they are to remain. This should be done in the spring, and a little mulch must be laid about their roots, and they must be watered in dry weather. In two years after planting they will make very strong shoots, which are to be trained up, to stakes, that they may not trail upon the ground. After this, they require no farther care, than to cut out their dead branches every year, and in the spring to shorten such branches as are too long and rambling. They may also be raised from seeds, sown either as soon as ripe, or in the spring; but this is a more tedious way, as they lie six or twelve months in the ground before they appear, and after that require two years care in a nursery-bed before they are fit to be planted out where they are to stand.

VI'TEX, *the chaste tree*, in botany, the name of a genus of trees, the characters of which are these: the flower consists of one leaf, and is, as it were, bilabiated, and tubular behind; the pistil arises from the cup, and is fixed in the manner of a nail to the hinder part of the flower; this finally becomes a roundish fruit, divided into four cells, each containing oblong seeds.

VI'TIS, *the vine*, the name of a genus of plants, the characters of which are these: the flower is of the rosaceous kind, and is composed of several petals, arranged in a circular form; from the middle of the flower there arises a pistil, which is surrounded by a number of stamina; this finally becomes a round, succulent, or juicy berry, containing usually four pear-fashioned seeds. See the article VINE.

VITIS *Idæa*, *the whortle*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the globose campaniform kind. The pistil arises from the cup, and is fixed in the manner of a nail to the hinder part of the flower; the cup finally becomes a soft umbilicated berry, juicy, and containing small seeds.

VI'TRIOL *of copper*. The glass-makers have a method of making this without corrosives, which was originally practised by Neri, and with which they make very fine colours in glass, particularly a fine sea-green.

The method of making the preparation is this: take little thin pieces of brass, and lay them stratum super stratum in a crucible, with powder of brimstone. When the vessel is full, set it luted and covered in an open wind furnace, with burning coals over it, and let it stand two hours; then let the furnace cool of itself, and take out the crucible; the mass within will be of a blackish obscure purple; powder and sift it fine, and then, mixing with every pound of it six ounces of powdered brimstone, take a round vessel of earth that will bear the fire, place it upon iron bars set across in an open wind furnace, fill it with coals, and then put in the powder; keep it burning and stirring about till all the brimstone is burnt up; then take out the pan, and powder the calcined mass again, sift it fine, and proceed with it thrice as before; the last time let it stand on the fire till it become red. Put a pound of this calcined copper into a glass body, with six pints of water; evaporate two pints or thereabouts in a sand heat; the water is then of a fine blue, and must be poured off clear; then filtrate it. Evaporate the water from the remaining sediment of copper left in the glass, and with new sulphur calcine it again and again; repeat this five or six times, and extract the blue tincture with water as before; filtrate all the waters, and put them together. Evaporate all to a fifth part or thereabouts, and set it in a cool place, and fine pointed crystals will be formed, resembling emeralds; separate these crystals, and evaporate the water again, till all the crystals be procured. Then put a pound of them into a glass retort, well luted and fitted to a capacious receiver; let the joints be well closed, and make a moderate fire for four hours; then make it violent for twenty hours, or till no more white fumes arise. The next day open the receiver, and separate the liquor into a glass, where it must be kept carefully sealed up. *Neri's Art of Glass.*

White VITRIOL. It has been disputed whether white Vitriol is any thing else than green Vitriol calcined. But it seems that white Vitriol is of a quite different species from either the green or the blue Vitriols.

In the condition in which white Vitriol is usually bought, it contains somewhat both of copper and iron; but, being purified by solution, filtration, and crystallisation, it is freed from both these metals, and appears to be a native Vitriol sui generis.

Blue VITRIOL, is made by evaporating ziment water to a proper standard; after which it is to be let out into coolers, where it shoots into regular, and beautiful crystals of a rhomboidal form and composed of ten planes. These have the same qualities with the water; and, being dissolved in common water, they make a ziment liquor, undistinguishable from the native kind. See the article ZIMENT *Water*.

VITRIO'LIC *Waters*, waters impregnated with particles of vitriol.—The countries which abound with mines of copper and iron usually afford a great many Vitriolic waters.

VIVACI'SSIMO, in the Italian music, denotes a degree or two quicker than vivace, and is much the same with allegro.

VIVES. A name given by our farriers to a disease of horses, which consists in the growth of certain flattish kernels in clusters, like bunches of grapes, beginning from the ears and creeping downwards, between the chop and the neck of the horse towards the throat.

U'LMUS, *the elm*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the campaniform kind, consisting of one leaf, and containing a great number of stamina. The pistil arises from the bottom of the flower, and finally becomes a membranaceous or foliaceous fruit,

fruit, of a heart-like ſhape, in the center of which, there is placed a pear-faſhioned capſule, which is alſo of a membranaceous ſtructure, and contains a pear-faſhioned ſeed. See the article ELM.

UN'DERWOOD.—In the cutting the Underwood of coppices, when the ſtubs are great, they ſhould be ſtubbed up, for they only take up a great deal of room, and ſend up few ſhoots, their cracks and holes letting in water, and uſually half killing them. The taking up theſe ſhould be performed in winter, and the ſpaces they leave will be ſoon occupied by young trees; if not, a long branch of ſome neighbouring tree may be laid down, and will ſoon ſend up a ſufficient ſupply of ſuckers for the place.

In felling the Underwood, it is always proper to leave young trees enough. The worſt of theſe may be taken down the next fall, eſpecially if any of them grow near a great tree that will be fit to fell the next ſeaſon, becauſe they may be ſpoiled by its fall. When trees are at their full growth, there are ſeveral ſigns of their decay, as the withering or drying of their top branches, their taking in water at ſome of their knots, their being hollow or diſcoloured, and their making but ſmall ſhoots. If wood-peckers make holes in the body, it is a bad ſign, and, according to the appearance of one or more of theſe ſymptoms, it is very proper to cut down the tree before it decays farther. Large and ſpreading trees in coppices are often of more miſchief than advantage, as they ſpoil a great deal of the Underwood by their droppings.

The owner of a coppice muſt be very careful, when he fells the wood ſtanding, by the acre, to mark before-hand what ſtandards are to be left, becauſe otherwiſe the purchaſer ſeldom fails to cheat him, by felling ſome of them. *Mortimer's Huſbandry.*

Sea-UN'ICORN, in natural hiſtory, the name of a fiſh of the whale kind, remarkable for having a horn growing out at its noſe, in the manner of the ſuppoſed Unicorn's horn, as deſcribed by many too credulous authors.

This fiſh feeds on fleſh, or other fiſh, and is not only found in the main ſea, but ſometimes gets up into large rivers. In the year 1636 there was a large one caught in the river Oſte, near its diſcharging itſelf into the Elbe, in the duchy of Bremen; this place is four German miles from the ſea. The ſkin of this fiſh was ſpotted with dark brown ſpots upon a white ground; the epidermis was tranſparent, and under it was another ſkin very thin and ſpotted; but the true ſkin was brown, and near an inch in thickneſs. On the top of the head there is only a ſemilunar hole, as in the porpoiſes; this hole opens into the two channels, which run through the ſkull to the palate, and are called the ductus hydrogogi. The people who examined this creature, were not able to find any aperture in the body for the diſcharge of the excrements; whence it has been generally believed, that the creature voids them through this paſſage in the head.

Authors have differed in the name of the proceſs iſſuing from the head, ſome calling it a horn, others a tooth; for ſome are of opinion that it ſerves it to break the ice for air; but others pretend that it is an offenſive weapon, with which it wounds the common whale, and other large fiſh; and that, when it has plunged it up to the head in the whale's body, it ſucks the juices of that animal.

The fiſh was near twenty feet long, and about four feet in diameter. The horn ſtood on the fore-part of the head, juſt above the mouth, and was ſix feet long, white like ivory, and curiouſly wreathed or twiſted. The body was ſmooth and ſlippery, like that of an eel; the head, in proportion to the body, was ſmall, not exceeding ſixteen inches in length: the eyes not bigger than a ſix-pence. It had, on each ſide of the neck, two black fins, one above, another at a ſmall diſtance; theſe were two feet long, of the breadth of a hand, and about half an inch in thickneſs. *Phil. Tranſ.* N°. 447.

U'NIVALVE *Shells*, in natural hiſtory, a term uſed to expreſs one of the three general claſſes of ſhell-fiſh; the other two are the bivalves and multivalves. The Univalve ſhells are thoſe which conſiſt only of one piece, not of two or more joined together.

VOLU'TA, *the volute*, in natural hiſtory, the name of a genus of ſhells, the characters of which are theſe: they are Univalve ſhells, and have an oblong mouth, with a clavicle ſometimes erect, ſometimes depreſſed, and they are ſometimes coronated at the top.

VO'LVULA, in natural hiſtory, the name of an extraneous foſſil body, nearly allied to the entrochus, being compoſed of the ſame ſubſtance, and being, like that of a cylindric column, made up of ſeveral joints; the commiſſures of the joints are, however, much leſs viſible in the Volvulæ than in the entrochi, and they are not ſtriated, as in the entrochus, from the center to the circumference.

U'PLAND. The Uplands lie either on the tops of hills, or on their ſides, or on the ſlopes of riſing grounds. They ſometimes have a ſandy ſoil, ſometimes a rocky, gravelly, or loamy one; and ſometimes they conſiſt of tough clay, or a black mould. They are uſed by the farmers either for grazing or corn, as they happen to be more moiſt or more dry; and this difference depends upon their ſituation and nature.

Thoſe lands which lie flat upon the tops of hills are uſually the drieſt, and thoſe which form the ſlopes or ſides are uſually the moiſteſt, becauſe of the wet that is continually ouzing through them. The chalky, and eſpecially the clayey ſoils in theſe places, are moſt of all ſubject to be wet, eſpecially in winter, becauſe they retain the moiſture a long time; though they have alſo the inconveniencies of the ſandy and rocky lands in the ſame ſituations, chapping in ſummer. The black mould, and the hazely loams in theſe places, are the beſt for corn, as well as for paſture, eſpecially if the latter eſcapes the common misfortune of being full of worms. Theſe lands neither are waſhy in winter, nor parched up in ſummer.

The Upland meadows have ſome diſadvantages, as they often need mending or feeding, which thoſe that lie lower do not; but then they make amends for this in their hay, which is always much finer and ſweeter than that of the low-lands.

UPLO'PER, a name given to one particular ſpecies of pigeon, called by Moore columba gutturoſa faliens.

It was firſt brought to England from Holland, and much reſembles that kind of pigeon called the Engliſh powter, but that it is ſmaller: its crop is very round, and in this it buries its bill. Its legs are very ſmall and ſlender, and its toes are ſhort, and cloſe together, on which it treads ſo nicely, that, when moving, any ſmall thing might be put under the ball of its foot. The pigeons of this ſpecies are generally all blue, all black, or all white, ſeldom or never pyed. They are very ſcarce in England, and in Holland have been valued at five and twenty guineas a pair.

They have their name from the Dutch word oplopen, which ſignifies to leap up; and it was thus named from its manner of approaching the hen, which is always by leaping upon her. *Moore's Columbarium.*

URANO'SCOPUS, in zoology, the name of a fiſh of the cuculus kind, called in Engliſh the ſtar-gazer, and by ſome authors callyonymus.

URTI'CA, *nettle*, in botany, the name of a genus of plants, the characters of which are theſe: the flower is of the apetalous kind, being compoſed only of a number of ſtamina placed in a cup. Theſe are barren, and the ſeeds grow on other plants of the ſame ſpecies, which have no flowers, and are contained either in round globules, or bivalve capſules, or in long tufts.

The roots of the common nettle are much recommended in medicine; they are powerful diuretics, and are ſaid to have great virtues againſt the ſtone and gravel. They cleanſe the blood, and are ſaid to be of great ſervice in hæmorrhages of all kinds, particularly in ſpittings of blood, and overflowings of the menſes. Authors add to this, that they are ſpecifics by way of antidote againſt the poiſon of henbane and hemlock; but this we are not ſo well aſſured of. The young ſhoots of the plant are eaten in the ſpring, as good againſt ſcorbutic complaints. *Dale, Pharm.*

URTICA *marina*, in zoology, the name of a remarkable genus of fiſhes, ſo called from their affecting the ſkin, on touching them, with a painful ſenſation like that of ſtinging of nettles. Theſe are an animal of the loweſt claſs, and have by many been reckoned among thoſe creatures called zoophytes, or plant animals, as ſuppoſed to partake of the nature of vegetables and of animals. Some of the ſpecies of this fiſh are found looſe upon the ſmooth ſhores, and ſome fixed to the rocks which are always covered with water. M. Reaumur obſerves alſo, that many of the ſpecies have no property of ſtinging, or cauſing any painful ſenſation of the fleſh.

VULNERA'RIA, in botany, the name of a genus of plants, whoſe characters are theſe: the flower is of the papilionaceous kind, and from its cup, which is of a tubular form and turgid, there ariſes a piſtil, which finally becomes a ſhort pod, containing roundiſh ſeeds; and being contained in a membranaceous bladder, which was before the cup of the flower.

VULPES, *the fox*. This creature has been long famed for its cunning, and is plainly of the dog kind.

It differs, however, from the common dog in the length, denſe diſpoſition, and ſoftneſs of its hair, eſpecially thoſe about its tail, and in its ſmell, which is peculiarly rank and diſagreeable. Its uſual colour is a reddiſh tawny, though it is ſometimes found white, and ſometimes black. Its manner of digging itſelf a hole in the earth, is alſo a cuſtom wholly different from all the dog kind, and it is far from the tameneſs of that animal, being with difficulty made to loſe its fierceneſs. Its internal parts, in general, are very much like thoſe of a dog. *Ray's Syn. Quad.*

W.

WALE, or WAIL, in a ſhip, thoſe outermoſt timbers in a ſhip's ſide, on which men ſet their feet when they clamber up a ſhip's ſide. They are reckoned from the water, and called her firſt, ſecond, or third Wale, or bend.

WALL. Of all the materials for building Walls for ripening fruit, brick is generally the beſt, as it reflects a great deal of heat, retains its warmth a great while, and affords, by the ſmalneſs of the joints, the convenience of faſtening up the trees with ſmall nails. If theſe Walls are coped with free-ſtone, and have ſtone pilaſters at proper diſtances, to break the force of the winds, and ſhelter the fruit-trees, they make the moſt advantageous, as well as the moſt beautiful of all Walls.

It is ſometimes an advantageous thing to build theſe Walls upon arches, that the roots of the trees may have room to ſpread under, and to the other ſide of them. This is neceſſary when the ſoil is a hard gravel; for, without this, when the roots of peaches, &c. have reached the gravel, they find not ſufficient nouriſhment, and the trees canker and die. But, though Mr. Fairchild had found great advantages from this way of building Walls, Mr. Miller diſapproves it. Some alſo have propoſed the building ſlanting Walls; but the ſame author gives many reaſons why the perpendiculars are preferable, and ſeems to think, that, if Walls could be eaſily contrived to ſlope a little forward, they would be even preferable to theſe. *Miller's Gard. Dict.*

WALL, in fortification, is that part of the parapet which is contained in one piece from end to end, and is about 2½ or 3 feet high.

The embraſures in the Wall ſhould as much as poſſible be cut perpendicular to the parapet; therefore the battery ſhould be parallel, or nearly ſo, to the object to be battered: for the direct ſhots have moſt force; and oblique embraſures weaken the merlons, or parts of the parapet ſtanding between the embraſures.

The embraſures are uſually about 2 or 2½ feet wide on the inſide, and about 9 or 10 feet on the outſide; whereby the cannon may be traverſed from the right to the left, ſo as to command a pretty large extent in front. The diſtance from the middle of one embraſure to the middle of the next ſhould be about 18 feet, in order to leave ſufficient room for the working of the guns, and the ſtowage of the ſhot and other neceſſaries.

WA'LNUT, in botany. See the JUGLANS.

The effluvia of Walnut-trees are ſaid to be hurtful to the head. Mr. Boyle aſſures us they cauſed the head-ach in himſelf. *Works abr. Vol.* 1.

WA'MPUM, a ſort of ſhells, ſeveral of which, being ſtrung upon threads, are uſed as money among the Indians.

It is made of a ſhell formed into ſmall cylinders, of about one quarter of an inch long, and a fifth of an inch over, and, being bored as beads, is ſtrung in great numbers upon long ſtrings. In this ſtate it paſſes among the Indians in their uſual commerce, as ſilver and gold among us; but, being looſe, it is not ſo current.

It is both white and black, and the meaneſt is in ſingle ſtrings, of which the white goes at five ſhillings a fathom, and the black at ten; or, by number, the white at ſix a penny, the black at three. The next in value to the ſingle ſtrings is that which is wove into bracelets of about three quarters of a yard long, black and white, in ſtripes, and ſix pieces in a row, the warp conſiſting of leather thongs, and the woof of thread; theſe the gentlewomen among them wear, wound twice or oftener about their wriſts.

The moſt valuable of all is that woven into girdles. Theſe are compoſed of many rows, and the black and white pieces woven into ſquares or other figures. Theſe girdles are ſometimes worn as their richeſt ornaments; but they are oftener uſed in their great payments, and make their nobleſt preſents, and are laid up as their treaſure. *Grew's Muſæum.*

WARD'S *Pill.* Some have conjectured that this medicine, which had ſo great a run, and to which a diminution of the numbers in the bills of Mortality, one year after it happened to come on vogue, was ſaid in a public advertiſement to be owing; it has been conjectured, I ſay, that this medicine was made of butter of antimony; others think it the glaſs of antimony, and cinnabar of antimony amaſſed with gum tragacanth. See Ward's Pills diſſected, and *Med. Eſſ. Edinb.*

Mr. Clutton mentions ſome caſes where they did ſervice, but relates the hiſtories of fifty caſes where they did great miſchief.

To diſcover the compoſition of theſe pills, he diſſolved the ſeveral ſorts of them, and then, viewing with a microſcope the powder which precipitated, he ſaw three different-coloured powders remaining of the blue pill; to wit, a yellow, red, and white powder; the yellow and red agreed exactly with the glaſs of antimony, and the white ones appeared to be common arſenic. Ward's pill being incloſed in copper, and expoſed to a ſtrong heat, made the copper white, and as hard as iron, which arſenic always does. He alſo obſerved in this blue pill another powder, which he judged to be zaffer, that is, calcined, incorporated with flints. He thinks the proportion of the ingredients in this blue pill to be, one-third glaſs of antimony, near two-thirds of arſenic, and a very ſmall part of cobalt, or zaffer, with ſome powder of blue.

The red pill appeared to be much the ſame compoſition as the blue, only red arſenic was made uſe of inſtead of the white, and the colouring of blue powder was left out.

The purple pills tinged glaſs blue, which cobalt or zaffer does; and therefore Mr. Clutton thinks them principally compoſed of cobalt, with a little glaſs of antimony, which left a yellowiſh border upon the glaſs.

WA'RREN. The word Warren is now generally applied to a piece of ground ſet apart for the breeding and preſerving of rabbets.

In the ſetting up a Warren, great caution is to be uſed for the fixing upon a proper place and a right ſituation. It ſhould always be upon a ſmall aſcent, and expoſed to the eaſt or the ſouth. The ſoil that is moſt ſuitable, is that which is ſandy; for, when the ſoil is clayey or tough, the rabbets find vaſtly more difficulty in making their burrows, and never do it ſo well; and if the ſoil be boggy or mooriſh, there would be very little advantage from the Warren, for wet is very deſtructive of theſe animals.

All due precautions muſt be taken, that the Warren be ſo contrived, that the rabbets may habituate themſelves to it with eaſe. Many would have it that Warrens ſhould be incloſed with walls; but this is a very expenſive method, and ſeems not neceſſary nor adviſeable; for we find but very few that are ſo, and thoſe do not ſucceed at all the better for it.

Mr. Chomel's opinion is, that it ought to be ſurrounded with a ditch. This indeed is no fence to prevent the rabbets from going out, unleſs there be water in it; but it marks the intended bounds of the Warren, and the rabbets generally confine themſelves within its circumference, though not neceſſarily compelled to do ſo. The ſpace proper for a Warren has no limits but the owner's pleaſure; but, in general, the larger it is, the more profitable it alſo proves; and the rabbets, when once accuſtomed to the place, will keep within its bounds, though they are neither hemmed in with Walls nor ditches, nor any other fence whatever.

WASH, the diſtiller's name for the fermentable liquor, made by diſſolving the proper ſubject for fermentation and diſtillation in common water.

With reſpect to the proper workings of this liquor, great regard is to be had to the containing veſſel. Its purity, and the proviſion for its occaſional cloſeneſs, are the things to be principally conſidered. Though it is neceſſary that the veſſel be perfectly clean, yet in the cleanſing it great care muſt be taken that no ſoap, or other unctuous body, be uſed, for this would check the fermentation in it; and for the ſame reaſon all ſtrong alkaline lixiviums are to be avoided. Lime-water, or even the turbid ſolution of quick-lime, however, may be ſafely uſed for this purpoſe; and this is indeed particularly proper to deſtroy a prevailing acid, which is very apt to be generated about the ſides and bottoms of theſe veſſels, if the warm air has acceſs to them, and thus prevents the order of the fermentation. All ſtrong alkaline lixiviums have as bad an effect on the contrary, and a ſpecial care muſt be had that no corrupt or putrified yeaſt, nor any remains of former fermented matters, hang about the ſides of the veſſels, for this would infect whatever ſhould be afterwards put into them. Foulneſſes of this kind, when of long ſtanding, are of all others the moſt difficult to be cured, and often are of great damage to the diſtiller.

WASHING *of ores*, the purifying an ore of any metal by means of water, from earths and stones; which would otherwise render it difficult of fusion.

The method of doing it is this: break the ore to a coarse powder in an iron mortar, weigh twenty or thirty docimastical centners of it, put them into the Washing trough, and pour some water upon them, that the ore may be thoroughly moist; then have a vessel full of water, the diameter of which must be a little larger than the length of the trough; take the trough with the left-hand by the top of the hinder part, and, dipping it horizontally into the water, move it gently with the right-hand from the fore-part of the trough, which is always to be made the shallower part of it, towards the hinder part, which is deeper; then take out the trough, and incline it a little on the fore-part, that the water may run out, and the heavier metallic part remain at the bottom; repeat this several times, till the remains at the bottom of the trough are quite pure. If the stone in which ore is lodged be too hard for powdering in its natural state, as the flinty and debased crystalline ones commonly are; the whole must be calcined, and quenched in cold water several times over, and afterwards powdered and washed in this manner: when it is thus washed, assay a centner of it, and, from the head of metal this yields, it will be easy to estimate the value of the ore. *Cramer's Art of Assaying.*

WASP. The Wasp has four wings and six feet; his body is yellow, with black triangular spots: the common Wasp breeds in the ground. There is another kind much more fierce, but very rare: these breed in woods and mountains; they are larger, and have broader bodies, and much more black about them; their sting is so large, that it seems disproportioned to the size of their bodies.

To these are to be added the ichneumon Wasps, which are smaller than the others, and have very slender bodies, but of the same colours with the common kind: they usually live in the holes of mud-walls, and make a sort of porch of mud before the doors of their habitations.

There is also another Wasp common about Vienna; this is three times as large as the common kind, and seems of two different species, the one having rough antennæ, and the other smooth; they are both variegated with black and a bright yellow. *Mouffet's Hist. Insect.*

WASP-*fly*, in natural history, a species of fly having very much the external figure of a Wasp, but harmless, without a sting, and with only two wings.

WASP-*tipula*, in natural history, the name of an insect described by Mr. Reaumur, and being properly a tipula, or long-legs, though greatly resembling a Wasp.

WASTE-*cloths*, in a ship of war, the cloths hung up on the uppermost work of a ship's hull, to shade the men from an enemy in the fight; and therefore by some are called fights.

WASTE-*trees*, in a ship, are those timbers which lie in Waste.

WATCH-*glass*, aboard a ship, runs four hours and is used to shift or change their Watches by. There are also half Watches, hour-glasses, minute, and half-minute-glasses; by which last they count the knots, when they heave the log, in order to find the ship's way.

WAVE (*Dict.*)— The great Mr. Boyle has proved by numerous experiments, that the most violent wind never penetrates deeper than six feet into the water; and it should seem a natural consequence of this, that the water moved by it can only be elevated to the same height of six feet from the level of the surface in a calm; and this six feet of elevation being added to the six of excavation, in the part whence that water so elevated was raised, should give twelve feet for the utmost elevation of a Wave. This is a calculation that does great honour to its author; for Count Marsigli measured carefully the elevations of the Waves near Provence, and found that, in a very violent tempest, they arose only to seven feet above the natural level of the sea; and this additional foot in height he easily resolved into the accidental shocks of the water against the bottom, which was, in the place he measured them in, not so deep as to be out of the way of affecting the Waves; and he allows that the addition of one-sixth of the height of a Wave, from such a disturbance from the bottom, is a very moderate alteration from what would have been its height in a deep sea, and concludes, that Mr. Boyle's calculation holds perfectly right in deep seas, where the Waves are purely natural, and have no accidental causes to render them larger than their just proportion.

In deep water, under the high shores of the same part of France, this author found the natural elevation of the Waves to be only five feet; but he found also that their breaking against rocks, and other accidents to which they were liable in this place, often raised them to eight feet high.

We are not to suppose, from this calculation, that no Wave of the sea can rise more than six feet above its natural level in open and deep water, for Waves immensely higher than these are formed in violent tempests in the great seas. These, however, are not to be accounted Waves in their natural state, but they are single Waves formed of many others; for in these wide plains of water, when one Wave is raised by the wind, and would elevate itself up to the exact height of six feet, and no more, the motion of the water is so great, and the succession of Waves so quick, that, during the time this is rising, it receives into it several other Waves, each of which would have been at the same height with itself; these run into the first Wave one after another, as it is rising; by this means its rise is continued much longer than it naturally would have been, and it becomes terribly great. A number of these complex Waves arising together, and being continued in a long succession by the continuation of the storm, make the Waves so dangerous to ships, which the sailors in their phrase call mountains high. *Marsigli Hist. Phys. de la Mer.*

WAVE-*offering*, among the Jews, a sacrifice offered by agitation or waving towards the four cardinal points.

WEALD, or WALD, in the beginning of names of places, signifies a situation near woods; and the woody parts of the counties of Kent and Sussex are called the Wealds, though misprinted wildes, in the statute 14 Car. II. c. 6.

The word Weald in Saxon signifies a wood.

WEAVER's *Alarm*. This contrivance is only a weight fastened to a packthread, which is placed horizontally, so that in a certain time a candle may burn down to it. Then, the flame of the candle setting fire to the thread, the weight falls, and awakens the sleeping person. See *Phil. Trans.* N°. 477, where we have a figure to explain the invention, which got its name from being in frequent use among the Weavers.

WEEDS. The farmer finds it impossible ever wholly to destroy the Weeds in his lands; and the reason seems to be, that in many kinds the seeds will lie many years in the ground, and successively grow, some one year and some another; so that the destroying the crop entirely, for one year, does not kill them for succeeding ones. The seed of red-poppy will lie twenty years in the ground, in a land all that time occupied by saintfoin; and, if it be, after that, plowed for corn, they will all grow, and fill the field.

The seeds of these plants will never all come up in one year, because they must have their exact degrees of depth, moisture, and covering; the seeds which want any of these one year, lie to grow up another. The best defence the farmer has hitherto found against these enemies, is to endeavour their destruction by a summer fallow. This, if the weather be propitious, does make some havock among them, but it never destroys them entirely. If the seeds lie so high that the summer's heat parches them up, or so deep that it cannot reach them, they do not germinate, and are by that means saved for another year. And another thing which saves a very great number of them, is their being able to bear the heat and moisture of the whole year without growing. Wild oats, and many other seeds of Weeds, are of this kind. If you gather these when ripe, and sow them in the most careful manner, watering them at times, and taking all the care of them that is necessary to the most tender plants, they will not grow till the spring come twelve-months after they were sowed, and sometimes not till the spring after that; that is, two years and a half after the time of putting them into the ground. It is plain from this, that no art can destroy these by fallowing, or other means, in one year.

The common way of weeding among the young corn turns out to very little good; if this is done while the weeds are young, the greatest part of them are only cut or broken off near the ground; this, instead of destroying them, gives them new vigour, and they shoot up with many heads in the place of one, and draw more nourishment than at first: if, on the other hand, it is done when they are grown up, the relief comes after the disease; for by that time they have robbed the corn of all the nourishment, or nearly all, they could. Hand-weeders also frequently do more harm in the corn by treading it down, than they do good by taking out the Weeds. This operation sometimes costs the farmer twelve shillings an acre, besides the mischief done, and yet there remain Weeds enough for a crop the next year from seeds.

The method of horse-hoeing is a very excellent way of curing lands of this disease, so long as it is carefully practised; one of the greatest advantages it will bring the farmer is, that no Weeds will grow up but those whose seeds are brought in the air, and these are but very few in comparison of the other kinds.

WEEDS, in mining, a term used by our English diggers to express any sort of unprofitable substance found among the ores of metals. They seem to have borrowed the phrase from the gardeners; and as every thing with them is a Weed, except what they have planted, and expect to gather; so every thing is a Weed with the miners, except the thing they are sinking for.

The principal substances known in our mines under the names of Weeds, are mundic or marcasite; this is of three sorts, white, yellow, and green; daze, a kind of glittering talcy stone, of the telaugium kind, which endures the fire, and is of various colours and hardnesses; iron-moulds or pyritæ; caul, which is brownish and spungy; and glister, which is a sort of talc. *Phil. Trans.* N°. 69.

WEEVIL, in natural history, the name of a small insect which does great damages in magazines of corn, by eating into the several grains, and destroying their whole substance.

This creature is somewhat bigger than a large louse, and is of the scarab kind, having two pretty, jointed, tufted horns,

and

and a trunk or piercer, projecting from the fore-part of its head: at the end of this trunk, which is very long in proportion to its body, there are a sort of forceps, or sharp teeth, with which it gnaws its way into the heart of the grain, either to seek its food, or to deposit its eggs there. By keeping these creatures alive in glass tubes, with a few grains of wheat, their copulation and manner of generation have been discovered. The female perforates a grain of wheat, and therein deposits a single egg, or, at the utmost, two eggs; and this she does to five or six grains every day for several days together. These eggs, which are not longer than a grain of sand, in about a week, produce as odd a sort of white maggot, which wriggles its body very much about, but is very little able to move from place to place: this, in about a fortnight, turns to an aurelia, from which is produced the perfect Weevil. This destructive creature is itself very subject to be destroyed, and when in the egg or aurelia state, is very subject to be eaten by mites. *Baker's Microf.*

WEIGHT, *pondus*, in mechanics, is any thing to be raised, sustained, or moved by a machine; or any thing that in any manner resists the motion to be produced.

In all machines, there is a natural ratio between the Weight and the moving power.—If the Weight be increased, the power must be so too; that is, the wheels, &c. are to be multiplied, and so the time increased, or the velocity diminished.

"The center of gravity F, *Plate* XLII. *fig.* 9, of a body IH, together with the Weight of the body, being given; to determine the point M, in which, lying on an horizontal plane, a given Weight G, hung in L, cannot remove the body I H out of its horizontal situation."

Conceive a Weight hung in the center of gravity F, equal to the Weight of the whole body IH, and find the common center of gravity M, of that and the given Weight G.—If the point M be laid on the horizontal plane, the Weight G will not be able to move the body H I out of its place.

WELD, the name by which our farmers commonly call the luteola or dyers weed. This is a very rich commodity among the dyers, and is the more advantageous to the farmer, as it may be raised on very poor land, and at a very small expence. Moderately fertile land does best for it; but it will grow upon the most barren; and, if this be but dry and warm, it will require no tillage. The seed may be sown with barley or oats, and only harrowed in with brush or furze, and rolled down with a wooden roller. It is a very small seed, and the greatest difficulty about it is the sowing it even. It is a slow grower; a gallon of seed is sufficient for an acre; and, though it makes but little progress the first summer, it begins to grow after the corn is cut, and the next year yields a good crop.

There is a great nicety required in the time for gathering it; for this should be when the stalk is full ripe, and the seeds not so ripe as to fall out; it is to be pulled up by the hand, and made up into little bundles to dry. The seed may be either threshed out, as soon as it is housed, or in the spring following; but the plant must be carefully kept dry. The seed sells at about ten shillings the bushel, and the dyers use it for deep lemon colour, and bright yellows. It is more cultivated in Kent than in any other part of England, and it there yields the farmer from forty shillings to ten pounds an acre.

WET *Couch*, a term used by the maltsters for one of the principal articles of malt-making.

In the making malt, the usual way is to soak the grain in water two or three days, till it becomes plump and swelled, and the water is brown; the water is then drained away, and the barley is removed to a floor, where it is thrown into a wet couch, that is, an even heap of about two feet thick.

In this heap the barley spontaneously heats, and begins to grow, shooting out first the radicle, and, if suffered to continue growing, soon after the blade; but, at the eruption of the radicle, the process is to be stopped short, by spreading the wet couch thin over the floor, and turning it once every four or five hours for two days, laying it thicker each time; after this it is thrown into a large heap, and there suffered to grow hot of itself, and afterwards spread abroad again and cooled, and then thrown upon the kiln to be dried crisp without scorching. *Shaw's Lectures.*

Toothed WHALE, *cetus dentatus*, a name given to a peculiar kind of Whale, called by Johnston, and many other writers, by the too general name of balæna.

This is distinguished from the common Whale which yields the Whale-bone, by having white and strong teeth in the lower jaw, which that fish has not. This is the species of Whale from which the sperma ceti was originally taken. It was first of all discovered on the coast of New England, being thrown on the coast there, and sperma ceti formed by the sun and air out of the oil of its head; but it is far from being peculiar to that place; the northern seas afford it, and it is not unfrequently taken on the western coasts of Ireland. One caught there, about fifty years since, measured seventy-one feet in length, which is nineteen feet more than the length Clusius allows to this fish.

WHEAT.—When Wheat is planted early, less seed is required to an acre than when it is planted late, because less of it will die; and poor land should always be allowed more seed than rich, because a greater number of the plants will perish on this land than on the other. The least quantity of seed is necessary for rich land, that is planted early; for, in this case, very few of the seeds will fail to produce a plant that will live and flourish. The use of the hoe causes every plant to send out a great number of stalks from the same root, and in these, more, than in the number of plants, consists the richness of a crop, as the ears on these are always largest and fullest.

Another thing to be considered, in order to find the proper quantity of seed to plant, is, that some wheat of the same species has its grains twice as large as others: in this case a bushel, containing but half the number of grains that it does in small-grained wheat, one bushel of the small-grained will plant just as much as two bushels of this; not the measure of the seeds, but the number of the grains being the thing to be considered in regard to the sowing.

It is a very natural thing to suppose, that a large-grained Wheat will produce larger and finer plants, and larger grain than a small-grained one; but experiments have proved, that there is nothing in this; for the smallest-grained Wheat produces fully as large plants as the largest, and those with as great ears, and as big seeds; but the young plants appear smaller and poorer.

Six gallons of middle-sized seed is the usual quantity drilled upon an acre; but on rich lands, planted early, four gallons will suffice; because then the Wheat will have roots at the top of the ground before winter, and tiller very much, without danger of the worms, and many other accidents, which the late planted Wheat is very liable to.

If it be drilled too thin, it will be in danger of falling, and, if too thick, it may happen to tiller so late in the spring, that some of the ears may be blighted; a medium therefore is best.

The depth to plant it at is from half an inch to three inches; for, if planted too deep, there is more danger of its being eaten off by worms between the grain and the blade. A Wheat-plant that was not sown early, sends out no root above the grain before the spring, and is nourished all the winter by a single thread, proceeding from the grain up to the surface of the ground: this is the thread of life to the plant during the winter, and, the longer that is, the greater danger there is of the worm, that creature much more easily finding a thread that extends by its length to five or six inches deep, than one which reaches but one inch; besides, the worms in winter do not inhabit very near the surface of the ground, and therefore they never naturally come in the way of the short threads, though the long ones are always in their reach.

It is very necessary to take care against the rooks, just at the time when the Wheat is shooting up. These mischievous birds perceive it beginning to sprout, before the farmer can perceive any thing of it, and are led by the shoot to pick it up; they must be carefully kept off the ground for a week or ten days at this season; for at the end of that time the blade will be grown up, and the grain so exhausted of its flower, that it will be of no value to them, nor will they give themselves any trouble about stealing it.

The rooks never molest such Wheat as is sown about Michaelmas time; for at this season there is so much grain of the late harvest scattered about the fields where it has grown, that they find it much more worth their while to pick it up there, than to search under ground for it in the sown crops, which therefore escape till too far grown for this animal. *Tull's Horsehoeing Husbandry.*

The season for sowing Wheat is in the autumn in moist weather. In the down countries the farmers begin sowing of their Wheat in August, if there happens rain; so that when they are in their harvest, if the weather stops them, they employ their people in sowing: for, if the corn is not forward in the autumn, so as to cover the ground before winter, it seldom succeeds well on those dry lands; especially if the spring should prove dry. But in the low strong lands, if they get their Wheat into the ground by the middle of November, the farmers think they are in good season: but sometimes it so happens, from the badness of the season, that in many places the Wheat is not sown till Christmas, or after; but this lately sown Wheat is subject to run too much to straw, especially if the spring should prove moist.

The usual allowance of seed-wheat to one acre of land is three bushels; but, from repeated experiments, it has been found, that half that quantity is sufficient: therefore, if the farmers have regard to their own interest, they should save this expence of seed, which amounts to a considerable article in large farms, especially when it is to be purchased; which most of the skilful farmers do, at least every other year, by way of change; for they find, that the seeds continued long upon the same land will not succeed so well, as when they procure a change of seeds from a distant country. And the same is practised by the husbandmen of the Low-countries, who commonly procure fresh seeds from Sicily every second or third year; which they find succeed better with them, than

than the feeds of their own country. In the choice of the feeds, particular regard should be had to the land upon which it grew; for, if it is light land, the Wheat which grew upon strong land is the best; and so vice versa.

There have been some persons in England curious enough to procure their seed Wheat from Sicily, which has succeeded very well: but the grain of this has proved too hard for our English mills to grind, which has occasioned their neglecting to procure their seeds from thence; nor do I think there can be much advantage in procuring the seeds from abroad, since the lands of England are so various, as to afford as much change of seeds as will be necessary. And, the less we purchase from abroad, the greater will be the saving to the public; so that it should be the business of skilful farmers to want as few seeds as possible; since, by exchange with each other, they may so contrive, as not to part with ready money for any seeds.

The land which is usually allotted for Wheat, is laid fallow the summer before the corn is sown; during which time, it is plowed two or three times, to bring it into a tilth; and the oftener and better the ground is plowed, and the more it is laboured with harrows between each plowing, the better will be the crop, and the fewer weeds will be produced. But in this article most of the farmers are deficient; for, after they have given their lands one plowing, they frequently leave it to produce weeds, which sometimes are permitted to stand until they shed their seeds, whereby the ground will be plentifully stocked with weeds: and, as an excuse for this, they say, that these weeds will supply their sheep with some feed, and the dung of the sheep will mend their land. But this is a very bad piece of husbandry: for the weeds will draw from the land more than the dung of the sheep will supply: so that it is undoubtedly the best method to keep the ground as clean from weeds as possible, and to stir it often to separate the clods, and render the land fine. And, where the land can enjoy a winter's fallow, it will be of much greater service to it, than the summer: and, by thus labouring of the land, it will be of equal service to a dressing of dung. Therefore, if the farmers could be prevailed on to alter their method of husbandry, they would find their advantage in it: for the expence of dressing in some countries is so great, as to take away the whole profit of the crop.

There is also a very absurd method in common practice with the farmers, which is the carrying of their dressing, and spreading it on the land in the summer; where it lies exposed till the sun has dried out all the goodness of it, before it is plowed into the ground; so that the dressing is of little value: but the dung should never be laid on the land faster than it can be plowed in; for one load of dung, so managed, is better than three in their usual method.

As Wheat remains a longer time upon the ground than most other sorts of corn, it requires a greater stock of nourishment, to lengthen and fill the ears: therefore, if the dressing is exhausted in winter, the corn will have but short ears, and those but lean, nor will the grain afford much flour: so that it frequently happens, that a light dressing of soot in the spring, at the time when the Wheat is beginning to stalk, proves of greater service to the crop, than a dressing of dung laid on the land before it is plowed; especially if the dung is not very good. Deep plowing, where the staple of the ground is deep enough to admit of it, will also be of great service to the corn; for the small fibres of the roots, which are the mouths that supply the nourishment, extend themselves very deep into the ground. I have traced many of them upwards of three feet, and do believe they spread much farther where the ground is light; therefore it is of great advantage to the crop to have the ground stirred and loosened to a proper depth.

Of late years, many composts have been advertised for the steeping of the seeds of corn, in order to improve their growth: some of these have been sold at a dear rate: but as so great success was assured by the inventors, to those who should make use of them, there were numbers of persons who made the trial; but, so far as I have been able to get information of the experiments, they did not succeed so well, as to encourage the use of these compositions. For in some trials, which I made myself with great care, it was found, that the Wheat which had been steeped in the composition, came up sooner, and grew much ranker in the winter, than that which had not been steeped: but in the spring the unsteeped Wheat had a greater number of stalks to each plant, and the ears were better fed, than those which had been steeped: therefore these sorts of composts have been found of no use to the crop.

I have before observed, that, in general, the farmers sow more than double the quantity of corn on their lands than is necessary: therefore there is a great waste of grain, which, in scarce years, amounts to a considerable sum in large farms. But I fear, whatever can be said to prevent this, will have but little weight with the practitioners of agriculture; who are so fond of old customs, as rarely to be prevailed on to alter them, though they are extremely absurd. But, if these people could be prevailed on to make the trial with care, they must be soon convinced of their error: for, if they will but examine a field of corn sown in the common way, they will find but few roots with more than two or three stalks, unless by chance, where there may be some few roots which have room to spread; upon which there may be six, eight, or ten stalks, and frequently many more. I have seen a field of Wheat which had not a greater allowance than one bushel of corn to an acre, where the produce was much greater than in any which was sown with the common allowance. And if the land is good, and the roots stand at a proper distance from each other, there will be few roots which will not produce as many stalks as I have here mentioned, and the ears will be better nourished.

But, if the land is not covered with the blades of corn by the spring, the farmers think they shall have no crop; whereas, if they had patience to wait till the roots put out their stems, they would soon be convinced of the contrary; especially if they could be prevailed on to draw the roller over the Wheat in March, which will cause it to spread, and produce the more stalks. But, before this operation, it will be proper to have the corn cleaned from weeds; for, if these are permitted to grow, they will draw away much nourishment from the corn. And, if at this season the land is made clean of weeds, the corn will soon after spread, and cover the ground, whereby the growth of weeds will be greatly lessened.

There is not any part of husbandry which requires the farmer's attention more, than that of keeping his land clean from weeds; and yet there are few who trouble themselves about it, or who understand the proper method of doing it. Few of them know those weeds which are annual, so as to distinguish them from those which are perennial; and, without this knowledge, it will be much more difficult for a person to clean his land, let his industry be ever so great: for annual weeds may be soon destroyed, if taken in time; whereas, if they are neglected, their seeds will soon ripen, and scatter; after which it will require three times the labour and expence to get rid of them, as would have been sufficient at the beginning; and then the crop would have had no bad neighbours to rob it of its nourishment. There is also another great advantage in keeping of corn clean from weeds, which is, that the corn is not so liable to take the smut, as when it is full of weeds, as I have frequently observed; so that cleanness is as essential to the well-doing and growth of vegetables, as in animals. And the changing of the seed annually is also as necessary, as the change of air is to all sorts of animals: for, where this has been carefully practised, there has rarely happened any smutty corn on the farms.

Brining of the seed-wheat is what the farmers generally practise, to prevent the smut; which in most years answers very well: but there is nothing which contributes more to this, than keeping the plants in good health: which is better effected in the drill-husbandry, than in the common method of sowing in broad-cast: for, by stirring of the ground with the hoe-plough between the rows of corn in the spring, the roots will be better supplied with nourishment: for, in strong lands, where the water may have lain in the winter, the ground will bind so hard on the first dry weather, as to stint the corn, and frequently cause it to change colour. When this happens, the roots seldom put out many stalks; and those which are put out, are weak: but, where the ground can be stirred to loosen the parts, the corn will soon recover its colour and strength, and cover the land with shoots: and this corn will be much less in danger of being lodged by wet or wind, the stalks being very strong.

Indeed the horse-hoeing husbandry has many advantages of the common method; but it is not likely to be brought into general practice by the present set of husbandmen: so that, unless the gentlemen who have lands in their hands introduce it, and encourage young persons to undertake it, who are not so much attached to the old practice, there is little hope of seeing this sort of husbandry spread in England.

The produce of an acre of Wheat is various, according to the goodness of the soil. In some of the shallow down-lands, where there have been near four bushels of corn sown, I have known the produce not double of the seed: but, when this is the case, the farmer had much better let his land lie waste, since the produce will not defray the expence; so that more than the rent of the land is lost. And, although these sort of crops are frequent on such lands, yet such is the passion for plowing among the husbandmen at present, that, if they were not restrained by their landlords, they would introduce the plough into every field, notwithstanding they are sure to lose by it.

But, although the produce of these poor downs is so small, as before related; yet, upon good land, where the corn has stood thin upon the ground, I have known eight quarters reaped from an acre, over the whole field, and sometimes much more. And I have been informed by persons of great credit, that on good land, which was drilled and managed with the horse-hoe, they have had twelve quarters from an acre of land; which is a great produce: and this is with greater certainty, if the seasons prove bad, than can be expected by the common husbandry.

The price of corn varies continually; and this variation is often very great in the space of one or two years: so that from

from being so cheap, as that the farmers could not pay their rents, in the compass of a year the price has been doubled. But this might be so managed by an honest administration, by purchasing from the needy farmers in times of plenty, at a moderate price, and laying it up in public granaries, until there is a scarcity, as to supply the poor; whereby the public will never be in danger of wanting the staff of life, nor will the farmers suffer by having too great plenty. For, when the Wheat is sold much under four shillings the bushel, the farmer cannot pay his rent, and live; nor can the poorer sort of people afford to purchase good bread, when the wheat is sold at a price much higher than five shillings the bushel: therefore, when it is at a medium, between these, there can be no great cause of complaint. *Miller's Gard. Dict.*

Buck WHEAT. See BUCK *Wheat*.

WHEEL (*Dict.*)—The Wheel is one of the principal mechanic powers.—It has places in most engines; in effect, it is of an assemblage of Wheels, that most of our chief engines are composed.—Witness clocks, mills, &c.

Its form is various, according to the motions it is to have; and the use it is to answer.—By this it is distinguished into simple and dented.

Simple WHEELS, are those whose circumference and axis is uniform, and which are used singly, and not combined.—Such are the Wheels of carriages; which are to have a double motion: the one circular about their axis; the other rectilinear; by which they advance along the road, &c. which two motions they appear to have; though, in effect, they have but one: it being impossible the same thing should move, or be agitated two different ways at the same time.

This one is a spiral motion; as is easily seen, by fixing a piece of chalk on the face of a Wheel, so as it may draw a line on a wall, as the Wheel moves.—The line it here traces is a just spiral, and still the more curve, as the chalk is fixed nearer the axis.

We shall add, that, in Wheels of this kind, the heighth should always be proportioned to the stature of the animal that draws or moves them.—The rule is, that the load and the axis of the Wheels be of the same heighth with the power that moves them: otherwise, the axis being higher than the beast, part of the load will lie on him; or, if it be lower, he pulls to disadvantage, and must exert a greater force. Though Stevinus, Dr. Wallis, &c. shew, that to draw a vehicle, &c. over waste, uneven places, it were best to fix the traces to the Wheels lower than the horses breast.

The power of these Wheels results from the difference of the radii of the axis and circumference.—The canon is this: "As the radius of the axis is to that of the circumference, so is any power, to the weight it can sustain hereby."

This is also the rule in the axis in the peritrochio; and, in effect, the Wheel, and the axis in peritrochio, are the same thing; only, in theory, it it usually called by the latter name, and, in practice, by the former.

Dented WHEELS, are those either whose circumference, or axis, is cut into teeth, by which they are capable of moving and acting on one another, and of being combined together.

The power of the dented Wheel depends on the same principle, as that of the simple one.—It is only that to the simple axis in peritrochio, which a compound lever is to a simple lever.

Its doctrine is comprised in the following canon, viz.—"The ratio of the power to the weight," in order for that to be equivalent to this, "must be compounded of the ratio's of the diameter of the axis of the last Wheel to the diameter of the first; and of the ratio of the number of revolutions of the last Wheel, to those of the first," in the same time.—But this doctrine will deserve a more particular explication."

1. Then, if the weight be multiplied into the product of the radii of the axis, and that product be divided by the product of the radii of the Wheels, the power required to sustain the weight will be found.—Suppose, for instance, the weight A, *Plate* XLII. *fig.* 8. $= 6000$ pounds, $BC = 6$ inches, $CD = 34$ inches, $EF = 5$ inches, $EG = 35$ inches, $HI = 4$ inches, $HK = 27$ inches. Then will BC, EF, $HI = 120$: and CD, EG, $IK = 32130$. Hence the power, required to sustain the weight, will be $6000.\ 120 : 32130 = 22\frac{1}{2}$ very nearly; a small addition to which will raise it.

2. If the power be multiplied into the product of the radii of the Wheels, and the factum be divided by the product of the radii of the axis; the quotient will be the weight, which the power is able to sustain.—Thus, if the power be $22\frac{1}{2}$ of a pound, the weight will be 6000 pounds.

3. "A power and a weight being given, to find the number of Wheels, and in each Wheel, so, as that the radius of the axis, to the radius of the Wheel: so, as that the power, being applied perpendicularly to the periphery of the last Wheel, may sustain the given weight."

Divide the weight by the power: resolve the quotient into the factors which produce it.—Then will the number of factors be the number of Wheels; and the radii of the axes will be to the radii of the Wheels, as unity to the several Wheels.—Suppose, for instance, a weight of 3000 pounds, and a power of 60, is 500, which resolves into these factors, 4. 5. 5. 5. Four Wheels are to be made, in one of which, the radius of the axis is to be the radius of the Wheel, as 1 to 4.—In the rest, as 1 to 5.

4. If a power move a weight by means of two Wheels, the revolutions of the slower Wheel are to those of the swifter, as the periphery of the swifter axis is to the periphery of the Wheel that catches on it.

Hence, 1. the revolutions are as the radius of the axis F E, to the radius of the Wheel D C.—2. Since the number of teeth in the axis F D is to the number of teeth in the circumference of the Wheel M, as the circumference of that, to the circumference of this: the revolutions of the slower Wheel M are to the revolutions of the swifter N, as the number of teeth in the axis, to the number of teeth in the Wheel M it catches into.

5. If the factum of the radii of the Wheels, G D, D C, be multiplied into the number of revolutions of the slowest Wheel M; and the product be divided by the factum of the radii of the axes which catch into them, G H, D E, &c. the quotient will be the number of revolutions of the swiftest Wheel O. For instance, if $GE = 8$, $DC = 12$, $GH = 4$, $DE = 3$, and the revolution of the Wheel M be one; the number of revolutions of the Wheel O will be 8.

6. If a power move a weight by means of divers Wheels, the space, passed over by the weight, is to the space of the power, as the power to the weight.—Hence, the greater the power, the faster is the weight moved; and vice versa.

7. The spaces, passed over by the weight and the power, are in a ratio compounded of the revolutions of the slowest Wheel, to the revolutions of the swiftest; and of the periphery of the axis of that, to the periphery of this.—Hence, since the space of the weight and the power are reciprocally as the sustaining power to the weight; the power that sustains a weight, will be to the weight, in a ratio compounded of the revolutions of the slowest Wheel, to those of the swiftest, and of the periphery of the axis of that, to the periphery of this.

8. "The periphery of the axis of the slowest Wheel, with the periphery of the swiftest Wheel, given; as also, the ratio of the revolutions of the one, to those of the other: to find the space which the power is to pass over, while the weight goes any given length."

Multiply the periphery of the axis of the slowest Wheel, into the antecedent term of the ratio, and the periphery of the swiftest Wheel, into the consequent term; and to these two products, and the given space of the weight, find a fourth proportional: this will be the space of the power.—Suppose, for instance, the ratio of the revolutions of the slowest Wheel, to those of the swiftest, to be as 2 to 7; and the space of the weight 30 feet: and let the periphery of the axis of the slowest Wheel be to that of the swiftest, as 3 to 8. The space of the power will be found 280.

9. "The ratio of the peripheries of the swiftest Wheel, and of the axis of the slowest; together with the ratio of their revolutions, and the weight, being given: to find the power able to sustain it."

Multiply both the antecedents and the consequents of the given ratio's into each other: and to the product of the antecedents, the product of the consequents, and the given weight, find a fourth proportional: that will be the power required.—Suppose, for instance, the ratio of the peripheries 8 : 3. That of the revolutions 7 : 2; and the weight 2000: the power will be found $214\frac{2}{7}$.—After the same manner may the weight be found; the power and the ratio of the peripheries, &c. being given.

10. "The revolutions the swiftest Wheel is to perform, while the slowest makes one revolution, being given; together with the space the weight is to be raised, and the periphery of the slowest Wheel; to find the time that will be spent in raising it."

Say, as the periphery of the axis of the slowest Wheel is to the space of the weight given; so is the given number of revolutions of the swiftest Wheel, to a fourth proportional; which will be the number of revolutions, performed while the weight reaches the given heighth.—Then, by experiment, determine the number of revolutions the swiftest Wheel performs in an hour; and, by this, divide the fourth proportional found before.—The quotient will be the time spent in raising the weight.

Centrifugal WHEEL, a name given by Dr. Desaguliers to a machine for extracting the foul air out of hospitals, ships, &c.

Plate XLII. *fig.* 10. represents a case D E C B, containing a Wheel of seven feet in diameter, and one thick; being a cylindrical box, divided into twelve cavities by partitions directed from the circumference towards the center, but wanting nine inches of reaching the center, being open towards the center, and also towards the circumference, and only closed at the circumference by the case, in which the Wheel turns by means of an handle fixed to its axis A, which axis turns in two iron forks, or half concave cylinders of bell-metal, such as A, fixed to the upright timber or standard A E.

From the middle of the case on the other side behind A, there

 comes

comes out a trunk or square pipe, which we call the sucking-pipe; which is continued quite to the upper part of the sick person's room, whether it be near or far from the place where the machine stands, in an upper or lower story, above or below the machine. There is a circular hole in one of the circular planes, of the machine of eighteen inches diameter round the axis, just where the pipe is inserted into the case, whereby the pipe communicates with all the cavities; and, as the Wheel is turned swiftly round, the air which comes from the sick room is taken in at the center of the Wheel, and driven to the circumference, so as to go out with great swiftness at the blowing-pipe B, fixed to the said circumference.

As the foul air is drawn away from the sick rooms, the air in the neighbouring apartments will gradually come into the room through the smallest passages: but there is a contrivance to apply the pipes which go to the sick room to the blowing-pipe B, while the sucking-pipe receives its air only from the room where the machine stands. By this means fresh air may be driven into the sick room, after the foul has been drawn out.

This machine would be of great use in all hospitals, and in prisons: it would also serve very well to convey warm or cold air into any distant room; nay, to perfume it insensibly, upon occasion.

Fig. 11. Represents the inside of the flat of the Wheel which is farthest from the handle, and next to the sucking-pipe.

1, 2, 3, 4. Represents the cavity or hole which receives the air round the axis, having about it a circular plate of iron, to hold all firm; which plate is made fast to the wood, and to the iron cross that has the axis in it.

g g g. Denotes, by a pricked circle, a narrow ring of thick blanketting, which, by pressing against the outside case, whilst it is fixed to the outside of the flat of the Wheel, makes the passage into the Wheel tight.

H H H, is another circle of blanketting, likewise fixed to the outside of the Wheel, and rubbing against the case, that the air, violently driven against the inner circumference of the case, may have no way out, but at the blowing-pipe.

There is on the outside of the other flat of the Wheel, where the handle is fixed, a ring of blanketting, like H H H, opposite to it; but none opposite to *g g g*, because the wood there is not open, but comes home close to the axis.

Fig. 12. Gives a vertical section of the Wheel and case a little forward of the axis, drawn by a scale twice as large as that of the other two figures.

A *a*, the axis separated by the irons A *a*, cylindrically hollowed except the upper part, where a pin keeps in the axis.

B D, the case with the sucking-pipe S *a*.

E A, the prop for one end of the axis.

1, 2. The opening into the wheel.

g g. The eminence of the wood, to which is fixed the small ring of blanketting.

The four black marks, one of which is near H, represent the sections of the two other rings of blanketting. *Desaguliers's Course of Philosophy.*

WHEE'ZING, a name given by our farriers to a distemperature in horses, in which they draw their breath with difficulty and noise.

The generality of people make this and pursiness in horses the same distemper; but the more judicious always distinguish it, as wholly different from that. Pursiness proceeds always from a stuffing or oppression of the lungs; but this Wheezing is only owing to the narrowness of the passages between the bones and gristles of the nose.

The horses that are most of all afflicted with this distemper, do not want wind; for, notwithstanding they wheeze excessively when they are exercised, yet all the time their flanks are not moved, but keep in the same condition that they were while the creature stood still. The dealers call these sort of horses blowers, and, though there is no real harm in the thing, it is a disagreeable quality, and few people will chuse them that have much service for them.

There are some horses that have a natural defect in their breathing, which makes it at all times attended with some difficulty, but not with the Wheezing before-mentioned; these are called thick-winded horses.

People who are careful in the buying horses, will purchase neither of these kinds; but then is this caution to be observed in regard to this defect, that it often seems to be in horses where it really is not. When a horse has been kept a long time in the stable without exercise, he will, at the first riding, be out of breath, and fetch it in a difficult and painful manner, though he be neither a blower or thick-winded; but all this will go off with a little exercise.

There are some temporary wheezers and blowers among horses: these, at times, rattle, and make a great noise through their noses in taking breath; but the complaint goes off and returns. This is only occasioned by a great quantity of phlegm, for their flanks do not redouble with it at the worst of times, nor have they any cough with it; so that there is no danger of their being pursy.

WHI'PLADE, in husbandry, a term used by the farmers in some places, for a particular sort of cart, whose hinder part is made up of boards, after the manner of a dung-cart, having also a head of boards, and shambles over the thills; this head being made so as either to be taken out or left in. The cart may be indifferently used to carry dung or other things; dung when the head is in, and corn, &c. when it is taken out.

WHIRL-*pool*. These, in rivers, are very common, from various accidents, and are usually very trivial, and of little consequence. In the sea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine Whirl-pool among the Orcades, which would prove very dangerous to strangers, though it is of no consequence to the people who are used to it. This is not fixed to any particular place, but appears in various parts of the limits of the sea among those islands. Wherever it appears, it is very furious, and boats, &c. would be inevitably drawn in and perish with it; but the people who navigate them are prepared for it, and always carry an empty vessel, a log of wood, or large bundle of straw, or some such thing in the boat with them; as soon as they perceive the Whirl-pool, they toss this within its vortex, keeping themselves out; this substance, whatever it be, is immediately received into the center, and carried under water; as soon as this is done, the surface of the place where the Whirl-pool was becomes smooth, and they row over it with safety; and in about an hour they see the vortex begin again in some other place, usually at about a mile distance from the first.

WHI'STLE-*fish*, a name given by the people of Cornwall to a species of gadus with only two fins on the back, otherwise called mustela fluviatilis.

WHITE *Land*, in agriculture, a tough clayey soil, naturally of a somewhat whitish hue when dry, especially when it has lain some time untilled, but becoming blackish after rain; this appears of a light greyish colour, when turned up by the plough, and slides off from the plough-share with ease, and with a smooth glossy surface.

It has often a yellowish hue with the grey, and is often veined with large parcels of a blue marly earth. *Moreton's Northamptonshire.*

WHITE *Throat*, in zoology, the name of a small bird, very common in our gardens and hedges, and seeming to have been described under the name of spipola by Aldrovandus and some others, though most approaching to the ficedula class.

WHITE *upon* WHITE, in the porcelain manufactory, a name given by the English merchants to a particular China-ware, which is formed of three different white substances, the body being of one, the flowers of another, and the varnish which covers these of a third.

The principal art, in the making this sort of China, is the finding the proper degree of dryness in the vessels for receiving the pencilling or upper coats. It is a fine art. And the principal colour is made of an earth called hoache, which is much of the nature of our steatites.

WHI'TING, in zoology, the English name of a common fish of the asellus kind, commonly distinguished by the writers in ichthyography, by the name of asellus mollis, though by some called asellus albus and merlangus.

The Whiting is distinguished from the other species of the cod kind by these characters: it is of a small size, seldom much exceeding a foot in length, and is thin and slender in proportion to its length, particularly about the tail. Its scales are very small, and its colour much more pale and whitish, than in any other fish of the cod kind, whence it has its English name. The belly is white, and the belly-fins behind the tail are spotted with small black dots. It has no beard. Its eyes are large, and its upper jaw longer than its under; so that its teeth, which are large and crooked, fall over, and are uncovered when the mouth is shut; and the inner part of this jaw is armed also with very small teeth. Its belly, or rather its breast-fins, are nearer the head than in any other species. It is common in the English seas and elsewhere. *Willughby's Hist. Pisc.*

WI'CKER-*tree*, a name given by the English to a tree common in China, and described by Kircher and others. It is, as it were, a rope twisted by nature, about an inch thick, and creeps along the earth often for above a hundred paces together, much embarrassing the way, but serving for cables of ships, seats, hurdles, beds, mats, and various other necessary uses. It endures no vermin, and is much valued for being cool and refreshing in the hot seasons. *Kircher's China Illust.*

WI'CRANGLE, in zoology, an English name for the mattagess, or greater butcher-bird, the lanius cinereus major of authors. *Ray's Ornithol.*

WICRA'NTUM, in natural history, a name given by the people of the East-Indies to certain fossil bodies, of the nature of the pyrites, of the size of pease, and formed into variously angular figures.

WI'LDERNESS, in gardening. There is nothing so great an ornament to a large garden as a Wilderness, when properly contrived and judiciously planted.

The Wilderness should always be proportioned to the size of the garden, and should never be situated too near the house; because the trees perspire so large a quantity of watery vapours, as make the air very unwholesome. They should never be so placed as to block up a good prospect; but, where the view naturally

naturally ends with the verge of the garden or little more, nothing terminates it so well as a fine plantation of trees. The size of the trees should be considered, and tall growing ones should be planted in larger places; smaller, in less extensive; ever-greens also should be kept by themselves, and placed most in sight, not mingled confusedly among the trees which cast their leaves.

The walks should be large, and not numerous; the large walk is best made serpentine, and this should not be entered upon the grand walks of the garden, but by some private walk. *Miller's Gard. Dict.*

WILDS, a term used by our farmers to express that part of a plough by which the whole is drawn forwards.

The Wilds are of iron, and are of the form of a gallows, whence they are by some called the gallows of the plough, but improperly, the gallows of the plough being properly that part formed by the crow-staves, and the transverse piece into which they are mortised at the top.

The Wilds consist of two legs, and a transverse top-piece: one of the legs and the top-piece are all of one piece of iron, and the other leg, which is loose, has a hole in the top, into which the end of the transverse piece is received; both these legs pass through the box of the plough, which is that transverse timber through which the spindles of the wheels run: these legs are pinned in behind the box with iron pins; the holes through the box at which these legs pass, are not made at right angles, but slanting upwards, so that the fore-part of the Wilds is higher than the hinder part; were it not for this, the upper part of the crow-staves would lean quite back when the plough is drawn.

The use of the notches in the Wilds is to give the plough a broader or narrower furrow; if the links are moved to the notches on the right-hand, it brings the wheels towards the left, which gives a greater furrow; and, on the contrary, a smaller furrow is made when the links are moved to the notches on the left. The legs of the Wilds should be nineteen inches, and their distance eight inches and a half; they must be made strong, and the links must be placed in different notches, that the front of the plough may be kept steady, and the wheels not be drawn one before the other. These links are of iron also, and are six inches and a half long, and to these are fastened the chains of the harness, by which the whole plough is drawn along. *Tull's Husbandry.*

WILLOW, *salix*, in botany, a genus of plants, whose characters are:

The leaves are entire; the flower, which is male, and grows on a separate plant, is amentaceous, spiked, and consists of a multitude of stamina. The ovary, which is found only on the female plant, is furnished with a long tube, adorned with four horns, is of a conoidal figure and constituted in such a manner as to become a spiked fruit, containing a multitude of capsules resembling horns, and gaping by maturity into two parts. These capsules are full of many downy seeds.

There are a great number of species to be found in England, especially of the sallows, as I have been informed by a very judicious basket-maker, there are at least thirty sorts, which they distinguish by name, commonly in use in their trade; and, besides these, there are a great number of mountain Willows, which grow upon dry grounds, and are cultivated as underwood, in many parts of England.

All the sorts of Willows may be easily propagated by planting cuttings or sets in the spring, which readily take root, and are of quick growth. Those sorts which grow to be large trees, and are cultivated for their timber, are generally planted from sets, which are about seven or eight feet long: these are sharpened their larger end, and thrust into the ground by the sides of ditches and banks, where the ground is moist; in which places they make a considerable progress, and are a great improvement to such estates; because their tops will be fit to lop every fourth or fifth year. The larger wood, if sound, is commonly sold for making wooden heels, and pegs for shoes; as also to the turners, for many kinds of light wares.

The sallows are commonly planted in cuttings made from strong shoots of the former year, and are about three feet long; these are commonly thrust down two feet deep into the ground, and are one foot above it. The soil should always be dug or plowed before they are planted, and the cuttings placed about three feet row from row, and eighteen inches asunder in the rows; observing always to place the rows the sloping way of the ground, especially if the tides overflow the place; because, if the rows are placed the contrary ways, all the filth and weeds will be detained by the plants, which will choak them up.

The best season for planting these cuttings is in February; for, if they are planted sooner, they are apt to peel, if it proves hard frost, which greatly injures them.

These plants are always cut every year; and, if the soil be good, they will produce a great crop, so that the yearly produce of one acre has been often sold for fifteen pounds; but ten pounds is a common price, which is much better than corn-land; so that it is great pity these plants are not more cultivated, especially upon moist boggy soils, upon which few other things will thrive.

WIND (*Dict.*)— The husbandman often suffers extremely by high Winds, in many different respects. Plantations of trees, at a small distance from the barns and houses, are the best safeguard against their suffering by Winds; but they must not be planted so near, as that their fall, if it should happen, would endanger them. Yews grow very slowly, otherwise they are the best of all trees for this defensive plantation. Trees suffer by Winds, being either broken or blown down by them; but this may be in a great measure prevented by cutting off great part of the heads and branches of them in places where they stand most exposed.

Hops are the most subject to be injured by Winds of any crop; but this may be in a great measure prevented by a high pale, or very thick thorn hedge; this will both keep off the spring Wind, which nips the young buds, and be great safeguard against other Winds that would tear the plants from their poles. The poles should always be very firm in the ground; and the best security to be added to this is a row of tall trees all round the ground.

Winds, attended with rain, do vast injury to the corn, by laying it flat to the ground. The best method of preventing this, is to keep up good inclosures; and, if the accident happens, the corn should be cut immediately, for it never grows at all afterwards. It should be left on the ground, in this case, some time after the cutting, to harden the grain in the ear. *Mortimer's Husbandry.*

WIND *flower*, in botany, the English name of the anemone. See the article ANEMONE.

WIND-*gall*, a name given by our farriers to a distemperature of horses. In this case, there are bladders full of a corrupt jelly, which, when let out, is thick, and of the colour of the yolk of an egg.

They vary in size, but are more usually small than large. Their place is about the fetlock joint, and they grow indifferently on all four legs, and are often so painful, especially in the summer-season, when the weather is hot, and the ground dry and hard, that they make the creature frequently stumble, or fall absolutely down.

The general method of cure is to open the swelling about the length of a bean, and to press out the jelly: when this is done, they apply a mixture of the oil of bays and the white of an egg, covering it with tow.

Another method is, after the jelly is all squeesed out, to wrap round the part a woollen cloath, and then applying a taylor's hot iron, this is to be rubbed over till all the moisture is carried away; it is then to be daubed all over with pitch, mastich, and resin, boiled together, laying tow in plenty over all.

The Wind-galls that are situated near the sinews, are much the most painful of all, and soonest make the horse lame.

The general cause of Wind-galls is supposed to be extreme work, or exercise in very hot weather; but it is to be observed, that those horses, which have long joints, will be Wind-galled, if they work never so little.

The worst Wind-galls are those of the hinder legs; all the above-mentioned will frequently miss of success in these, and nothing but fire will cure them.

WIND-*hatch*, in mining, a term used to express the place at which the ore is taken out of the mines.

The word hatch is the general term used by the miners to express an opening from the surface into the mine, or in the attempting to find a mine.

Thus the word essay-hatches signifies the openings made in search of the trains of shoad-stones; and the tin-hatch in Cornwall is the name of the opening by which they descend into a tin-mine.

The word Wind-hatch seems to be a corruption of winder-hatch; for at these places, they have a winder conveying two buckets, the one constantly up, the other constantly down; the man below fills the bucket that descends; and, when that which ascends full is emptied at the mouth of the hatch, the person who has the care of that part of the work, delivers it empty to go down again. *Phil. Transf.* N°. 69.

WIND-*sails*, in a ship, are made of the common sail-cloth, and are usually between twenty-five and thirty feet long according to the size of the ship, and are of the form of a cone ending obtusely: when they are made use of, they are hoised by ropes to about two-thirds or more of their height, with their basis distended circularly by hoops, and their apex hanging downwards, in the hatch-ways of the ship; above each of these, one of the common sails is so disposed, that the greatest part of the air, rushing against it, is directed into the Wind-sail, and conveyed, as through a funnel, into the upper parts of the body of the ship. *Phil. Transf.* N°. 463.

WIND-*shock*, a name given by our farmers to a distemperature to which fruit-trees, and sometimes timber-trees, are subject. It is a sort of bruise and shiver throughout the whole substance of the tree; but, the bark not being often affected by it, it is not seen on the outside, while the inside is twisted round and greatly injured.

It is by some supposed to be occasioned by high Winds; but others attribute it to lightning. Those trees are most usually affected by it, whose boughs grow more out on one side than on the other.

The

The beſt way of preventing this, in valuable trees, is to take care, in the plantation, that they are ſheltered well, and to cut them frequently in a regular manner, while young.

The Winds not only twiſt trees in this manner, but they often throw them wholly down: in this caſe, the common method is to cut up the tree for firing, or other uſes; but, if it be a tree that is worth preſerving, and if it be not broken, but only torn up by the roots, it may be proper to raiſe it again by the following method: let a hole be dug deep enough to receive its roots in the place where they before were; let the ſtraggling roots be cut off, and ſome of the branches, and part of the head of the tree; then let it be raiſed; and when the torn-up roots are replaced in the earth, in their natural ſituation, let them be well covered, and the hole filled up with rammed earth; the tree will, in this caſe, grow as well, and perhaps better, than before. If nature be left to herſelf, and the trees be not very large, the pulling off the roots will raiſe it. *Mortimer's Huſbandry.*

Venetian WINDOW, a very elegant Window, invented by the Venetians. *Plate* IV. *fig.* 1. in the Dictionary, repreſents a Window of this kind.

WINE (*Dict.*)—The method of converting white Wine into red, ſo much practiſed by the modern Wine-coopers, is this: put four ounces of turnſole rags into an earthen veſſel, and pour upon them a pint of boiling water; cover the veſſel cloſe, and leave it to cool; ſtrain off the liquor, which will be of a fine deep red inclining to purple. A ſmall proportion of this colours a large quantity of Wine. This tincture might be either made in brandy, or mixed with it, or elſe made into a ſyrup with ſugar for keeping. A common way with the Wine-coopers is to infuſe the rags cold in Wine for a night or more, and then wring them out with their hands; but the inconveniency of this method is, that it gives the Wine a diſagreeable taſte, or what is commonly called the taſte of the rag; whence the Wines, thus coloured, uſually paſs among judges, for preſſed Wines, which have all this taſte from the canvas rags in which the lees are preſſed.

The way of extracting the tincture, as here directed, is not only attended with this inconveniency; but it loads the Wine with water; and, if made into a ſyrup, or mixed with brandy, it would load the Wine with things not wanted, ſince the colour alone is required. Hence the colouring of Wines has always its inconveniencies. In thoſe countries which do not afford the tinging grape, which affords a blood-red juice, wherewith the Wines of France are often ſtained; in defect of this the juice of elder-berries is uſed, and ſometimes logwood is uſed at Oporto.

The colour, afforded by the method here propoſed, gives wine the tinge of the Bourdeaux red, not the port; whence the foreign coopers are often diſtreſſed for want of a proper colouring for red Wines in bad years. This might perhaps be ſupplied by an extract made by boiling ſtick-lac in water. The ſkins of tinging grapes might alſo be uſed, and the matter of the tournſole procured in a ſolid form, not imbibed in rags. *Shaw's Lectures.*

Any conſiderable heat, or even a degree of ſimmering, or tepidity, will, by its inteſtine and ſubtile agitation, that barely diſturbs the fine ſaline and ſpirituous parts, which are very ſuſceptible of heat, thereby diſjoin them from the reſt, and occaſion an alteration in the taſte, tranſparency and durability of the Wine, as much as if the ſpirit had been drawn off by diſtillation, and afterwards poured in again, in which caſe the whole ceaſes to be Wine, though it is poſſible to bring it to Wine again by bringing on a new fermentation.

It is a common accident, and a diſeaſe in Wines, to be kept too hot, and is not eaſy to cure when it has been of any long continuance, otherwiſe it may be cured by introducing a ſmall artificial fermentation, that new ranges the parts of the Wine, or rather recovers their former texture: but the actual expoſing of Wine to the fire, or ſun, preſently diſpoſes it to turn eager; and the making it boiling hot is one of the quickeſt ways of expediting the proceſs of making of vinegar.

On the other hand, Wine kept in a cool vault, and well ſecured from the external air, will preſerve its texture entire in all the conſtituent parts, and ſufficiently ſtrong for many years; as appears not only from old Wines, but other foreign fermented liquors, particularly thoſe of China, prepared from a decoction of rice, which being well cloſed down in the veſſel, and buried deep under ground, will continue for a long ſeries of years, rich, generous, and good, as the hiſtories of that country univerſally agree in aſſuring us.

The ſame is to be underſtood of vinegar which has once thrown off the ſuperabundant earthy parts, and many of the oily ones which preſided in it while it was Wine; whence the ſaline ones now get the aſcendant, and as it were ſubdue and preſide over the ſpirituous ones. In this ſtate it will continue perfect a long time; good and ſtrong vinegar, well ſtopped down, and placed in a cool place, preſerving itſelf unaltered for a long ſeries of years: but, if it be left open, ſo that its fine vapour exhales, or its ſubtile part be drawn from it, and again poured back; in either caſe it loſes its uniform conſiſtence, and particularly its durability, and immediately hurries into vapidity and corruption.

If either by fraud or accident a larger portion of water is mixed with Wine than is proper for its conſiſtence, and no way neceſſary or eſſential, this ſuperfluous water does not only deprave the taſte, and ſpoil the excellence of the Wine, but alſo renders it leſs durable; for humidity in general, and much more a ſuperfluous aqueous humidity, is the primary and reſtleſs inſtrument of all the changes that are brought on by fermentation. It may doubtleſs therefore be of uſe, and it is ſometimes abſolutely neceſſary, to take away this ſuperfluous water from the other part which ſtrictly and properly conſtitutes the Wine. This has been agreed upon on all hands as a thing proper; but the manner of doing it has not been well agreed on; ſome have propoſed the effecting it by means of heat and evaporation, others by percolation, and others by various other methods, all found unſucceſsful when brought to the trial; but the way, propoſed by Dr. Shaw from Stahl, is the moſt certain and commodious; this is done by a concentration of the Wine, not by means of heat, but of cold. *Stahl's Schediaſm. de Concentratione Vini.*

Condenſing of WINES, a phraſe uſed by Stahl, and ſome other writers, to expreſs what is more uſually called the concentrating them, that is, the freeing them from what ſuperfluous humidity they contain, and by that means rendering them more rich and noble, and freeing them from their taſteleſs part, reducing them to a ſmaller bulk, and by that means making them fitter for tranſportation, and finally rendering them more durable in their perfect ſtate, and much leſs ſubject to the various accidents that make them decay.

Various methods have been attempted for the effecting of this, and great objections found in the way of all of them, except the lateſt, brought into uſe by Stahl, and ſince recommended greatly to the world by Dr. Shaw in his Chemical Eſſays.

If any kind of Wine, but particularly ſuch as have never been adulterated, be in a ſufficient quantity, as that of a gallon or more, expoſed to a ſufficient degree of cold in froſty weather, or be put into any place where ice continues all the year, as in our ice-houſes, and there ſuffered to freeze, the ſuperfluous water that was originally contained in the Wine, will be frozen into ice, and will leave the proper and truly eſſential part of the Wine unfrozen, unleſs the degree of cold ſhould be very intenſe, or the Wine but weak and poor. This is the principle on which Stahl founds his whole ſyſtem of condenſing Wines by cold.

When the froſt is moderate, the experiment has no difficulty, becauſe not above a third or fourth part of the ſuperfluous water will be frozen in a whole night; but, if the cold be very intenſe, the beſt way is, at the end of a few hours, when a tolerable quantity of ice is formed, to pour out the remaining fluid liquor, and ſet it in another veſſel to freeze again by itſelf: this is proper, for two reaſons; firſt, becauſe, the quantity of ice growing large, more of the concentrated Wine will be apt to lodge in it than ſhould, and it will require a longer time to drain and clear away from the ice. The making the experiment will ſufficiently explain this to any body; for, without breaking the ice, the unfrozen part will, barely by inclining the veſſel, find its own way out, and drain clear from the watery part, which is now converted into ice; ſo that, if the draining be perfect, the ice of the moſt perfectly red Bourdeaux claret will become nearly as clear and pale as water, and will reſolve by heat into an almoſt entirely colourleſs phlegm. This is no ſmall curioſity attending this experiment, and at the ſame time affords a criterion of its exact performance.

If the veſſel, that thus by degrees receives the ſeveral parcels of the condenſed Wine be ſuffered to ſtand in the cold freezing place where the operation is performed, the quantity lying thin in the pouring out, or otherwiſe, will be very apt to freeze anew; and, if it be ſet in a warm place, ſome of this aqueous part thaws again, and ſo weakens the reſt. The condenſed Wine therefore ſhould be emptied in ſome place of a moderate degree as to cold or heat, where neither the ice may diſſolve, nor the various ſubſtance mixed among it be congealed. But the beſt expedient of all is to perform the operation with a large quantity of Wine, or that of ſeveral gallons, where the utmoſt exactneſs, or the danger of a trifling waſte, needs not be regarded.

By this method, when properly performed, there firſt freezes one third part of the whole liquor, and this is properly the more purely aqueous part of it, inſomuch that, when all the vinous fluid is poured off, to be again expoſed to a concentration, the ice remaining behind, from this firſt freezing, being ſet to thaw in a warm place, diſſolves into a pure and taſteleſs water.

If the Wine, now once concentrated, ſhould, by a long continuance in the freezing cold, be again congealed to the utmoſt (unleſs the cold were very ſevere indeed) and then again be drained from its ice, there, ſoon after this, falls to the bottom of the veſſel a pure white powder or tartar, and even the icy part afterwards depoſits a little of the ſame ſubſtance after thawing; and, after the ſtanding two or three days, there is always more and more of this tartar precipitated, and that conſtantly the more, in proportion as the Wine was the more auſtere, or leſs adulterated with ſugar-candy, or the like, for theſe things contain no tartar.

The ice of the second operation on a quantity of wine differs in nothing from that of the first, provided only that the Wine was poured clear off from it, before the ice is set to melt, by which means it dissolves into a clear phlegm. This shews the excellency of the operation, as it loses not its efficacy upon repetition, but brings away mere water as well at last as at first, without robbing the Wine of any of its genuine or truly valuable parts. The remaining liquor, which has escaped being frozen in these two operations, is a real concentrated Wine, as appears by its colour, consistence, taste, and smell; for it now has all these properties in a much larger degree, than while it contained so much superfluous moisture of a merely aqueous kind. It therefore becomes a nobler and richer Wine, than could any way be procured without such a contrivance. For, as, by this means, two thirds of the quantity are taken away in the better sorts of Wine, and three fourths in the weaker, what remains must needs possess three or four times the strength and virtues of the same quantity of the crude Wine.

The benefit and advantage of this method of congelation, if reduced to practice in the large way, in the Wine countries, must be evident to every body. Concentrated Wines in this manner might be sent into foreign countries instead of Wine and water, which is what is usually now sent, the Wines they export being loaded, and in danger of being spoiled by three or four times their own quantity of unnecessary, superfluous, and prejudicial water.

The business is, how to perform the operation, for, Wine-countries being in general hot countries, the business of freezing will not be so easily carried on there as in the cold ones: but this is an objection easily solved by observing, that, in most of the Wine countries that we are acquainted with, there are hills and mountains, the tops of which are covered with snow all the year round; and all who are acquainted with natural philosophy, very well know, that, where there is snow to be had, there will be no difficulty about freezing.

The difficulty rests therefore not in the matter of freezing, but in the reducing the Wines, when thus concentrated, to their due and natural state again; for, though the addition of water alone does this in a tolerable manner, yet better means may certainly be found on farther trials. The way of using poor Wines, and such as in themselves are of little use or value, is always a good one, and is sufficiently advantageous; because what there is in the price of these above water, is made up to the proprietor in the quantity of the final produce; water could only give the same quantity of the Wine that there was originally, and before the condensation; but these Wines will bear to be mixed in so much larger a quantity, that the produce will warrant the gaining by the practice.

This method is not practicable to advantage in the Wine countries alone. Dr. Shaw assures us, that he has himself experimented it here, and with the use of proper freezing mixtures has reduced wines in England to a much smaller quantity, in proportion to the whole, than in the strongest of Stahl's experiments. It is evident that, by how much the quantity is smaller, by so much it is richer and stronger, provided that the operation has been properly performed. The doctor assures us, the noble essence or rob, thus prepared, is capable of working almost miracles, by turning water into Wine, and the like; but that, in order to its succeeding well, there requires great care in the operator, when the congelation is repeated the last times. *Shaw's Chemical Essays. Stahl's Concentrat. Vin.*

Diseases of WINES. All Wines, malt liquors, and vinegars, which are all well made, and perfect in their kind, will grow fine of themselves, barely by standing; so that, if they do not thus grow fine in a reasonable time, it is a sign that they labour under some disease; that is, they are too aqueous, too acid, too alkaline, or they tend to putrefaction, or the like. In all these cases, which may properly enough be called the diseases of Wines, suitable remedies are required before the Wines will grow fine. The most general remedy, hitherto known for all the diseases of Wines, is a prudent use of tartarised spirit of Wine, which not only enriches, but disposes all ordinary Wines to grow fine. *Shaw's Lectures.*

Low WINES, in the distillery, the term for the spirituous liquor distilled immediately from the fermented matter, and continued running so long, that the last of it was not at all inflammable. This liquor is afterwards rectified to a proof spirit of the strength of brandy, and thence to a rectified spirit called alchol, or spirit of Wine. *Shaw's Lectures.*

Pricked WINES. An easy method of recovering pricked Wines may be learned from the following experiment: take a bottle of red Port that is pricked, add to it half an ounce of tartarised spirit of Wine, shake the liquor well together, and set it by for a few days, and it will be found very remarkably altered for the better.

This experiment depends upon the useful doctrine of acids and alkalies. All perfect Wines have naturally some acidity, and, when this acidity prevails too much, the Wine is said to be pricked which is truly a state of the Wine, tending to vinegar: but the introduction of a fine alkaline salt, such as that of tartar, imbibed by spirit of Wine, has a direct power of taking off the acidity, and the spirit or Wine also contributes to this, as a great preservative in general of Wines. If this operation be dexterously performed, pricked Wines may be absolutely recovered by it, and remain saleable for some time: and the same method may be used to malt liquors just turned sour. *Shaw's Lectures.*

WINE-*fly*, in natural history, the name of a small black fly, found in empty Wine-casks, and about Wine-lees, and called by the Latins bibio.

It is produced of a small red worm, very common in the sediment of Wine.

WINGS *of butterflies*. The beautiful Wings of this genus of insects are distinguished from those of the fly-kind, by their not being thin and transparent, like them, but thicker and opaque. This opacity in them is owing only to the dust which comes off of them, and sticks to the fingers in handling them; and it is also to this dust that they owe all their beautiful variety of colours. — Authors, in general, call this dust feathers; but Mr. Reaumur more justly calls them scales.

WINGS *of gnats*. — These are of a very curious structure, and well worthy the use of the microscope, to see them distinctly. The wings of a gnat, like those of most other insects, are of a cartilaginous substance; friable, and transparent as a piece of talc, and the circumference, and inner substance of the Wing, are strengthened by slender, but firm ribs, which are divaricated into several ramification. These appear to us to be mere straight fibres; but they are probably hollow, and perform the office of vessels, for carrying the fluids or air necessary to the support of the Wing, as well as to strengthen it. In the wings of butterflies there are similar ribs, but all hid by the scales. In the Wings of gnats, they are almost, but not absolutely, naked; for the microscope shews that these nerves or ribs, with their several ramifications, resemble so many stalks of plants, covered with small oblong leaves. The latter are scales, but their number is very small, compared with that of the butterfly class; but they make a slighter and more elegant ornament. *Reaumur's Hist. Inf.*

WIRE (*Dict.*) — Iron-Wire is made from small bars of iron, which are called Osleom iron, which are first drawn out to a greater length, and to about the thickness of one's little finger, at a furnace, with a hammer gently moved by water. These thinner pieces are bored round, and put into a furnace to aneal for twelve hours. A pretty strong fire is used in this operation.

After this, they are laid under water for three or four months, the longer the better; then they are delivered to the workmen called rippers, who draw them into Wire through two or three holes. After this they aneal them again for six hours, and water them a second time for about a week, and they are then again delivered to the rippers, who draw them into Wire of the thickness of a large packthread. They are then anealed a third time, and then watered for a week longer, and delivered to the small Wire-drawers, called over-house men.

In the mill where this work is performed, there are several barrels hooped with iron, which have two hooks on their upper sides, on each whereof hang two links, which stand across, and are fastened to the two ends of the tongs, which catch hold of the Wire, and draw it through the hole. The axis on which the barrel moves does not run through the center, but is placed on one side, which is that on which the kooks are placed; and underneath there is fastened to the barrel a spoke of wood, which they call a swingle, which is drawn back a good way by the cogs in the axis of the wheel, and draws back the barrel, which falls to again by its own weight. The tongs hanging on the hooks of the barrel are by the workmen fastened to the end of the Wire, and by the force of the wheel the hooks being pulled back, draw the Wire through the holes.

The plate in which the holes are is iron on the outside, and steel on the inside; and the Wire is anointed with train oil, to make it run the easier. *Ray's English Words.*

WOAD, *isatis*, in botany. See the article ISATIS.

WOLF, *lupus*, in zoology. See the article LUPUS.

WOOD (*Dict.*) — The structure and organisation of Wood is a subject on which many have employed their thoughts; but perhaps none with greater success than the celebrated Monsieur Buffon, of the Royal Academy of Sciences at Paris.

This gentleman observes that the organisation of Wood is yet unknown in all its parts; and, that though the world is greatly indebted to the observations of Grew, Malpighi, and Hales, yet, when he entered on the subject, he found there was much more unknown than known, and determined to observe, from its first state, the growth of trees, and the formation of their woody part.

The seed of a tree, suppose an acorn, if put into the earth in the spring season, produces, after a few weeks, a tender shoot, of an herbaceous structure, which enlarges, extends itself, and hardens by degrees, and, in the first year's growth, has in it a slender filament of a woody substance. At the extremity of this young tree there is a little button formed, which opens the next year into leaves, and from which there is propagated a second a second shoot, in all respects like that of the first year, except that is more vigorous, grows faster, and hardens much more considerably. This is also terminated by a button like that of the precedent year, and in this is contained the shoot of the third year; and in this manner is the growth of the tree carried on, till it has acquired its whole height.

Each of these buttons is a sort of seed, which contains the shoot of the succeeding year, just as the seed itself did that of the first: and the growth of a tree in height is carried on therefore by a series of annual productions, exactly like one another; and the full-grown tree is, though perhaps a hundred feet high, composed only of a number of short trees, joined end to end, the longest of which is not above two feet in length. These little trees of the several years never at all alter their height or length, or even their thickness; they remain even in a tree of a hundred years old, of their original length and diameter, and suffer no change, but in becoming harder.

This then is the manner in which trees grow in height; how they grow in thickness is next to be inquired into.

The button which makes the summit of the tree of the first year, draws its nourishment through the very substance of that little tree; but the principal tubes or vessels which serve to convey the sap, are placed between the bark and the woody filament.

The action of this sap, in moving, dilates and enlarges these vessels, while the button, in raising itself up in growth, elongates them; the sap also, in continually passing them, leaves behind it certain fixed parts, which augment the solidity. Thus the second year's little tree contains in its middle a woody filament in form of an elongated cone, which is the production of the Wood of a former year, and a woody bed for it, which is also of a conic shape, and which surrounds the first filament, and reaches beyond it in length; and this is the production of the second year. The third bed forms itself altogether like the second, and all the succeeding ones are formed by the same law, and in the same order, and envelope one another in a continued succession or series, so that a large tree is composed of a number of woody cones, which enfold, cover, and envelope one another, as the tree increases in thickness.

When the tree comes to be cut down, one easily counts, in a transverse section of the trunk, the number of these cones, the sections of which make so many concentric circles; and the age of the tree is known by the number of these circles, for they are distinctly separate from one another; in a vigorous and well grown-oak, these lines are each of a sixth of an inch or more in thickness, and the substance of these lines or circles is very hard and firm, but the substance of the Wood, which lies between, and unites these to each other, is much less so. This intermediate matter is always the weak part of the Wood, and its structure and organisation is perfectly different from that of the woody cones, and depends entirely on the manner in which those cones are united to one another. This is explained in the following manner:

The vessels, which are longitudinally disposed in the Wood, and convey the nourishment to the button, not only are extended and hardened by the action of the sap in motion, and by the firm particles it deposits; but they are ever attempting also an extension of another kind; they are ramified all along as they go, and break into numberless extremely minute filaments, which issue from them like so many branches; these, on the one part, are destined to the production of the bark of the tree; and, on the other, are connected to the Wood of the preceding year, and from between the two woody beds a sort of spungy reticular work, which, when cut transversely, even to a great thickness, shews numberless little cavities and holes, resembling a sort of lace-work. The woody beds are therefore united to one another by a sort of net-work; this net-work, however, does not occupy nearly the space of the woody circles which it separated, and is usually indeed but about a sixth part of their thickness. This thickness is much the same in all the trees of the same species, whereas the woody beds vary in them very considerably in thickness; in the oak they are found from a sixth to a four and twentieth part of an inch in thickness.

By this easy exposition of the texture of Wood, it is easy to discover that the longitudinal coherence of the particles of it must needs be vastly greater than the transverse: one sees also that, in little pieces of Wood, as in a bar of an inch thickness, if there are fourteen or fifteen of these woody beds, there will also be thirteen or fourteen of these intermediate spaces; and consequently it will be much weaker than if there were but five or six of these woody beds in it, and consequently but four or five of these intermediate spaces.

It may also be observed, that in those little bars of Wood there are two or three of the woody beds wounded, which is often the case; the strength of the bar must be thence greatly impaired: but the greatest fault these small pieces of Wood are subject to, is the different disposition of these beds in the different parts of the same tree; and this difference is so great, that the force or strength of a large beam of any Wood cannot be computed by proportion, from that of a small piece of the same Wood; which, were it possible, would make calculations of this kind extremely easy. The ingenious author of this paper has from hence calculated the force and strength of timber used in building. *Memoirs Acad. Par.* 1740.

The people who work much in Wood, and that about small works, find a very surprising difference in it, according to the different seasons at which the tree was cut down, and that not regularly the same in regard to all species, but different in regard to each. The button-mould-makers find that the Wood of the pear-tree, cut in summer, works toughest; holly, on the contrary, works toughest when cut in winter; box is mellowest when it has been cut in summer, but hardest when cut about Easter; hawthorn works mellow when cut about October, and the service is always tough, if cut in summer.

WOOD-*cock*, a bird of passage, that comes into England about the middle of October, and goes away again in March.

During their stay with us, they ramble about from place to place, never remaining above eight or ten days together in the same Wood or meadow. They seldom or never fly in the daytime, unless disturbed by men, or by some beast. In whatever places they are put up, they always fly to the thickest Wood that lies near, and there hide themselves under the sturdiest and thickest trees, where they remain all day searching for earthworms, and other food, under the fallen leaves.

When night comes, they go out of the Woods, and generally resort to watery places, where they may wash their bills, fouled with the taking their prey, and thrusting into the earth; here they remain all the night, and, if there is tolerable shelter, they stay also the day under it; but, when there wants this, they fly away to the Woods in the morning. In their flight, they chuse the shadiest places, and will coast it away to a great distance in search of the highest Woods to retire to, that they may be the better secured, and there more defended from the annoyance of the Wind. While they travel under shelter, they always fly low; but when they come to any glade to cross, they mount to a considerable height; but, as soon as they have passed this, they sink again.

They hate flying high, and they are afraid to fly among trees, because, like the hare, they see but very badly straight before them; and it is owing to this imperfection in their sight, that they are so easily taken in nets spread in their places of resort.

The draw-net, in countries which are very woody, is extremely profitable in this sport, it being no uncommon thing to take ten or a dozen Wood-cocks at a time in it.

The method of using it to advantage is this: there must be chosen a proper place in some thick Wood, where these birds are found to resort, and a place must be cleared for them, and for the net. Supposing the Wood about three hundred paces long, in this case, towards the middle there must be cut a walk through it eight fathoms wide: near the end of this, two opposite trees are to be pitched upon, proper to support the two sides of the net; the boughs of these are to be all cleared away, and the nets fastened by logs and pullies.

When the net is thus placed, the sportsman must provide some covert in which he may stand concealed. This is easily made by half a dozen boughs of ever-green trees with their leaves; and the sportsman, when he has stuck these down in the ground, and interwoven their boughs together, may either stand behind it, or sit down on a bundle of dry fern, or any other such matter. At three or four feet distance from this stand, towards the net, there is to be a strong stake fastened into the ground, and on this the lines of the net are to be fastened when it is drawn up. When there comes a Wood-cock, the net is to be let down as soon as ever he is taken, to entangle him the more, for, otherwise, in the struggling he may chance to make his escape. The sportsman is then to run up, and break a wing, and crush his head. The net is then to be refitted again as quick as possible, for, when one is caught, there is great reason to suspect that many more are coming the same way, which will be all lost, if the sportsman is slow at his work.

If a hare, or any other creature worth the taking, come along the walk, the net is not to be immediately let down upon it, for in that case it would certainly start back, or run forwards, and in either case would probably make its escape: the net is to be drawn up five or six feet, that he may pass quietly under it without suspicion: as soon as he is gone by, the sportsman is to make a great shout, and let go the net; the creature will, on this noise, start back, and will thus be certainly taken in the net.

There are, in many places, great thoroughfares through some open piece of ground, by which Woodcocks pass in great numbers from one Wood to another. If there be in these two trees, naturally planted, so as to sustain the nets, they are by all means to be used; but, if not, the sportsman will find it worth his while to be at the expence of planting two trees deep in the earth, at proper distances, that they may stand all weathers. Nets spread between these are the most fatal of all others to these birds, for all that inhabit either one or the other of the Woods come this way at times, without suspicion of any danger or disturbance.

There is another method of taking these birds in high Woods, with those nets called hays, of the nature of the rabbets-hays, only with smaller meshes. The Woodcocks are to be driven into these, and there should always be at least two or three of them planted together. When the sportsman has provided

 himself

himſelf with nets, he is to take five or ſix perſons into the Wood with him. The proper Woods for this purpoſe are thoſe of ſeven or eight years growth; and the people are to go into ſome part of them, near the middle. The nets or hays are to be placed in the ſame manner as they are for taking of rabbets, but two or three joining together at the end, and hanging over ſlopewiſe that way which the Wood-cocks are intended to be driven.

The nets being thus fixed, let the company go to the end of the Wood, placing themſelves at about ten rods diſtance from one another; they muſt all have ſticks in their hands, and they are to move forwards ſlowly towards the nets, making a noiſe by ſtriking the ſticks againſt the trees and branches, and by hallooing with their voices: in this manner they are to move up to the net; and the Wood-cocks in that part of the Wood will all be terrified before them, but will not take wing, but run along upon the ground, and thus be driven along like a drove of beaſts, ſo that, when the company come up, they will find almoſt all of them in the net. When that part of the Wood is thus drove, the nets are to be turned the other way, and placed ſlopewiſe in the contrary direction, and the company, retiring to the other end of the Wood, are to drive the Wood-cocks that are in that part with the ſame noiſe, till they have ſent them into the nets in the ſame manner.

Thus all the Wood-cocks in the Wood may be taken with very little trouble, and this may be done equally at any time of the day.

Another way of taking this bird is, by means of nooſes or ſprings.

The Wood-cock and the ſnipe ore both eaſily taken alſo with bird-lime, when their places of reſort are known, but they are not ſo eaſily found as many other birds.

The cuſtom of the Wood-cock is uſually to be upon the banks under hedges, and by the ſides of ditches towards the ſun; and they will ſuffer the ſportſman to come nearer them in the daytime after a moon-ſhiny night, than after a dark one. The reaſon of which is, that, having fed well by moon-light, they are only fit for reſt in the day following; but, when the night has been dark, they are ſeeking food all the day long.

The ſnipes naturally lie by the ſides of rivers, when the plaſhes and ponds are frozen, and they always lie with their heads up or down the ſtream, never tranſverſely.

In order to take either of theſe birds by bird-lime, the ſportſman muſt be provided with a large number of ſmall and ſmooth twigs, neatly and evenly covered with good bird-lime. Theſe muſt be placed ſloping, ſome one way, ſome another, and the whole place about where they reſort muſt be covered with them. The ſportſman then muſt conceal himſelf very carefully, that the ſight of him may not frighten away the game.

Wood-*cock ſhell*, a name given by the Engliſh naturaliſts to a particular kind of the purpura. The French call it becaſſe.

Wood-*land*, in agriculture, a term uſed, by the farmers of many counties of England, for a ſort of ſoil, from its conſtant humidity and dark colour, reſembling the ſoil in Woods, which, of whatever nature it originally is, will always be made to appear thus from the continual dropping of trees, and the want of a free air and ſun, together with the fall of leaves, deſtroyed and waſhed to pieces by the wet.

This ſoil in the open countries has a conſiderable quantity of clay in it, and holds the water a long time that once falls upon it: in wet weather it ſticks firmly to the plough-ſhare, and, in dry, is very apt to crack. In uncultivated places it uſually produces ruſhes and ruſh-graſs. A moiſt and dripping year is extremely detrimental to this ſort of land. *Morton's North.*

Wood-*lark*, in ornithology. This is one of the ſweeteſt of our ſinging-birds, and is indeed very little inferior to the nightingale, when in good health; for we are not to judge by ſuch as are made feeble by improper food, or want of cleanlineſs in their cages.

It is one of the tendereſt birds we have, and yet it breeds the ſooneſt of any that we know of. They principally frequent gravelly grounds, and the ſides of hills, that are expoſed full to the ſun; and, if there be any ſtumps of oaks in theſe places, they always reſort to them.

The females couple with the males in the beginning of February, at which time, and never before, they part with their laſt year's brood; immediately after coupling, they betake themſelves to building their neſt.

They generally build in lay, or grounds, where the graſs is rank, and is grown brown. The principal material they uſe is dry graſs, and they always chuſe ſome place ſheltered by a good tuft for their neſt, to defend themſelves from the cold winds, which are very ſevere at that ſeaſon. They feed their young principally with a ſmall red worm; but it is very difficult to find this kind, to feed a neſt of them under our care, and they will not do well without it; ſo that they ſcarce ever come to any thing this way.

Wood-*mite*, in natural hiſtory, the name of a little animal frequently made the ſubject of microſcopical obſervation, and by ſome called the Wood-louſe; though that leſs properly, as there is another larger animal generally known by that name.

The Wood-mite is in ſhape and colour very like a louſe, and is frequently found running very nimbly, but always by ſtarts and jumps, on old books and rotten Wood. The eyes of this creature are of a fine gold colour, and can be thruſt out or drawn in at pleaſure; and when examined by the microſcope, the periſtaltic motion of the guts is ſeen very diſtinctly and beautifully; and, what is more wonderful, there is obſerved a very diſtinct and regular motion in the brain.

This probably is the ſame animal with the pediculus pulſatorius, deſcribed by Derham, as one of the death-watches. *Baker's Microſcope.*

Wood-*pucerons*, in natural hiſtory, a name given by Mr. Reaumur to a ſmall ſpecies of inſects of the puceron kind, of a greyiſh colour, and diſtinguiſhed by its two hollow horns on the hinder part of its body.

Theſe animals very much reſemble, both in ſhape and ſize, the pucerons of the alder; but, as thoſe live always on the ſurface of the ſtalk, theſe make their way deep into the wood of a tree.

WOOLLEN *Manufactory* (*Dict.*)—In order to ſet this uſeful mechanic invention in a true light, we ſhall add here the moſt uſual terms uſed therein, ranged in the ſame order as the various operations are performed.

The wool is waſhed; either in heaps, in ſtanding water; or in the coyriddle, in running water; or in tubs full of river water.

To prepare the bath or ſuds, is to let the wool ſoak in water, until it has thickened the water in the tub, by diſcharging its greaſineſs and ſalt in it. Thence it is, that inſects ſeek clean wool, and will not touch that which retains its natural moiſture.

Wool in the greaſe, is that which ſtill preſerves its natural greaſineſs. This is better for keeping, becauſe the moth will not get into it.

A waſhing of wool, is a heap of wool, taken out of the tub, and ſet to drain in the air.

To waſh the wool alive, is to waſh it on the ſheep's back before ſhearing.

The ſhears are ſciſſars made of one piece of ſteel, which forms the bow and two blades. The bow is a ſemicircle, from whence the two blades ſtretch forwards. Theſe are preſſed cloſe to each other, and cut the wool under the workman's fingers, and then fly back by the ſpring of the bow.

A tod of Wool is what is cut off the ſkin of the ſheep, beginning at the legs and ending at the head.

A fleece is the tod gathered up into a packet. Out of trade, a fleece ſometimes ſignifies a ſheep ſkin with the Wool on.

The puſhes are Wool finer than the reſt, which ſhoot out by little tufts in different places. They are plucked off the ſheep before ſhearing. In the province of Berry this laſt name is given to the wool taken off the thighs.

The breechings are thoſe which are ſo hard and clotted, that they are of the conſiſtence of felt. They are alſo called clottings, becauſe the beaſt, eſpecially when ſick, dirts and clots them by lying much on one ſide.

Pelled wool is that which comes off from ſcabby ſheep.

Sprazely or crudley wool is the young hungry wool which ſhoots out before the old is ſhorn.

Locks or breechings are long white hairs, as ſtiff as badger's hair.

All theſe ſorts of wool are bad or rejected. Yet it cannot be ſaid that they ought to be thrown away as uſeleſs. They are uſed in very coarſe works, ſuch as ordinary rugs.

Clipping is cutting off the coarſe ends of the wool, before it is waſhed. Thoſe ends are called locks.

The fleece wool is that which hath been ſhorn off the ſheep while alive.

The lambs wool is the wool cut off lambs.

The glovers wool is the wool, which the leather-dreſſer takes off the ſkin, after the ſheep is killed.

The fell wool is the wool ſtripped off ſheep, which died of ſome diſtemper. The uſe of this ſort is prohibited.

In ſorting Segovia wool, it is diſtinguiſhed into firſt, ſecond, and third. The ſame order is obſerved in ſorting Spaniſh wool.

As to other ſorts of wool, the only diſtinction that is made, is into the high wool, which is the longeſt, and is generally reſerved for combing; and the low wool, which is uſually carded. However the long wool, when it is to make cloth, is alſo carded, becauſe it does better ſo than when combed.

Fine wool unſcoured, is only fit for the market, and not for working. In order to work it, in ſome caſes they begin by waſhing and combing it; in others by getting out the greaſe by boiling, in order to waſh and comb it afterwards: and there are other caſes ſtill, in which it is firſt dyed, then carried to the river, and thence to the comber.

The ſcouring boiler, or copper, has a croſs bar in it, to ſupport the wool taken out of the water. There are alſo poles to ſtir the wool, peſtles to pound or beat it, hooks to draw it out, baſkets to hold and carry it to the river, where the cleaning of it is finiſhed.

Common wool, which has been waſhed on the ſheep's back, ought, before working, to be carefully examined, picked off the locks or clipped, and cleaned of all refuſe.

In ſome manufactories wool is wrought white, in others it is dyed before working.

For dying wool the ſame utenſils are requiſite as for ſcouring.

The

The ingredients are the preparatory and colouring materials.

Setting the copper is to put the neceffary ingredients into it.

Handling the wool is to open it, by ftirring it with the poles, in order to make every part of it take the colour equally.

Increafing the boiling is to enlarge the fire.

Cooling the wool is to fpread it out in the air.

If the wool has been only grounded or galled; that is, if it has only had its firft dip, or the firft tincture of Galls, copperas, or other ingredients, whether preparatory or colouring; then it muft be brought in from the airing to the copper, to be there revived by a fecond dip, which brightens the dye, or to be lowered by a new mixture, which either diminifhes its luftre, or gives it another teint; or in fine to give it a deeper caft of the fame colour.

To beat the wool, whether dyed or white, is to fpread it on a hurdle, and to open its texture by whipping it with fwitches, in order to make it fit for combing, or carding, and fpinning.

For combing wool they ufe

A little furnace, which ferves to warm the combs.

A vice and hook to fix the combs.

A pair of combs, which are two little boards, almoft fquare, ftuck with teeth of iron wire, fome a little longer than others. Each comb has its handle.

A hammer, to put in and take out thefe teeth.

A brafs hollow tube, to mend them when out of order.

A file, to point them when blunt.

A windlafs, to twift the wood foaked in foaped water, before it be put on the comb.

A tub, in which the foap is diffolved.

To comb in water, is to comb the wool that has been fprinkled with oil, in order to wafh it afterwards.

A certain quantity of wool is given by weight to the workman.

A beating, is a parcel of wool beaten on the hurdle.

A fliver is a proper quantity of wool put into the teeth of the comb.

To difcharge it, is to take out the fliver, after having moved the right comb backwards and forwards on the left, and the left on the right.

The carding is the quantity of wool that fticks to each comb, and is fufficiently combed after a certain number of movements of one comb on the other. There are always two cardings, as well as two combs.

A diftaff is two cardings joined together, which make up a fufficient quantity for the diftaff.

The fhort wool, which cannot be wrought together by combing, is not loft. It goes to the card.

To brimftone the wool, is to fufpend the feveral fkeins over the brimftone room.

The brimftone ftove is a little ftove well clofed and cemented at top, to whiten the wool by the fumes of brimftone burning in a pan.

When dyed wool is combed, they begin by mixing it according to the tafte and fkill of the mafter-worker.

The different colours are effaced by the judgment in mixing them, whereby there refults a new colour.

The comber follows a certain rule in the quantity of each colour he takes for each combing: on which depends the uniformity of the colour required.

Carded wool is broke in a different manner from combed wool. It paffes through two tools called cards, which are two little quadrangular pieces of board, three or four times as broad as tall, with a handle to each, and thick fet with fmall crooked wires. The cards are changed, beginning by the wideft, and ending with the clofeft, in order to break the wool, and mix the colours the better.

Spinning is of two forts.

Twifted thread is fpun by the fpindle or little reel, from combed wool, and ferves for the chain or warp, which is the ground of little ftuffs. The name of chain, or warp, is alfo given to the threads running lengthwife in a piece of cloth, and which make the ground of it.

The flack fpun is made by the great wheel from carded wool, and is called the wool or fhute. The wool croffes the threads of the warp, and may be called fhute with regard to a ftuff that has a pile.

The thread of the work in cloths is generally called back thrown, becaufe, being made from carded wool, as well as the woof, it is likewife fpun by the great wheel, but with the circumftance of croffing the wheel-ftring: which has a double good effect, viz. to make a thread fomewhat better twifted and ftronger, and to give it a different twift from that of the woof; whereby they thicken better in the fulling mill.

Stuffs may be divided into three forts, tammy, ferge, and cloth.

Tammy or ftuffs of two tammies, are made of thread of warp upon thread of warp, that is, the warp is of twifted thread, and the woof of the fame, both made from combed wool.

Serge is made of flack fpun, or carded wool, on a warp of tammy, or combed wool.

Cloth is made of two foft threads, that is, both the warp and woof are of thread fpun from carded wool, and very little twifted, in order to make a more fubftantial and woolly ftuff.

Thefe three fundamental forts are fubdivided into a vaft number of others, according to certain qualities added to them, and different ways of working.

To weave, is to work at the loom, or to make ftuff.

One weaver is fufficient for making tammy and ferge; becaufe as thefe little ftuffs are not wide, the fame workman can throw his fhuttle with his right hand between the threads of the warp, and receive it with his left, in order to throw it the contrary way. But cloths and blankets, being very wide, are wrought by two weavers, one of whom throws the fhuttle, the other receives and throws it back; and they go on thus alternately with as much regularity, as if the work was done by the two hands of the fame man.

The loom is compofed of feveral parts, whereof the chief are the loom-pofts and crofs-bars.

The three rolls or rollers, viz. the little one, the cane-roll. The warp is at firft faftened at one end of the loom on the leaft of thefe rollers, and at the other end is rolled on the fecond cylinder, which is thicker, and is called the cane-roll: according as the warp is filled with woof, the ftuff is to be rolled under the loom on the knee-roll; and at the fame time the fame length of the thread of the warp is unrolled off the cane-roll, as that of the ftuff rolled on the knee-roll.

The batten is a large moveable frame fufpended on two pins at the top of the loom, to move freely backwards and forwards, under the workman's hand, who, after every throw of the fhuttle or thread of the woof, ftrikes in this thread more or lefs with the batten and reed.

The reed or comb is made of two rods, with a long row of teeth of reeds, or brafs wire. It is placed at the lower part of the batten. Every thread of the warp paffes fingly between two teeth of the reed: that fo the batten may move without breaking the threads, and ftrike in the woof equally, without leaving any part of it irregular.

The lams are behind the reed. Each lam is compofed of two virgees or laths, whofe length fhould be the width of the ftuff, and of little ftrings ftretched from one virgee to the other, which are called leifhes. In the middle of each leifh there is a loop or little ring of thread, horn, or glafs, to receive one of the threads of the warp. Thofe threads of the warp, which pafs through the loops of one lam, pafs between the leifhes or threads of the other lam; and thofe which pafs through the loops of the fecond lam, play freely between the threads of the firft; fo as to be able to defcend, while the firft afcends: and thus thefe two lams being near their ends faftened to a common cord paffed round a pulley at top, and at bottom to another cord which fupports a treadle, lying under the workman's feet; if he lowers the fore lam with his left foot, the other lam muft rife up. The reverfe happens upon a contrary motion. If there are a greater number of lams to vary or figure the ftuff, certain parcels of threads are thus raifed and lowered at a time, whereby divers openings are made to receive the throw of the fhuttle. As often as the foot is changed, and the warp receives a new throw of the woof, the batten clofes it more or lefs according to the quality of the ftuff. When the increafe of the ftuff hinders the play of the batten, there is as much of the warp rolled off the cane-roll, as of the ftuff rolled on the lower great cylinder. Concerning the manner of guiding the threads of the warp through the rings of the jack on the warping mill; of managing the feparation of the threads of the portee; of uniting feveral portees in one chain; and of making one entire warp of them all; of brufhing or moiftening it with fize, to make the threads glide eafier in working; of mounting it on the loom, by faftening it in a grove of the little roller; of paffing the threads in good order through the teeth of the reed, and then dividing the fame threads, and making fome of them go through the loops of one lam, and between the leifhes of the next; and others between the leifhes of the firft, and through the loops of the fecond; of fixing and maintaining the divifions of the threads, by the infertions of feveral rods which prevent their mixing; of facilitating, in fine, the unwinding and play of the warp and woof by the ufual precautions and proper tools. Thefe operations are eafily comprehended at firft fight. But their number is fo great, that if the workmen did not ufe great difpatch, by every one conftantly plying to his own part; fheep's wool either would never be converted into cloathing, or would bear too high a price for the common people. Let us not remain unacquainted with what fhews the greateft induftry, after the play of the lams.

The fhuttle is a piece of hard wood, that runs tapering to a point at both ends, and has a cavity in the middle, called the box or chamber, for receiving the quills.

The quill is a fmall pipe of reed, on which a proper quantity of the thread of the woof has been wound, and which plays on the fhuttle pin.

The fhuttle pin is an iron wire, which runs through the quill, and with it is fet in the chamber of the fhuttle. It is put in, fecured, and taken out, by the different action of a fpring at the end of the chamber, where the fhuttle pin is placed.

As the fhuttle runs through the warp, the thread of the woof, which flips through a hole or eye in the fide of the fhuttle, and has been faftened to the lizier, muft run off the quill, which runs round as the ſhuttle goes on. When this quill is emptied, another is put in its place; and the ends of the thread of the two quills are laid cloſe to one another without knotting; only taking care to manage the throw of the ſhuttle, ſo as to be ſure of keeping both theſe ends of the woof together.

The head of the piece are ſome few inches of the ſtuff, made with a different ſort of woof from the reſt. The names of the workmen and place are wrought in it: and afterwards the lead-ſeals are put to it, which are a teſtimony of its being examined and found to be of good materials, and of the breadth and quality required by the laws for the reſpective ſorts.

The temple is compoſed of two flat notched rulers, ſecured one over another by a ſliding ring, and having pins points at their ends. The workman faſtens the two ends, full of points or ſpikes, to the two liziers, or liſts, which are the outer threads of the width of the ſtuff; and, by bringing the virgers or laths more or leſs forward, he keeps the ſtuff conſtantly of an equal breadth. If he did not take care to temple his ſtuff, the woof would ſhrink unequally, and bring the threads of the warp nearer together in ſome places, and in others farther aſunder. But by removing his temple from time to time, to keep it near the laſt throws of the woof, he ſtrikes the woof in upon a ſquare, and ſo as to make it receive the ſtroke of the batten equally in every part.

The workman continues to throw the ſhuttle, to temple, and to wind off alternately. When he is come to the end of the piece, he takes another ſort of thread for the woof, as he had done at beginning it, and makes a ſtripe of a different colour, for the names and ſeals, as above. Theſe two ends are called the head and the fag-end.

To ſteam a little ſtuff, as is done at Amiens, Rheims, and La Mans, is to render it ſopple, by expoſing it to the ſteam of boiling water in a ſquare kettle or copper, where it is laid, ſtill on its roller, with other pieces. This operation diſpoſes it for dreſſing well.

The fullery is a water-mill for working great mallets on ſtuffs, either to clean them, or thicken them to the conſiſtence of felt.

The ſtocks, or fuller's pots, are hollow veſſels to hold the ſtuffs, which are continually turned under the ſtrokes of the mallets.

The levers, or prominent bars, are the ends of pieces of timber, that run through the axle-tree or arbor of the wheel, and which, as they paſs, catch the heads of the mallets, raiſe them up, and let them fall as they go off.

To earth the ſtuff, is to rub it with fuller's earth.

To beat it in the earth, is to full the ſtuff with the earth on it, letting a water-cock run on it at the ſame time.

To ſcour cloth, is to full it after ſoaping it with black ſoap, which carries off all ſpots.

To clean-ſtuff, is to full it with a great deal of water, to carry off any remains of dirt, and to rince it.

To beat it dry, is to full it without water, till it has acquired the utmoſt thickneſs it is capable of, and beyond which it runs into a pap.

When ſtuffs come from the fulling mill, they are aired, that is, hung out.

The pieces, brought from off the poles or tenters, ought to be made up, that is, properly folded on a table; then gummed at every fold, by ſprinkling the backſide with a ſolution of gum arabic in water.

To ſtretch the ſtuff, is to paſs it from one roller on another, keeping it conſtantly of the ſame breadth, over a braſier, by means of an iron bar, on which it ſlides; whereby the heat penetrates, and breaks its ſtiffneſs. And, by thus paſſing ſeveral times from one roller on another, it is rendered pliant in every part alike.

There are ſome ſtuffs that are unrolled and rolled without fire. But it is always allowed to ſuch as are to be dreſſed very well.

The effects of this ſtretching are, firſt, to ſmooth or take out the bad folds; ſecondly, to gum the whole piece equally by the fire's ſpreading the moiſture every-where, which evaporates, and leaves the gum behind. Thirdly, to ſtretch the whole in an uniform manner: which is of vaſt conſequence in the wear of ſtuffs.

They are folded near a good fire.

They are leafed, by putting a leaf of paſteboard hot, between every two folds.

They are put between two thick boards of box, which take in the whole pile of folds.

They are left ten or twelve hours in a ſtrong preſs: and this is repeated three or four times.

They are viſited for the laſt time, and after drawing out the two ends, called the head and fag-end, the lead-ſeals, tickets, and other marks are put on which denote the quality, breadth, length, dye, and other things preſcribed by the laws: then they are put into the preſs again, and ſtitched, by ſecuring the folds looſely with threads run through the liziers.

There are ſome other practices peculiar to different manufactories; but they all tend to the ſame end.

Cloth is not ſtretched on the rollers; but, after having been fulled, teazled, tentered, or hung on the rack, ſhorn twice, cottoned, and the pile laid ſmooth one way, it is gummed or folded on leaves, put to the preſs, the leaves are changed, and, inſtead of thick coarſe paſteboards, others thinner and ſmoother, called cards, are put between the folds: it returns to the preſs, or elſe to the calender, which gives it its laſt gloſs. *Spectacle de la Nature, Tome VI.*

WORD (*Dict.*)—Simple and primitive Words have no natural connection with the things they ſignify; whence there is no rationale to be given of them: it is by a mere arbitrary inſtitution and agreement of men, that they come to ſignify any thing. Certain words have no natural propriety or aptitude, to expreſs certain thoughts, more than others; were that the caſe, there could have been but one language.

But, in derivative and compound Words, the caſe is ſomewhat different.—In the forming of theſe, we ſee, a regard is had to agreement, relation, and analogy: thus, moſt Words that have the ſame ending, have one common and general way of denoting or ſignifying things; and thoſe compounded with the ſame propoſitions, have a ſimilar manner of expreſſing and ſignifying ſimilar ideas in all the learned languages where they occur.

For the perfection of language, it is not enough, Mr. Locke obſerves, that ſounds can be made ſigns of ideas; unleſs theſe can be made uſe of, ſo as to comprehend ſeveral particular things; for the multiplication of Words would have perplexed their uſe, had every particular thing needed a diſtinct name to be ſignified by.

To remedy this inconvenience, language had a farther improvement in the uſe of general terms, whereby one Word was made to mark a multitude of particular exiſtences; which advantageous uſe of ſounds was obtained only by the difference of the ideas they were made ſigns of: thoſe names becoming general, which are made to ſtand for general ideas; and thoſe remaining particular, where the ideas they are uſed for are particular.

It is obſervable, that the Words which ſtand for actions, and notions quite removed from ſenſe, are borrowed from ſenſible ideas; as, to imagine, apprehend, comprehend, underſtand, adhere, conceive, inſtil, diſguſt, diſturbance, tranquillity, &c. which are all taken from the operations of things ſenſible, and applied to modes of thinking.—Spirit, in its primary ſignification, is no more than breath; angel, a meſſenger. By which we may gueſs what kind of notions they were, and whence derived, which filled the minds of the firſt beginners of languages; and how nature, even in the naming of things, unawares, ſuggeſted to men the originals of all their knowledge: whilſt, to give names that might make known to others any operations they felt in themſelves, or any other ideas that came not under their ſenſes, they were forced to borrow Words from the ordinary and known ideas of ſenſation.

The ends of language, in our diſcourſe with others, are chiefly three: firſt, to make our thoughts or ideas known one to another.—This we fail in, 1°. When we uſe names without clear and diſtinct ideas in our mind. 2°. When we apply received names and ideas, to which the common uſe of that language doth not apply them. 3°. When we apply them unſteadily, making them ſtand now for one, and anon for another idea.

Secondly, to make known our thoughts with as much eaſe and quickneſs as poſſible.—This men fail in, when they have complex ideas, without having diſtinct names for them; which may happen either through the defect of a language, which has none; or the fault of the man, who has not yet learned them.

Thirdly, to convey the knowledge of things.—This cannot be done, but when our ideas agree to the reality of things.—He that has names without ideas, wants meaning in his Words, and ſpeaks only empty ſounds.—He that has complex ideas without names for them, wants diſpatch in his expreſſion.—He that uſes his Words looſely and unſteadily, will either not be minded, or not underſtood.—He that applies names to his ideas, different from the common uſe, wants propriety in his language, and ſpeaks gibberiſh; and he that has ideas of ſubſtances, diſagreeing with the real exiſtence of things, ſo far wants the materials of true knowledge.

Watch-WORD, in an army, or garriſon, is ſome peculiar Word, or ſentence, by which the ſoldiers know and diſtinguiſh one another in the night, &c. and by which ſpies and deſigning perſons are diſcovered.

It is uſed alſo to prevent ſurprizes.—The Word is given out in an army every night by the general, to the lieutenant, or major-general of the day, who gives it to the majors of the brigades, and they to the adjutants; who give it firſt to the field-officers, and afterwards to a ſerjeant of each company, who carry it to the ſubalterns.

In garriſons it is given, after the gate is ſhut, to the town-major, who gives it to the adjutants, and they to the ſerjeants.

WORK-HOUSE, a place where indigent, vagrant, and idle people are ſet to Work, and maintained with cloathing, diet, &c.

Meal WORM. There are two very different inſects found in our meal or flour; the one is ſo ſmall, that it is only to be ſeen by the microſcope: all that the naked eye can diſcover of it is, that ſomething is alive in the place, from the whole ſubſtance of the flour being in motion.

The

The other meal-Worm is larger, and more frequently offers itself to our observation; it consists of eleven rings, and has three pair of legs. The mouth of this Worm is made into a kind of forceps, and from this arise, on each side, a great number of small spinulæ; these serve instead of teeth, and the animal feeds by means of them. They are found sometimes very soft and tender, sometimes hard and firm, and at other seasons they are very brisk and lively; at others they have scarce any life in them.

The most remarkable thing, in regard to these worms, is, that they are always exactly of the colour of the flour which they live among. Ray has observed, that the white flour breeds white ones; the coarser flour breeds larger and greyer ones; and that flour which has the bran among it breeds brown ones, of the same colour with itself. This is a provision of nature for the safety of the animal, since, were it of a colour different from that of the flour, it must be easily discovered among it, and would be picked out and thrown away. The caterpillar tribe are thus preserved, by being of the colour of the leaves they feed on; their green usually suiting itself exactly to that of the tree or plant. *Deslandes, Trait Phys.*

Worms, in husbandry.—These creatures are very prejudicial to corn-fields, eating up the roots of the young corn, and thereby destroying great quantities of it.

Sea-salt is the best of all things for destroying them.—A decoction of wood-ashes, or walnut leaves, will answer the same purpose; and any particular plant may be secured, both from worms and snails, by strewing a mixture of lime and ashes about its roots. It is a general caution among the farmers to sow their corn as shallow as they can, where the field is very subject to Worms. *Mortimer's Husbandry.*

Worms, in medicine (*Dict.*)—Tin is often recommended as a good remedy against Worms, particularly of the flat kind. Dr. Alston, in the Med. Ess. Edinb. Vol. V. Art. 7, directs an ounce and an half of the powder of pewter-metal to be mixed in half a Scotch mutchin, or about half a pint English measure of treacle, for children; but, to grown persons, he gives two ounces of the powder of pure tin, put through the finest hair-sieve, and mixed with eight ounces of treacle. As to the administration of this medicine, the original receipt directs half of it to be taken the Friday before the change of the moon; the day after, half of the remainder, and the rest on Sunday. On the Monday a purge is to be taken. The doctor thinks there is probably nothing in the particularities of the day: but says, the medicine succeeds well in several species of Worms. The Memoirs of the French Academy give a very remarkable account of an obstinate pain caused by a Worm in the nose, a place where few persons would have suspected such an animal for the cause of it.

WRECK, in metallurgy, a vessel in which the third washing is given to the ore of metals.

In Cornwall, when the tin-ore has been twice washed, they take the head tin, or that part of the tin ore that lies uppermost out of the bubble, and, throwing it into this vessel, they pour water on it, and work it about with wooden rakes, till it is cleared from whatever other extraneous matter there may still have remained mixed with it, and is, after this, fit for the melting-house, to be run into metal. *Ray's English Words.*

WRITING. To make new writing appear old, moisten it with oil of tartar per deliquium, more or less diluted with water, as you desire the ink to appear more or less decayed. *Boyle's Works.*

We may write without ink or its materials: for this purpose, take a fine powder of calcined harts-horn, of clean tobacco-pipes, or rather of mutton bones burnt to a perfect whiteness, and rub it upon the paper, and then write with a silver bodkin or the like.

The discharging of ink out of parchment, paper &c. is commonly done by aqua fortis diluted sufficiently with water, that it may not destroy the paper. The like may be done with oil, or spirit of vitriol diluted. The juice of lemons, or strong vinegar, will take ink out of linen more safely, as the mineral acids are apt to destroy the linen, unless great care be used in diluting them.

We may write on iron with corrosive sublimate wetted with common water: for this purpose, the parts of metal we would preserve untouched should be covered with wax, and that taken off in the proper places to make way for the corroding substance.

The like may be practised by means of aqua fortis.

Mr. Boyle mentions a method he had of copying a whole page of writing at once. But we do not find his description of it any where.

The same author informs us of a method of imitating writing, on copper-plates. The copy to be engraved is to be wrote with a peculiar kind of ink, and the copper-plate, being moderately warmed, is rubbed over with a white varnish, and suffered to cool; then the paper being gently moistened, that it may readily communicate its ink, the writing is applied to the prepared surface of the plate, and passed through a rolling-press; by which means the ink, adhering to the varnish, leaves the letters very conspicuous. And hence it is easy with a needle to trace the strokes through the varnish upon the plate, which being afterwards cleaned, the letters are finished with the graver, and the work printed off in a rolling-press as common cuts.

Mr. Boyle does not mention what the varnish nor ink, used by the artificer from whom he received this method, was; but he tells us that he himself used the purer sort of virgin's wax, for a varnish; and for his ink he took fine Franckfort black carefully ground, with water, till it obtained the consistence of common ink; but no gum was added, lest it should hinder the ink from coming off. He also observes, that written characters may be taken off without the help of a press, by laying the moistened paper smooth upon the varnished copper, and rubbing it on hard with a convex piece of glass. *Boyle's Works.*

WYCH-*house.*—In the places where there are salt-springs, and salt-works are carried on at them, the work-house where the salt is made, is always called the Wych-house; and hence we may naturally conclude, that Wych was an old British word for salt; which is the more probable, in that all the towns in which salt is made end in Wych; as Namptwych, Droitwych, Middlewych, &c. *Ray's English Words.*

X.

XANTHIUM, in botany, the name of a genus of plants, the characters of which are these: the flower is of the flosculous kind, being composed of a number of floscules, each having one stamen. The seeds are produced on other parts of the plant, and finally become oblong and usually prickly fruits, divided into two cells, and containing each several oblong seeds.

XERANTHEMUM, in botany, the name of a genus of plants, the characters of which are these: the flower is radiated; its disk is composed of floscules standing upon the embryo seeds; but the outer circle is composed of plane flat petals, which are not affixed to embryo's, but are contained in the same cup with the floscules which make up the disk. The embryo's finally ripen into seeds, which are furnished with a foliaceous head.

We have several species of this plant cultivated in our gardens, and known in English by the name of everlasting flowers; a name common to all the species of this plant, and of the amaranthoides.

These flowers are of so dry and durable a structure, that, if gathered just when they are ripe, they will last many years in perfection, and appear as fresh as while growing; they are also capable of several tinges, and hence are often seen of fine blues and greens, colours not natural to them.

They are all propagated by sowing their seeds in August, in a warm border, observing to water and shade them till they are come up, if the weather proves over dry.

When the young plants are two inches high, they should be removed to another warm border under the shelter of a wall, and there planted at five inches distance from each other. They will here stand the winter very well, and in spring will be ready to grow up for flowering without any farther transplanting; they are only to be kept clear of weeds, and in June they will flower; the flowers should be gathered in July for drying, and some of the finest should be suffered to stand for seed; for the plants perish as soon as they have perfected their seeds, and must be renewed by sowing every year. *Miller's Gard. Dict.*

XIPHION, in botany, the name of a genus of plants, the characters of which are these: the flower is liliaceous, consisting only of one petal, and much resembling the iris flower. The pistil is in the manner of the iris also, ornamented with three petals, and the cup becomes a fruit of the shape of that of the iris; but the root wholly differs from that of the iris, being bulbous, and composed of a number of coats.

We have several species of this beautiful plant cultivated in our gardens, where they are called bulbous iris's; and, besides these, a vast number of varieties or new flowers, as the florists

rists call them, are frequently raised by those who propagate them from seeds. The culture of these being the same with that of several other plants of the same sorts, which are much valued for their flowers, it may not be amiss to give it at large.

There should be great care taken to save the seeds of the finest and strongest flowers, and in September some shallow pans or boxes must be placed with holes at their bottom to let out the moisture, and then filled with light and fine earth. On this the seeds must be sown pretty thick, and as evenly as may be; half an inch of the same earth must be sifted on these, and the boxes must then be set where they may have the morning sun; and, if the weather proves very dry, they must be gently watered at times. They must remain in this situation till October, and then must be removed to a place where they may have the benefit of the sun as great a part of the day as may be; here they must stand the winter, keeping the boxes very carefully clear from weeds.

In the spring the young plants will appear, and they should then be removed to their first situation, where they may have only the morning sun; and, if the weather be dry, they must be watered at times. In June their leaves will decay, and they must then have half an inch of fresh earth sifted over them, and be left in their situation till October, when they must be removed to the same place as before for the winter.

In the spring the leaves will appear again, and, when they are again perished, the earth must be taken out of the boxes, and sifted to separate the roots, which must then be planted at three inches distance on a bed of the same light earth; they must be buried three inches deep, and in the spring following must have about half an inch of fresh earth sifted over them; the leaves will this year appear and decay as before; and, the following year in June, they will most of them flower; when the finest flowers should be marked, that their roots may be taken particular care of. The following year the remainder, which did not flower at first, will produce their flowers; such of these as are finer than the rest, should be marked in the same manner, and the roots of these choice kinds be preserved with particular care. Whatever fine or new flower is thus raised from seed, may be afterwards propagated by off-sets from the roots, which, being planted out, will flower the second year, and often produce even finer flowers than the mother-root.

The roots of these flowers should be taken out of the earth only every other year; this should be done just when the leaves are decayed, and they should not be kept out of the earth above a fortnight.

The earth in which these flowers thrive best, is a light sandy loam; and, if it be taken up with the turf and the grass rotted among it before it is used, it will be so much the better. They do not delight in a rich dunged soil, nor should they be placed where they are too much exposed to the sun; for, besides that the flowers soon fade in these places, the roots are also always found to decay; but in an east border, where they may have the sun till eleven o'clock, and where the ground is not too moist nor over dry, they will stand a long time in flower, and thrive extremely well. *Miller's Gard. Dict.*

XY'LON, *the cotton-tree*, in botany, the name of a genus of plants, the characters of which are these: the flower consists of one leaf, and is of the bell-shape, very wide at the mouth, and divided into many segments. From its bottom there arises a pyramidal tube, usually loaded with stamina; and from the bottom of the cup there arises a pistil, which is fixed in the manner of a nail both to the hinder part of the flower, and to the tube. This ripens into a roundish fruit, divided into four or more cells, opening at the top, and containing numerous seeds wrapped up in a stringy white substance, which is called cotton.

The cotton is a woolly or downy substance, which incloses the seeds, and which is contained in a brown husk, or seed-vessel. It is from this plant that most of the cotton we use is produced, the difference of the several sorts of it being owing to the different soil and climates it has grown in, and the different culture it has received.

The cotton in the wool, as it is usually called, is what we have from Cyprus. Damascus cotton is called cotton in the yarn; and the Jerusalem cottons, which are called bazzes, are the finest kinds of all.

All the kinds of cotton plants are propagated with us from seeds, which must be sown on a hot-bed early in the spring; and, when the young plants are come up, they should be transplanted each into a separate pot of light earth, which is to be plunged into a moderate hot-bed of tanner's bark, observing to water and shade them till they have taken root; after this they should be watered at times, and have as much air as the season will permit. As they enlarge in size, they must be shifted into larger pots; but they must be kept in the stove, where the herbaceous kinds will annually flower in autumn; but they will seldom bring their pods to any perfection. *Miller's Gard. Dict.*

Y.

YEAST.—Common ale Yeast may be kept fresh and fit for use several months, by the following method: put a quantity of it into a close canvas bag, and gently squeeze out the moisture in a screw-press, till the remaining matter be as firm and stiff as clay. In this state it may be close packed up in a tight cask, for securing of it from the air; and will keep fresh, sound, and fit for use for a long time.

This is a secret that might be of great use to the brewers and distillers here; who, though they employ very large quantities of Yeast, seem to know no method of preserving it, or raising nurseries of it; for want of which they sustain a very considerable loss; whereas the brewers in Flanders make a very great advantage of supplying the malt-distillers of Holland with Yeast, which is rendered lasting and fit for carriage, by this easy expedient. *Shaw's Lectures.*

YE'LLOW (*Dict.*)—The Chinese are famous for their Yellows in dying, which never change with washing. They make this dye of the flowers of the acacia, in a manner in which we might use several of our own productions to great advantage. It is thus: they gather the flowers before they are perfectly ripe, and dry them in an earthen vessel over a gentle heat, till they crisp up in the manner of tea-leaves; they then add to them the ripe seeds of the same tree in different proportions; and then, boiling them in river-water with alum, they give the Yellow in any degree that they please.

They have three kinds of Yellow, which they distinguish by the names of Ngo-hoang, King-hoang, and hoang alone.

The first of these is the brightest Yellow; to dye five or six ells of silk of this colour, they use a pound of the flowers of the acacia, about two ounces of the seeds, and four ounces of alum.

The King-hoang is a somewhat deeper Yellow: to dye this, they use the same ingredients in the same proportion as in the former case; and, when the silk is dry from the dipping in this, they give it a second dipping in a slight tincture of Brazil-wood; this brings it to the fine strong Yellow we see.

The hoang, or pale Yellow, is made of the same ingredients as the first, only, instead of four ounces of alum, they put in but three ounces: river-water is found to be greatly preferable to any other, for the extracting these colours; but, even in that, there is great difference, some doing the business much better than others.

The Chinese are so expert in judging on this occasion, that they can tell by the taste of water, whether it will or will not do; and, if it taste faint, they know it is faulty; but they dip the pieces twice into it instead of once, and then the colour succeeds well.

The flowers of the acacia, when they have been prepared by roasting in this manner, may be kept all the year round, and employed in dying as occasion requires, only there is to be longer boiling for the dried flowers than the fresh ones; and it is always found that the fresh flowers give the brightest colour. *Observ. sur les Coutumes de l'Asie.*

YELLOW-*hammer*, in zoology, the name of a very common English bird, called by authors emberiza lutea; and by some hortulanus, by others luteus, and by others chloreus.

It is a little larger than the chaffinch, and is very beautifully variegated with a greenish or greyish brown, and a fine bright yellow.

There is besides this another kind, which is much smaller and of a browner colour on the back; this is called by some authors zivolo. *Ray's Ornithol.*

YEW, *taxus*, in botany, the English name of a genus of plants, and also a term used by the salt-workers of Limington and other parts of England, to express the first rising of a scum upon the brine in boiling.

YU'CCA, or MANIHOT, in botany, the name of the Indian corn.

We have three or four sp cies of this plant preserved in the gardens of the curious; a .d the common kind, when grown strong and hardy, will endure the cold of our climate in the open air, and produce its flowers with us. All the species may be propagated either from seeds sent from abroad, or from off-sets off-sets or heads taken from the old plants in the manner of the aloe. When they are to be raised from seeds, these are to be sown in a pot of light fresh earth, which being plunged into a moderate hot-bed, the young plants will appear in five or six weeks; and, when they are two or three inches high, they are to be removed, each into a separate pot, which is to be plunged again into the same hot-bed, where they are to be watered and shaded, and to have air given them, as the season and the heat of the bed will permit. In July they must be hardened by degrees to the open air, into which they must be removed soon after to harden them against winter. They must be placed in a defended situation, and remain abroad till October, when they are to be removed into the green-house, and placed among the hardier sorts of aloes. They are here to be treated exactly as those plants; and, when they are grown sufficiently strong, they may be removed into common borders, where they will remain through our winters, and flower very beautifully.

When they are to be raised from the off-sets, these must be laid in a dry place for a week or ten days, before they are planted, that the wound where they were taken off from the old plant, may heal; else, like the other succulent plants, they are apt to rot in the earth, and miscarry. *Miller's Gard. Dict.*

YUCCA-*bread*, or *Cassada-bread*, made in many parts of the West-Indies, and eaten there; and sometimes brought over as a curiosity to us. It is made of the root of this plant, known among the botanists by the name of manihot. This grows to five or six feet high; the stalk is woody and full of knots, and has a large pith in it; the leaves are digitated or divided into a number of segments, like so many fingers; the flowers are composed of one leaf, and are as large as our narcissus, and are succeeded by a fruit of the size of a hazel nut. The root is very large and thick, and of a dark colour without, but very white within. It grows wild, common enough in some places; but it is generally cultivated for use, setting it in large furrows. Its juice is poisonous, though the dry powder of the root is perfectly innocent and wholesome; but there is a kind of it which may be eaten raw, and which is now getting into use, instead of the other, which is a speedy poison, if eaten with its juice.

The manner of making the bread from these roots is this: they peel them, rasp them, and putting them into bags squeeze out the juice; then they dry the remaining matter over the fire, and, when it is sufficiently dried, either in the sun, or by artificial heat, are the Cassada-bread; which is very nourishing, and will keep without moulding, as well as biscuit.

The use of it is apt to contract the throat, if eaten dry, and sometimes brings on a danger of choaking; the best method is to moisten it in broth, or otherwise, before it is eaten, or else to have a bottle of water at hand to wash down every mouthful.

The juice, expressed in preparing this root for bread, will kill any animal that drinks it crude: but it may be boiled over the fire till a great part is evaporated, and the remainder, if it be far evaporated, will be sweet, and serve in the place of honey; if less evaporated, and set by to ferment, it will make a very good and wholesome vinegar. The juice of the roucou is said to be a counter-poison for the juice of Yucca. *Lemery, Dict. des Drog.*

The thicker cakes of Yucca-bread are called cassavi, or cassada, and are eaten by the poorer sort. The thinner are called sciam, and are eaten by the rich. *Grew's Musæum.*

Z.

ZA'FFER, or ZAFFRE, in chemistry, the name of a blue substance, of the hardness and form of a stone; and generally supposed to be a native fossil.

It is in reality, however, a preparation of cobalt; the calx of that mineral being mixed with powdered flints, and wetted with water to bring it into this form. *Hill's Hist. of Fossils.*

To prepare this for use in the glass trade, put it in gross pieces into earthen pans, and let it stand half a day in the furnace; then put it into an iron ladle to be heated red-hot in the furnace; take it out while thus hot, and sprinkle it with strong vinegar; and, when cold, grind it on a porphyry to an impalpable powder, then throw this into water in glazed earthen-pans, and, when it has been well stirred about, let it settle, and pour off the water; repeat this washing often, and the foulness of the Zaffer will be thus wholly separated. Dry the powder and keep it for use.

ZA'RNICH, in natural history, the name of a genus of fossils, the characters of which are these: they are inflammable substances, not composed of plates or flakes, but of a plain, simple, and uniform structure, not flexile, nor elastic, soluble in ore, and burning with a whitish flame, and noxious smell like garlic.

ZEBLI'CUM *marmor*, in natural history, a name given by several authors to a soft green marble variegated with black and white; and though the authors who have described it have not observed it, yet it no ways differs from the white ophites of the antients. *Hill's Hist. of Foss.*

ZIBELLI'NA, *or the mustela Zibellina*, in zoology, the name of the creature whose furr is the sable, so much valued among us.

It is an animal of the weasel-kind, of the size of a cat, and of a dusky yellow colour, with a mixture of deep brown; the anterior part of the head, and the ears, are of a brownish grey, and the hairs about its eyes, nose, and mouth, very long. *Ray's Syn. Quad.*

ZIBE'THICUM *Animal*, in zoology, the name of the creature commonly, but very improperly, called the civet-cat; for it does not at all belong to the cat kind; but wholly to that of the dog; the head and nose are plainly of the figure of the dog's; and the figure, number, and disposition of the teeth, are plainly the same as in the wolf, fox, and dog.

Its colour varies very much; its more usual one, however, is that of a pale grey, variegated with long black streaks, though in the females it is often yellowish, and sometimes whitish, and the spots black and round, like those of the leopard, or cat of mountain.

The whole shape of the creature approaches to that of the wolf or dog; its snout is long and small; its ears are small and roundish; its hairs are like those of the badger, but very soft. Its body is thick and fleshy, and something resembles the shape of a hog's; its feet are small, and its legs very short. The bags which contain the civet are placed between the anus and pudenda, and are found equally in the males and females; but in the male they are twice as large as the female; they have a large cavity in their internal part, and their orifice is small and cartilaginous. The perfumed liquor which is found in these bags, seems to be secreted from a number of glands, which lie between the two skins of which they are composed. It is remarkable, that in this creature, as in the badger, its nose and belly are black, whereas in almost all other animals these parts are either whitish, or much paler than the rest. These creatures copulate backwards.

ZI'MENT-*water*, or *copper-water*, in natural history, the name by which some have called water found in places where there are copper-mines, and lightly impregnated with particles of that metal.

The most famous spring of this kind is about a mile distant from Newsol, in Hungary, in the great copper-mine called by the Germans herrn grundt.

It is not easy to say at what time these waters were discovered, since there is no authentic account of it. Kircher, Brown, Toll, and others, mention them as well known in their times; but it is probable that they were not discovered in the days of Agricola, since he no where makes the least mention of them; and it is not probable that so great a curiosity, and that so immediately in his own way, would have escaped him, if known at that time, especially as he has commemorated the like virtue in the Schmolnich waters, much less famous for it, and of much less power than those of Newsol. The water in this mine is found at different depths, and is received into basons, for the purpose of separating the copper from it: in some of these it is much more highly sated with this metal than in others, and will make the supposed change of iron into that metal much sooner. The most common pieces of iron, used in the experiments, are horse-shoes, nails, and the like; and they are found not very much altered in shape, after the operation, except that their surfaces are more raised. *Phil. Trans.* N°. 479.

ZI'ZYPHUS, *the jujube-tree*, in botany, the name of a genus of trees, the characters of which are these: the flower is of the rosaceous kind, being composed of several petals arranged in a circular form; the pistil arises from the cup, and finally becomes a fruit of the shape of an olive, and of a fleshy substance, including a stone divided into two cells, each of which contains an oblong seed.

The species of jujube, enumerated by Mr. Tournefort, are these: the cultivated jujube, with large oblong fruit. And, secondly, the wild jujube. *Tourn. Inst.* See the article JUJUBE *in the Dict.*

ZODI'ACAL *Light*, a brightness resembling that of the milky-way, and which is sometimes perceived in the heavens, at certain times of the year, after sun-set, or before its rise. The form of this light resembles that of a pyramid, lying lengthways

lengthways in the zodiac, within which its point and axis are always inclosed, its base being placed obliquely with respect to the horizon. This phænomenon was first discovered, described, and named by Mr. Cassini the elder.

The Zodiacal light is nothing but the solar atmosphere, a rare and subtile fluid, either luminous by itself, or made so by the rays of the sun surrounding its globe; but in a greater quantity, and more extensively about its equator, than any other.

The Zodiacal light is more or less visible according to circumstances: but the solar atmosphere is not always visible by means of this light, though it be always seen about the globe of the sun in total eclipses.

One of the most essential circumstances for the perception of the solar atmosphere by the Zodiacal light, is its having a sufficient length on the zodiac; for, without this, its brightness is entirely hid from us by the twilights.

Mr. de Mairan says, it may be proved from many observations, that the sun's atmosphere sometimes reaches as far as the earth's orbit, and, there meeting with our atmosphere, produces the appearance of aurora borealis. See the article AURORA BOREALIS.

The length of Zodiacal light varies sometimes in reality, and sometimes in appearance only, from various causes.

The oblique position of this light, little different from that of the plane of the ecliptic, does not permit us to see it distinctly, and sufficiently elevated above the horizon; but some time after sun-set, towards the end of winter, and in spring, or before sun-rising in autumn, and towards the beginning of winter. Several causes hinder our seeing it, any more than the milky-way; such as moon-light, and strong twilights, among others.

Mr. Cassini often mentions the great resemblance of the Zodical light to the tails of comets. Mr. Fatio has made the same observation; and Mr. Euler has lately endeavoured to prove them owing to similar causes.

Mr. Euler observes, that, if the sun has an atmosphere, the force of the impulse of light, issuing from that globe, must drive particles of that atmosphere before it; but, as gravity is very strong at the sun, this impulse would never drive those particles beyond the limits of their atmosphere, were it not for the centrifugal force arising from the sun's motion round its axis. This being opposite to the action of gravity, and diminishing its effects, the impulse of the light may considerably dilate the figure of the solar atmosphere, from what it would be if it arose from the gravity and centrifugal force of its particles only; and this dilatation will be very considerable near the sun's equator, and very small towards its poles. The action of light thus diminishing the action of gravity, Mr. Euler attempts to calculate how far this diminution of gravity may increase the extent of the sun's atmosphere about its equator. He finds a cubic equation, the roots of which express the semi-axis, or greatest amplitude of this atmosphere. He adds, that, this equation having three real roots, it is possible that the solar atmosphere may become a ring surrounding the sun's globe, as the ring of Saturn surrounds the body of that planet.

ZOO'LOGY, (*Dict.*) — This makes one of the three kingdoms, as they are called, of natural history; the vegetable and the mineral being the two others: in these, however, there is this difference made by writers, that, while vegetables and minerals are treated of together, as all of a piece in each, the subjects of Zoology are divided, and it is made to compose, as it were, several kingdoms. Whoever is to write on plants and minerals, calls his work a treatise of botany, or minerology; and we have no words to express any subdivision of them into kingdoms; but, in Zoology, we treat, as different subjects, the different parts of it; and the history of birds is separated by some from the rest under the name of ornithology; that of quadrupeds under the name of tetrapodology; and we have, for the rest, the words entomology, amphibiology, and the like, expressing these things which are properly but the parts of Zoology, and so many distinct and separate studies.

This may easily be amended, by our considering the animal world as we do the vegetable and mineral, and dividing it, as we do the others, into its proper families; it will then be found that these are no better distinctions than those of the families of these things, and that the authors may as well set up separate studies under the names of bulbology, umbelliferology, and the like, as those.

A natural division of the subjects of Zoology, on this principle, will afford six several families of its subjects. 1. The hairy quadrupeds. 2. The birds. 3. The amphibious animals, such as serpents, lizards, frogs, and tortoises. 4. Fishes. 5. The insects. And, sixthly, those lowest order of animated beings the zoophytes. *Artedi Ichthyol.*

ZU'RNAPA, in zoology, the Arabian name of an animal of a very singular kind, and seeming properly to belong to no known genus of animals, but to be perfectly sui generis. It is also called camelopardalis by Latin authors, and geraffa by eastern nations.

ZYGÆ'NA, in zoology, the name of a fish of the shark kind, called in English the balance fish, or the hammer-headed shark.

ZYMO'LOGY, in chemistry, a term used by some writers, to express a treatise on fermentation, or the doctrine of fermentation in general.